

The Production of English /l/ by Mandarin Speakers

by

Yunjuan He

B.A., Beijing Language and Culture University, 2001

A Thesis Submitted in Partial Fulfillment of the
Requirements of the Degree of

MASTER OF ARTS

in the Department of Linguistics

© Yunjuan He, 2004
University of Victoria

All rights reserved. This thesis may not be reproduced in whole or in part, by photocopy
or other means, without permission of the author

Supervisor: Dr. Hua Lin

ABSTRACT

This study investigates the production of English /l/ in different syllable positions (syllable initial, syllable final and syllabic) by Mandarin speakers. Sixteen Mandarin speakers with the same linguistic background (all of them speak Northern dialects) and different social backgrounds (by English experience and gender) participated in a production experiment with two reading tasks.

A number of conclusions were drawn based on the results of the experiment. 1) Mandarin speakers of English produce syllable final /l/ and syllabic /l/ much less accurately than syllable initial /l/. 2) Mandarin speakers use three strategies to modify syllable final /l/: vocalization, deletion and retroflexion. 3) Mandarin speakers consistently vocalize syllabic /l/ as the diphthongs /ou/ or /əu/. 4) Vocalization is a common strategy for modifying the syllable final /l/ after different vowels, while deletion and retroflexion of /l/ only occur after back rounded vowels. 5) Experienced Mandarin speakers produce more native-like syllable final /l/s than inexperienced speakers. 6) Female Mandarin speakers produce accurate or nearly accurate syllable final /l/ more frequently than male Mandarin speakers. 7) Mandarin speakers more frequently vocalize syllable final /l/ after the back rounded vowels /u/ and /o/ in formal speech than in casual speech.

This is the first study that systematically examines the production of English /l/ in different syllable positions. Furthermore, it provides an explanation as to why Mandarin speakers employ their modification strategies from phonological and phonetic perspectives. The findings suggest that researchers should study the acquisition of English syllable final /l/ and syllabic /l/ by L2 speakers more deeply in the future. The results of this study may also contribute to research on the phonology of loan words which are borrowed from English to Mandarin. They suggest that Mandarin speakers' ways of producing English syllable final /l/ and syllabic /l/ might be the source for creating the renditions of loan words.

TABLE OF CONTENTS

CHAPTER ONE INTRODUCTION	1
1.1 PURPOSE OF THE STUDY	1
1.2 RESEARCH QUESTIONS	4
1.3 RESEARCH HYPOTHESES	4
1.4 LIMITATION OF THE STUDY	5
1.5 OUTLINE	5
CHAPTER TWO LITERATURE REVIEW	7
2.1 ENGLISH /l/ AND MANDARIN /l/	7
2.1.1 <i>English /l/</i>	<i>7</i>
2.1.2 <i>Mandarin /l/.....</i>	<i>10</i>
2.2 PRODUCTION OF ENGLISH /l/	11
2.2.1 <i>Historical Perspective</i>	<i>11</i>
2.2.2 <i>Dialectological Perspective</i>	<i>13</i>
2.2.2.1 <i>Social factors</i>	<i>14</i>
2.2.2.2 <i>Geographical factors.....</i>	<i>16</i>
2.2.2.3 <i>Linguistic factors</i>	<i>17</i>
2.2.3 <i>L1 Acquisition</i>	<i>22</i>
2.2.4 <i>L2 Acquisition</i>	<i>23</i>
2.2.4.1 <i>Production of /l/ in syllable initial position</i>	<i>23</i>
2.2.4.2 <i>Production of /l/ in syllable final position</i>	<i>26</i>
CHAPTER THREE METHODOLOGY.....	33
3.1 WORD LIST READING TASK.....	33
3.1.1 <i>Participants</i>	<i>33</i>
3.1.2 <i>Stimulus materials</i>	<i>34</i>
3.1.3 <i>Procedure</i>	<i>35</i>
3.2 DIALOGUE READING TASK	36
3.2.1 <i>Participants</i>	<i>36</i>
3.2.2 <i>Stimulus materials</i>	<i>36</i>
3.2.3 <i>Procedure</i>	<i>37</i>
3.3 ACOUSTIC JUDGMENTS.....	38
3.4 STATISTICAL ANALYSIS	39
CHAPTER FOUR RESULTS AND ANALYSIS.....	40
4.1 ERROR RATES	40
4.2 ERROR TYPES.....	42
4.2.1 <i>Error types in producing syllable final /l/</i>	<i>42</i>

4.2.2 Error types in producing syllabic /l/	55
4.2.3 Feedback from Mandarin speakers.....	55
CHAPTER FIVE DISCUSSION.....	57
5.1 ERROR RATES IN DIFFERENT SYLLABLE POSITIONS	57
5.2 ERROR TYPES IN DIFFERENT SYLLABLE POSITIONS.....	59
5.2.1 Error types for syllable final /l/.....	60
5.2.1.1 Linguistic factors	60
5.2.1.2 Social factors	67
5.2.2 Error types for syllabic /l/	70
5.3 IMPLICATIONS FOR PEDAGOGY	72
5.3.1 What kinds of errors influence the comprehension of listeners?.....	72
5.3.2 How should dark /l/ be taught to Mandarin speakers?.....	73
CHAPTER SIX CONCLUSION.....	75
6.1 SUMMARY	75
6.2 FUTURE STUDIES.....	79
6.3 CONTRIBUTIONS	81
REFERENCES.....	82
APPENDIX A.....	91
APPENDIX B.....	92
APPENDIX C	93

FIGURES

Figure 2-1. Schematic view of Sproat and Fujimura's (1993) and Browman and Goldstein's (1995) gestural account of /l/ in English. Shaded boxes represent stronger gestures. (Revised version of the diagram in Carter, 2003; p78).....	9
Figure 4-1. Error rates for production of the phoneme /l/ in different syllable positions	40
Figure 4-2. Error rates of production of the syllable /l/ with different preceding vowels in word list and mini-dialogue tasks	41
Figure 4-3. Percentages of occurrences of vocalization, deletion, and retroflexion with different preceding back vowels /u/ and /o/	46
Figure 4-4. Effects of experience on the percentages of occurrence of vocalization, deletion, and retroflexion to modify /l/ after the vowel /u/	48
Figure 4-5. Effects of experience on the percentages of occurrence of vocalization, deletion, and retroflex to modify the /l/ after the vowel /o/	49
Figure 4-6. Effects of gender on the percentages of occurrence of vocalization, deletion, and retroflexion to modify /l/ after the vowel /u/	51
Figure 4-7. Effects of gender on percentages of occurrence of vocalization, deletion, and retroflexion to modify /l/ after the vowel /o/	51
Figure 4-8. Effects of style on the percentages of occurrence of vocalization, deletion, and retroflexion to modify /l/ after the vowel /u/	53
Figure 4-9. Effects of style on the percentages of occurrence of vocalization, deletion, and retroflexion to modify /l/ after the vowel /o/	54

TABLES

Table 2-1. Variations on producing /l/ and /n/ (Wang & Lin, 2003; p. 109)	10
Table 2-2. Effect of age factors on the probability of L-vocalization	14
Table 2-3. Effects of gender and social class on the probability of l-vocalization.....	15
Table 2-4. Effects of locations on the probability of l-vocalization.....	16
Table 2-5. Effects of preceding vowel backness on the probability of l-vocalization	18
Table 2-6. Effects of preceding vowel height on the probability of l-vocalization....	18
Table 2-7. Effects of preceding vowel length on the probability of l-vocalization....	19
Table 2-8. Effects of the feature of following consonant on the probability of	

l-vocalization.....	20
Table 2-9. Effects of the feature of preceding consonant on the probability of l-vocalization.....	21
Table 2-10. Effects of following environment on the probability of l-vocalization...	21
Table 2-11. Strategies used by Mandarin speakers for modifying consonants in coda position.....	26
Table 4-1. Variations in vocalization.....	43
Table 4-2. Linguistic and social factors under investigation.....	44
Table 4-3. Percentages of occurrences of vocalization, deletion, and retroflexion when the syllable final /l/ occurs after different vowels, with the numbers of tokens in parentheses	45
Table 4-4. Percentages of occurrences of vocalization, deletion, and retroflexion by students with different levels of English experience, with the numbers of tokens in parentheses	47
Table 4-5. Percentages of occurrence of vocalization, deletion, and retroflexion by speakers of different genders, with the numbers of tokens in parentheses	50
Table 4-6. Percentages of occurrence of vocalization, deletion, and retroflexion in different reading styles, with the number of tokens in parentheses	52

Chapter One INTRODUCTION

1.1 Purpose of the study

It is well known that most second language (L2) speakers retain an accent from their first language, even once they can speak the second language with grammatical correctness and functional fluency. L2 speakers exhibit their accents not only in the way they produce their vowels, but also in their pronunciation of consonants. Mispronunciation of consonants sometimes is not just a matter of carrying a ‘foreign accent’, but often inhibits an effective communication. Without accurate pronunciation of consonants, conversations might not proceed smoothly.

Many studies have been conducted over the past two decades to explore how L2 speakers acquire English consonants in coda position. It has been found that: voiced stops were devoiced by Mandarin and Korean speakers (Hansen, 2001; Major & Faudree 1996; Wang, 1995); the interdental fricatives /θ, ð/ were changed into /s, z/, respectively, by Mandarin speakers (Hansen, 2001); the palatal fricative /ʃ/ and affricates /tʃ, dʒ/ were attached with a vowel /ɪ/ by Korean speakers (Schmidt & Meyer, 1995; Yeon, 2003); and nasal /ŋ/ was confused with nasal /n/ by Japanese speakers (Aoyama, 2003). Consonant clusters were simplified by L2 speakers by using epenthesis, deletion or feature changing strategies (Broselow et al., 1998; Kim & Yuntaek, 1998; Major, 1994; Major & Kim, 1999; Weinberger, 1987). However, most studies on the acquisition of liquids by L2 speakers only focus on the consonants in onset position rather than coda position.

(Bradlow et al., 1997, 1999; Borden et al., 1983; Goto, 1971; Sheldon et al., 1982, 1985).

No studies have been undertaken to systematically describe how Mandarin speakers acquire the English liquid /l/ in coda position.

This study is therefore designed to investigate the production of English /l/ in different syllable positions (e.g., syllable initial /l/ in *lip*, syllable final /l/ in *peel*, and syllabic /l/ in *people*) by adult native speakers of Mandarin. Mandarin speakers were chosen as subjects to study for two reasons. Firstly, Mandarin only allows nasals /n/ and /ŋ/ and retroflex /r/ in coda position (Lin, 2001). Although there are syllabic sibilants in Mandarin, such as /ts, ts^h, s, tʂ, tʂ^h ʂ/ (Lin, 2001), no syllabic /l/ occur in Mandarin syllable structure. Such restrictive coda selections make it possible for Mandarin speakers to feel that it is difficult to produce the phoneme /l/ correctly in syllable final and syllabic positions. Secondly, as a native speaker of Mandarin, I have knowledge of the syllable structure of Chinese phonology, which can help me to understand the difficulties that Mandarin speakers have in pronouncing the phoneme /l/ in syllable final and syllabic positions, and which allows me to analyze difficulties arising from their first language background with particular insight.

The various pronunciations of syllable final /l/ and syllabic /l/ made by native speakers of English have been described by many researchers. Vocalizing the /l/ in the above two syllable positions is a common strategy employed in London English (Bowyer, 1973; Hardcastle & Barry, 1989; Hudson & Holloway, 1977; Meuter, 2002; Przedlacka,

2001; Spero, 1996; Tollfree, 1999; Trudgill, 1986; Wells, 1982), African American English (Bailey & Thomas, 1998; Fasold & Wolfram, 1970; Green, 2002), Australian English (Borowsky, 2001; Borowsky & Horvath, 1997; Horvath & Horvath, 1997, 2001, 2002), New Zealand English (Bauer, 1986, 1994; Horvath & Horvath, 2001, 2002) and Falkland Island English (Sudbury, 2001; Johnson & Britain, 2003). The /l/ is often replaced by the back round vowels /o/ and /u/¹. In African American English, vocalized /l/ may coalesce with the preceding mid back vowels: "ball" becomes /ba/ and "bowl" becomes /bo/ (Bailey & Thomas, 1998; Fasold & Wolfram, 1970; Green, 2002).

The probability of the occurrence of vocalized /l/ in Australian English has been statistically analyzed by Borowsky (2001), Borowsky and Horvath (1997), and Horvath and Horvath (2002), according to linguistic factors (backness and height of the preceding vowel, length of the preceding vowel, following environments, features of the preceding consonant, and features of the following consonant), social factors (age, gender and class) and geographical factors (location). It was found that some factors had an effect on the probability of vocalization of /l/, while others did not. More details are presented in Chapter Two. In the present study, the effects of two linguistic factors (backness of the preceding vowel and features of the preceding consonant) and three social factors (experience, gender, and reading style) are considered.

¹ In some studies, the high back rounded /u/ is transcribed as the offglide /w/ or the back rounded vowel /ʊ/.

1.2 Research questions

This study aims to answer the following questions:

- How well do Mandarin speakers produce the singleton phoneme /l/? In other words, what are the variations of /l/ production typical to Mandarin speakers of English?
- What kinds of strategies do Mandarin speakers use to modify or approximate English /l/?
- What are the factors that prevent Mandarin speakers from producing English /l/ accurately?
- How do linguistic and social factors affect the ways Mandarin speakers modify English /l/?

1.3 Research Hypotheses

Hypotheses are generated for each of the research questions cited above. Each of the hypotheses will be tested in this study.

First hypothesis: Mandarin speakers of English will produce syllable final /l/ and syllabic /l/ less accurately than syllable initial /l/.

Second hypothesis: Mandarin speakers of English will employ three strategies in their attempt to achieve syllable final /l/ and syllabic /l/: vocalization, deletion and retroflexion.

Third hypothesis: A combination of the negative L1 phonological influence and phonetic influence prevents Mandarin speakers from pronouncing English /l/ correctly.

Fourth hypothesis: One linguistic factor (backness of preceding vowel) and three social factors (English experience, gender, and reading style) will affect Mandarin speakers' preferences in choosing different strategies to modify syllable final /l/.

1.4 Limitation of the study

This study focuses only on the production of the singleton /l/ in syllable initial, syllable final, and syllabic positions. The production of /l/ in intervocalic position and the production of consonant clusters with /l/ are not examined.

1.5 Outline

This study investigates the production of English /l/ in different syllable positions by Mandarin speakers. It has six parts: Chapter One outlines the purposes and goals of the study. Chapter Two reviews the literature on the pronunciation of the phoneme /l/ from historical, dialectological, first language acquisition and second language acquisition perspectives. Chapter Three presents the methodology of the study. For the purpose of the study, one experiment with two reading tasks was designed. The results of this experiment are presented in Chapter Four. Chapter Five is a discussion of

these results, which answers the research questions and tests the research hypotheses. The final chapter summarizes findings, makes suggestions for further studies, and presents the contributions of the present study.

Chapter Two LITERATURE REVIEW

In this Chapter, I first introduce the English /l/ and Mandarin /l/ in Section 2.1. In Section 2.2, I present a review and critique of currently available literature relevant to my main subject, showing that there have been no previous studies done focusing on the difficulties English /l/ poses for Mandarin speakers. However, some of the existing literature on English /l/ provided useful guidelines for this study: This literature includes research on the production of English /l/ from historical, dialectological, L1 acquisition, and L2 acquisition perspectives. The dialectological research considered the effects of social factors, geographical factors and linguistic factors on the probability of vocalizing syllable final /l/ and syllabic /l/.

2.1 English /l/ and Mandarin /l/

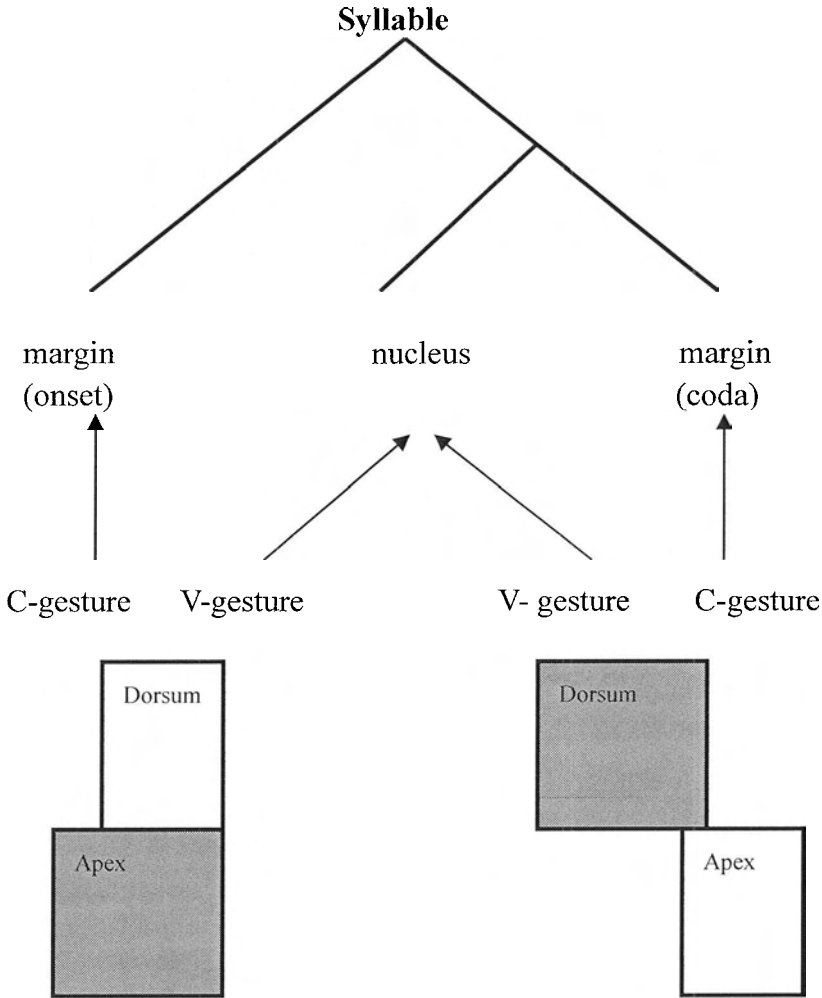
2.1.1 English /l/

English /l/ occurs in three different syllable positions. They are syllable initial /l/, as in *lip* /lɪp/, syllable final /l/, as in *peel* /pi:l/ and syllabic /l/, as in *people* /pi:pəl/. Traditionally, syllable initial /l/ is called light L or clear L (Hattori, 1984; Bladon & Al-Bamerni, 1976), while syllable final /l/ and syllabic /l/ are called dark L. In Sproat and Fujimura's (1993) study, they used the terms "prevocalic L" and "postvocalic L" to describe syllable initial /l/ and syllable final /l/, respectively. For the purpose of this study,

the phoneme /l/ will be categorized by its syllable positions.

According to Sproat and Fujimura's (1993) study, "All productions of /l/ involve two gestures, one gesture corresponding to the apical extension, henceforth termed the apical gesture, and the other corresponding to the dorsal retraction and lowering, the dorsal gesture. The apical gesture of /l/ is a consonantal gesture and the dorsal retraction gesture is a vocalic gesture since it does not produce a radical constriction in the vocal tract" (p. 304). "Consonantal gestures tend to be stronger in syllable initial position and weaker in syllable final position. Vocalic gestures tend to be weaker in syllable initial position and stronger in syllable final position" (p. 305). The relationship between these two gestures shows that the consonantal apical gesture is attracted to syllable margins, while the vocalic dorsal gesture is attracted to syllable nuclei. In terms of the gestures' timing, it was found that the apical gesture occurs slightly before the vocalic gesture in producing the syllable initial /l/. Both gestures end almost simultaneously. To produce the syllable final /l/, the dorsal gesture occurs much earlier than the apical gesture. The end of the dorsal gesture is almost synchronous with the beginning of the apical gesture (Browman & Goldstein, 1995). The above descriptions of the English /l/ are abstracted in Figure 2-1.

Figure 2-1. Schematic view of Sproat and Fujimura's (1993) and Browman and Goldstein's (1995) gestural account of /l/ in English. Shaded boxes represent stronger gestures. (Revised version of the diagram in Carter, 2003; p78)



2.1.2. Mandarin /l/

Unlike English, Mandarin has only syllable initial /l/, which sounds the same as English syllable initial /l/. In Mandarin, the nasal consonant /n/ and the lateral consonant /l/ are a minimal pair. However, people speaking a dialect, such as the Min, Xiang, Gan, Southeast or Jianghuai dialects, do not distinguish the pair /n/-/l/. Some dialects do not distinguish the minimal pair before open-mouth vowels (vowels begin with a non-high vowel, such as /a/, /o/ or /ɤ/) and lip-rounding vowels (vowels begin with the high back rounded vowel /u/), while other dialects do not distinguish it before any vowel. Meanwhile, the degrees of confusion are various. Some dialects use [n] to pronounce /l/ consistently. Other dialects use [l] to pronounce /n/ under any conditions. Some dialects treat [l] and [n] as interchangeable sounds, as shown in Table 2-1 below.

Table 2-1. Variations on producing /l/ and /n/ (Wang & Lin, 2003; p. 109)

Word	Mandarin	Chengdu	Wuhan	Nanjing	Yangzhou	Lanzhou	Nanchang	Changsha	Xiamen
/nan/	n-	n-	n-/l-	l-	l-	n-/l-	l-	n-/l-	l-
/lan/	l-	n-	n-/l-	l-	l-	n-/l-	l-	n-/l-	l-
/nian/	n-	n-	n-/l-	l-	n-	n-/l-	n-	n-/l-	n-
/lian/	l-	n-	n-/l-	l-	n-	n-/l-	l-	n-/l-	l-

In terms of syllable structure, Mandarin Chinese is very restricted in its coda selections. It only allows the nasals /n/, /ŋ/, or the retroflex /ɻ/ in coda position. Consonant clusters are not found in onset or coda positions.

2.2 Production of English /l/

Many studies have been done regarding the production of English /l/ from historical, dialectological, L1 acquisition and L2 acquisition perspectives.

2.2.1 Historical Perspective

Vocalization and deletion of syllable final /l/ are phenomena which often occur as languages change. In Recasens's (1996) study, L-vocalization is defined as the loss of central alveolar contact and the maintenance of tongue body configuration. In other words, the tip of the tongue does not touch the alveolar ridge and the dorsum of the tongue retracts.

From the spelling of some English words, such as *half*, *calf*, *palm talk* and *stalk*, we can tell they used to have a consonant cluster with the phoneme /l/ in their pronunciations. However, the /l/ is deleted in modern English pronunciation. Johnson and Britain (2003) note that the phoneme /l/ was vocalized after the vowel /a:/ and /o:/ and before labials and velars in the 16th century.

The vocalization of /l/ not only occurs in English, but also in other languages. Vocalized /l/ was found in Old French (Gess, 1998, 2001), Serbo-Croatian (Kenstowicz, 1994), Polish, Catalan and Mehri (Walsh, 1997) and many dialects of the Romance language family (Recasens, 1996).

For example:

Language	Old form	Modern form	Gloss
Old French	albe	aube	‘dawn’
Catalan	alba	auga	‘dawn’
	albarkok	aubercoc	‘apricot’
Provençal	falsu	faus	‘false’
	dulse	douts	‘sweet’
Portuguese	palpare	poupar	‘touch’

In Recasens’s (1996) study, he also mentions that Italian dialects changed syllable final /l/ into /r/ in some words.

For example:

Dialect	Old form	Modern form	Gloss
Ligurian	vulpe	vrurpe	‘fox’
La Spezia	talpa	tarpa	‘mole’
Piedmontese	malva	marva	‘mallow’
Neapolitan	ulmu	urmo	‘elm’
Calabrese	vulpe	vrurpe	‘blame’

From the above literature, we can see that the syllable final /l/ in certain contexts has historically changed into either vocalized /l/ or /r/.

2.2.2 Dialectological Perspective

There is no mention in the literature of variations in production of syllable initial /l/ in dialects of English. It is consistently pronounced correctly. Only one study, done by Ash in 1982, reported that intervocalic /l/ could be vocalized in Philadelphia. However, several studies found a variation of production of English syllable final /l/ and syllabic /l/. The term *L-vocalization* is used to describe this variation. This phenomenon was found in London English (Bower, 1973; Hardcastle & Barry, 1989; Hudson & Holloway, 1977; Meuter, 2002; Przedlacka, 2001; Spero, 1996; Tollfree, 1999; Trudgill, 1986; Wells, 1982), African American English (Green, 2002), Australian English (Borowsky, 2001, Borowsky & Horvath, 1997; Horvath & Horvath, 1997, 2001, 2002), New Zealand English (Bauer, 1986, 1994; Horvath & Horvath, 2001, 2002) and Falkland Island English (Sudbury, 2001; Johnson & Britain, 2003).

Several studies (Borowsky, 2001; Borowsky & Horvath, 1997; Horvath & Horvath, 1997, 2001, 2002; Johnson & Britain, 2003; Meuter, 2001) have been carried out to explore what kinds of factors could lead speakers to vocalize dark /l/. A number of linguistic, social and geographical factors were considered. I will review the previous studies from these three perspectives. In the following sections, several tables show the results from the studies conducted by Borowsky and Horvath (1997), Borowsky (2001), and Horvath and Horvath (2002). Figures in the tables represent the contribution that a particular factor makes to the probability of L-vocalization. The larger the figure, the

more likely the /l/ will be vocalized.

2.2.2.1 Social factors

Three social factor groups have been considered in the literature: age, social class and gender.

Borowsky and Horvath (1997) and Horvath and Horvath (2002) statistically examined the production of English syllable final /l/ by Australian and New Zealand speakers. They found that younger Australian people are more likely to vocalize the syllable final /l/ than older people are. The result is presented in Table 2-2. Johnson and Britain (2003) also found that the factor of age plays an important role in predicting whether the syllable final /l/ is vocalized by English speakers in the Fens region. Younger people (15-30 years old) displayed a higher percentage of vocalization of /l/ than older people (50-65 years old).

Table 2-2. Effect of age factors on the probability of L-vocalization

Age	Singleton /l/	
	Borowsky (2001)	Horvath and Horvath (2002)
Young	.598	.561
Middle aged	.392	.463
Old	.417	.370

The three studies demonstrate that the younger the speakers are, the more likely it is that they will vocalize dark /l/. This may mean that we are witnessing a linguistic

change which will increase in the future. In other words, the “proper” English syllable final /l/ and syllabic /l/ may completely disappear, to be replaced by the vocalization. None of the studies explained why younger speakers vocalize dark /l/ more frequently than older speakers.

In their study of the roles of gender and class in dialectal variation in Australian English, as shown in Table 2-3 below, Borowsky and Horvath (1997) found that people from the working class are more likely to vocalize /l/ compared to people from the middle class. However, the effect of gender and social class on the probability of L-vocalization is not statistically significant (Horvath & Horvath, 2002).

Table 2-3. Effects of gender and social class on the probability of l-vocalization

Gender and Social class	Dark /l/	Singleton /l/	Clustered /l/
	Borowsky and Horvath (1997)	Horvath and Horvath (2002)	Horvath and Horvath (2002)
Female Working	.664	.528	.553
Male Working	.514	.494	.490
Female Middle	.309	.502	.494
Male Middle	.420	.473	.457

Green (2002) mentions that L-vocalization is stigmatized as ignorant and uneducated speech by those who have preconceived notions about the people who use L-vocalization more frequently, for example, such as speakers of African American English and Southern American English.

2.2.2.2 Geographical factors

Johnson and Britain (2003) mentioned that: by the 1960s, dark /l/ had spread across the southern half of English. However, light /l/ still retained in the north English, the west Midlands and Norfolk. Vocalized /l/ was used in Surrey, Sussex, Essex and Oxfordshire.

As shown in Table 2-4 below, in Horvath and Horvath's (2002) study, there was a significant variation in the possibilities for vocalization of syllable final /l/ and syllabic /l/ among nine localities in Australia and New Zealand. They determined that people from New Zealand were more likely to vocalize the /l/ than people from Australia.

Table 2-4. Effects of locations on the probability of l-vocalization

The name of city	Singleton /l/	Clustered /l/
Brisbane	.136	.194
Melbourne	.257	.125
Hobart	.532	.409
Sydney	.449	.450
Mount Gambier	.593	.367
Adelaide	.675	.423
Auckland	.640	.661
Wellington	.653	.740
Christchurch	.619	.819

Bobda (2001) found that L-vocalization is one of the distinguishing characteristics of East African English. English people from Kenya, Uganda, Tanzania, Zambia and Malawi produce the syllabic /l/ as a vowel /o/, while English people from

Nigeria produce the syllabic /l/ as a vowel /u/.

2.2.2.3 *Linguistic factors*

Six linguistic factors in the production of dark /l/ have been considered in previous studies: The effects of the backness, height, and length of the preceding vowel, the effect of the following consonant on syllable final /l/ in a consonant cluster, the effect of a preceding consonant on syllabic /l/, and the effect of following environment.

As shown in Table 2-5, Borowsky (2001) found that a preceding front vowel was a strong inhibitor of L-vocalization, a preceding central vowel was a promoter of L-vocalization and a back vowel had an intermediate effect. However, the results of Horvath and Horvath's (2002) study show that preceding central vowels did not exert a stronger influence than back vowels. Regarding syllable final /l/ in consonant clusters in coda position, Borowsky (2001) found that the degree of influence of the backness of the preceding vowels was different for the /l/ in consonant cluster and the singleton /l/ in coda position. The probability of vocalization occurring after a front vowel was higher for clustered /l/ than for singleton /l/. However, the probability of vocalization occurring after a central vowel was slightly lower for clustered /l/ than for singleton /l/.

Table 2-5. Effects of preceding vowel backness on the probability of l-vocalization

Vowel backness	Singleton /l/		Clustered /l/
	Borowsky (2001)	Horvath and Horvath (2002)	Borowsky (2001)
Front	.438	.454	.353
Central	.554	.564	.798
Back	.558	.538	.556

In Borowsky's (2001) and Horvath and Horvath's (2002) descriptions, shown in Table 2-6, they found that the height of the preceding vowel was a strong factor in determining whether syllable final /l/ was vocalized. These two studies show that preceding high vowels favor vocalization, preceding mid vowels weakly disfavor vocalization, and preceding low vowels greatly disfavor vocalization. Concerning the difference between the /l/ in consonant cluster and the singular /l/ in coda position, Borowsky (2001) found that the probability of vocalization of clustered /l/ after a high vowel was higher than is the case for singular /l/. However, the probability of vocalization of clustered /l/ after a mid vowel was slightly lower than is the case for singular /l/.

Table 2-6. Effects of preceding vowel height on the probability of l-vocalization

Vowel height	Singleton /l/		Clustered /l/
	Borowsky (2001)	Horvath and Horvath (2002)	Borowsky (2001)
High	.597	.585	.832
Mid	.462	.474	.352
Back	.192	.160	---

The issue of length of the preceding vowel and its influence on the probability of vocalization of /l/ has caught several researchers' attention. Table 2-7 presents Borowsky's (2001) and Horvath and Horvath's (2003) observations that syllable final /l/ is more likely to be vocalized after a long vowel than after a short vowel. Sproat and Fujimura's (1993) study suggested that a long rhyme (long vowel) promotes the early and longer dorsal gesture while a shorter rhyme inhibits it. In other words, the dorsal gesture of a syllable final /l/ occurring after a long vowel is more prominent than that of one occurring after a short vowel. Therefore, the /l/ after a long vowel is more likely to lose its apical gesture and become vocalized.

Table 2-7. Effects of preceding vowel length on the probability of l-vocalization

Vowel length	Singleton /l/	
	Borowsky (2001)	Horvath and Horvath (2002)
Short	.413	.405
Diphthong	.545	.494
Long	.573	.612

Borowsky (2001) found that L-vocalization is most frequent when the post vocalic /l/ occurs before a dorsal consonant, less frequent when it occurs before a labial consonant, and least frequent when it is followed by a coronal consonant. His quantitative analysis is shown in Table 2-8. Borowsky attributed the high probability of

vocalization to the assimilatory effect of adjacent consonants with a shared place of articulation. If a dorsal consonant follows the /l/, such as in the word *milk*, the strong dorsal environment inhibits the apical gesture. If a coronal consonant follows the /l/, such as in the word *belt*, the environment naturally promotes the apical gesture.

Table 2-8. Effects of the feature of following consonant on the probability of l-vocalization

The feature of following consonant	Clustered /l/
Dorsal	.805
Labial	.671
Coronal	.407

Borowsky's (2001) observations, presented in Table 2-9, show that a preceding dorsal consonant promotes the vocalization of syllabic /l/, such as in the word *noodle*, while a preceding labial consonant inhibits vocalization, such as in the word *babble*. The dorsal consonant is a strong promoter and the labial consonant is an inhibitor because the preceding dorsal consonant creates a strong dorsal environment, which maximizes the dorsal gesture of the syllabic /l/ and minimizes the apical gesture. In contrast, the labial consonant and the following /l/ can be produced simultaneously, which gives enough time to produce both gestures of syllabic /l/.

Table 2-9. Effects of the feature of preceding consonant on the probability of l-vocalization

The feature of preceding consonant	Syllabic /l/
Dorsal	.752
Coronal	.528
Labial	.301

Following environment also influences the vocalization of dark /l/, as Borowsky's (2001) and Horvath and Horvath's (2002) findings in Table 2-10. Syllable final /l/ and syllabic /l/ are frequently vocalized before another syllable beginning with a consonant or before a pause. Followed by a vowel, syllable final /l/ is not frequently vocalized, whereas syllabic /l/ still has a relative high frequency of vocalization. In the environment of a following vowel, syllable final /l/ is easier to move to the next syllable to create an onset. Therefore, syllable final /l/ changes to syllable initial /l/, which is not vocalized by English speakers.

Table 2-10. Effects of following environment on the probability of l-vocalization

Following environment	Syllable final /l/		Syllabic /l/
	Borowsky (2001)	Horvath and Horvath (2002)	Borowsky (2001)
Consonant	.626	.616	.465
Pause	.527	.526	.669
Vowel	.176	.196	.419

2.2.3 L1 Acquisition

Generally speaking, liquids are often acquired late by children. In Johnson and Britain (2003, p. 15), point out that “many children operate a process of ‘gliding’ of liquids which sees [r] being produced as [w], clear /l/ as [j] and dark /l/ also as [w]”. Therefore, we can treat L-vocalization in syllable final position and syllabic position as a phenomenon that occurs during first language development. Some examples (cited from Johnson and Britain, 2003; p. 16) of this phenomenon are shown below:

Amahl

(Smith, 1973)

[bebu] *table*

[gigu] *tickle*

[æbu] *apple*

[æməu] *Amahl*

Gitanjali

(Gnanadesikan, 1996)

[biw] *spill*

[fəw] *smell/fell*

Daniel

(Menn, 1971)

[kʌdu] *cuddle*

[bʌbu] *table*

Trevor

(Pater, 1997)

[ʃeu] *Michelle*

[gigu] *tickle*

[kiku] *pickle*

Joan

(Velten, 1943)

[waw] *well*[baw] *bell*[bawt] *belt*

From the above data, we can see that children vocalize the dark /l/ in different syllable positions: syllable final position, as in the words *spill* [biw] and *belt* [bawt]; and syllabic position, as in the word *apple* [æbu]. Therefore, L-vocalization is not a phenomenon unique to adult native speakers, but is also apparent in child native speakers. This suggests that correctly producing /l/ in syllable final and syllabic positions might also be difficult for L2 speakers, since some native speakers of English sometimes produce /l/ improperly.

2.2.4 L2 Acquisition**2.2.4.1 Production of /l/ in syllable initial position**

Many studies in L2 acquisition have been done on the distinction between English /r/ and /l/ in onset position by adult speakers of languages, such as Japanese and Korean, which do not contrast these phonemes in their own consonant inventories.

These studies have tried to explore whether there is any relationship between production and perception of L2 consonants. Some researchers believe that inaccurate

sound production is due to inaccurate sound perception. That is, good perception is a prerequisite to accurate pronunciation. Other researchers disagree, claiming that L2 speakers can adequately produce L2 sounds which may not have been well perceived.

Studies by Goto (1971) and Sheldon et al. (1982) showed that some Japanese subjects were able to produce identifiable /r/ and /l/ tokens even though they were unable to reliably identify native English /r/ and /l/ tokens. This finding led these researchers to conclude that production can precede perception in the acquisition of a non-native contrast. I suggest that either claim is unsafe. Other factors need to be brought into consideration.

However, Borden et al. (1983) obtained results different from those of Goto (1971) and Sheldon et al. (1982). They examined the relationship between perception and production of English /l/ and /r/ by Korean learners of English. One of the main results obtained was that self-perception develops earlier and may be a prerequisite for accurate production. The authors note that “the ability to make phonemic perceptual judgments in an /r/ - /l/ continuum that are similar to those of English speakers also seems to improve before production” (p. 516).

In 1985, Sheldon statistically reanalyzed the results from Borden et al.’s earlier study (1983). Her study confirmed the findings of Sheldon and Strange (1982) and failed to support the argument made by Borden, Gerber and Milsark (1983) that accurate perception is acquired before accurate production. One of the important conclusions of

Sheldon's reanalysis was that the relationship between production and perception depended on the amount of time spent in the English-speaking environment by the Korean learners, so that "as the learner's time in the US increases, the probability of occurrence of perception exceeding production decreases" (p.111). This claim is supported by the fact that the speakers studied by Sheldon and Strange (1982) were advanced learners.

At present, there is no conclusive connection between speech perception and production. As concluded by Sheldon et al. (1982, p. 245), "at least for the contrast studied here, perceptual mastery of a foreign contrast does not necessarily precede adult learners' ability to produce acceptable tokens of the contrasting phonemes, and may, in fact, lag behind production mastery".

However, Bradlow et al. (1997, 1999) suggest that transfer of perceptual learning to speech production can occur. Bradlow et al. (1997, p. 2308) determined that "a perceptual training procedure is robust: it is not only effective in training Japanese adults to perceive the English /r-/l/ contrast, but is also effective in improving the pronunciation of non-native speech sounds without any explicit training or feedback in speech production.". The student, by being trained to perceive better, learns to speak better by his own efforts. Therefore, we can see that there is a link between perception and production in this case: Better perception makes for better production.

These studies seem to suggest that accurate production of liquids does not

necessarily predict accurate perception. However, accurate perception makes accurate production possible. That is, accurate perception is necessary but not sufficient for accurate production.

2.2.4.2 Production of /l/ in syllable final position

There are several studies on the acquisition of English consonants in coda position by Mandarin speakers (Anderson, 1987; Broselow, 1998; Flege and Davidian, 1984; Hansen, 2001; Wang, 1995, Weinberger, 1987). It has been claimed that three strategies (shown in Table 2-5) are employed by Mandarin speakers to modify English consonants: epenthesis, deletion and feature change.

Table 2-11. Strategies used by Mandarin speakers for modifying consonants in coda position

Strategy	Description	Example
Epenthesis	Speakers insert a vowel after the consonant.	$CVC \rightarrow CVC\underline{V}$
Deletion	One or more of the consonants in onset or (and) coda are not present in production.	$CVC \rightarrow CV(C)$
Feature change	Speakers produce the consonant in an anticipatorily different manner or place.	$CVC_1 \rightarrow CVC_2$

L1 transfer, universal constraints and social factors were all shown to affect the production of English syllable final consonants by Mandarin speakers. In the following

section, I will review these linguistic, universal and social constraints.

L1 transfer

Lin (2001, p. 55) mentions “Mandarin is monosyllabic at the morpheme level; the language is characteristically disyllabic at the word level.” She also points out that the way of creating Chinese words by a highly constrained into two-syllable template. Many morphological processes, including adding affixes, compounding, and abbreviation, are used to form disyllabic words.

In Wang’s (1995) study of the acquisition of English word-final obstruents by Chinese speakers, further elaborated by Broselow (1998) within a constraint-based Optimality Theory framework, students exhibited considerable preference for disyllabic forms. That is, epenthesis applies significantly more often to the consonant in coda position if the target word is monosyllabic than if it is to disyllabic (72% vs.17.5%), producing incorrect disyllabic outputs.

Universal constraints

The universally least marked syllable type in the primary languages of the world is the CV syllable. The results of Tarone’s (1980) study examining vowel epenthesis to word-final singleton consonants (VC → VCV) revealed that of the 45 instances of vowel epenthesis, more than 50% occurred before a pause, 40% occurred before a

word-initial consonant, and less than 5% occurred before a word-initial vowel. The reason for this asymmetry is that when followed by a second onsetless word, the final consonant of the first word will move to the onset position of the second word to form a CV. On the other hand, if the following word begins with a consonant, the final consonant of the first word needs another vowel to form a CV. Usually, the vowel is schwa. However, it is difficult to tell whether the L1 transfer of lack of stops in coda position or the universal preference for CV structure is the most important factor influencing Mandarin speakers when they modify English syllable structure. Most researchers prefer to attribute the modification of the structure CVC becomes CV or CVCV to L1 transfer, as consonants are not permitted in coda position in Mandarin.

Gender

From a phonetic perspective, some studies (Asher and Garcia, 1969; Tahta et al., 1981; Thompson, 1991) found that gender has a great influence on the degree of foreign accent. These studies found that females have weaker foreign accents than males. However, most studies did not show evidence that gender is a significant factor influencing the degree of L2 foreign accent (e.g., Suter, 1980; Flege & Fletcher, 1992; Elliott, 1995). From a sociolinguistic perspective, researchers found that female L2 speakers tend to show a higher frequency of using proper or standard forms / pronunciations than males (Gussenhovern, 1979; Leather & James, 1996; Broeder, 1982;

Regan, 1991). In Lin's (2003) study, there was no significant difference between the error rate of consonant clusters made by females and males. However, females used the epenthesis strategy more frequently than males did.

Experience

Common sense would suggest that the more L2 experience the speakers have, the more accurate their L2 pronunciation. In a number of studies, length of residence (LOR) is used to index speakers' level of L2 experience. It is generally assumed that LOR in the second language environment is positively correlated with the amount of L2 input a learner has received. Thus, the longer the LOR, the better the L2 pronunciation performance is. However, Hansen (2001) did not find any significant improvement in the accuracy of production of English coda consonants in his study of three Mandarin speakers after six months of learning in the US. However, his results might have been due to the short period he observed.

Styles

Bayley (1996) observed that syllable final t/d deletion was influenced by speech style in both native and non-native speech. The more careful the style, the less likely speakers are to omit syllable final t/d. He found that Mandarin learners of English are least likely to delete syllable final t/d when reading and most likely to delete them in the

relatively informal conversation represented by interviews. A similar result was found in Weinberger's (1987) study on L2 word-final consonants. Mandarin speakers were found to utilize epenthesis more than deletion in tasks without linguistic context. In tasks that supplied linguistic context, such as paragraph reading and storytelling, the proportion of epenthesis to deletion was $9.3/12.6 = .74$, whereas in list reading, where no linguistic context was available, the proportion was $11.3/5.5 = 2.0$. These two ratios show that the percentage of occurrence of deletion in casual reading style is higher than in formal reading style. Weinberger accounted for the lower rates of deletion in the list-reading task in terms of the notion of "recoverability." Since the list-reading task did not supply linguistic context, there was a high potential of ambiguity. Mandarin speakers, when speaking in a formal manner, add /ə/ after the syllable-final consonant to make it audible.

My review of the literature found that only four papers mentioned the difficulties of production of syllable final /l/ or syllabic /l/ by L2 speakers. Oh's (2002) study of children bilingual in Korean and English examined their knowledge of the language-specific articulatory gestures, timing, and allophonic (onset vs. coda) patterning of English /l/ and Korean /l/. The tongue tip (TT) was produced earlier by the Korean-English bilingual children than the one made by English monolingual children. The Korean-English bilingual children also had an additional gesture for producing syllable final /l/: raising of the body of tongue. This is a gesture used in producing the Korean /l/. Thus, the result was clearly shown that L1 transfer had played an important

role during the participants' L2 acquisition.

In Heselwood and McChrystal's (2000) study, subjects were bilingual in Punjabi and English. These subjects tended to use a palatalized /l/ to produce the syllabic /l/ in a word like *candle*. They also added a vowel /e/ before the palatalized /l/, which is very different from the mid-central schwa-type vowel found in monolingual English in these environments. However, the researchers did not explain why the subjects made such modification of syllabic /l/.

Only two papers briefly mentioned the difficulties that Mandarin speakers have in pronouncing the phoneme /l/ in syllable final and syllabic positions. Lee's (1976) paper mentioned their difficulties in pronouncing the phoneme correctly in these two syllable positions. However, he only pointed out the phenomenon without any description of how or why they cannot produce the /l/ in the same manner as native speakers. Hansen (2001) pointed out that the syllable final /l/ in word *tell* is one of the most difficult consonants for Mandarin speakers to pronounce correctly. He found that the /l/ is absent in 23% of productions and that 8% of productions involve feature change. However, he also did not explain how or why the feature changes.

So far, we can tell that the acquisition of English /l/ in syllable final and syllabic positions by L2 speakers has not been studied much. From the results of the five studies, we can see that L2 speakers did have difficulties with producing the /l/ in syllable final

and syllabic positions. However, only Oh's (2002) study provides reasons why his subjects did not produce the /l/ properly. Therefore, further studies need to be conducted to more deeply investigate L2 speakers' difficulties in producing syllable final /l/ and syllabic /l/. Since no previous studies have systematically examined the production of the lateral sound /l/ in syllable final and syllabic positions by Mandarin speakers, this study focuses on the acquisition of English /l/ in different syllable positions by Mandarin speakers.

Chapter Three METHODOLOGY

For the purpose of this study, one experiment was designed to examine the production of English phoneme /l/ in different syllable positions by Mandarin speakers. This experiment will document the ways in which Mandarin speakers produce the English phoneme /l/ as syllable initial /l/, syllable final /l/, and syllabic /l/ in two speech styles: word list reading and mini-dialogue reading.

3.1 Word list reading task

3.1.1 *Participants*

Eight Mandarin speakers (4 male and 4 female) in Victoria, Canada, and eight Mandarin speakers (4 male and 4 female) in Beijing, China, participated in this experiment. All of them were university students. They were all native speakers of the Northern dialects of Mandarin which did distinguish lateral /l/ from nasal /n/ in onset position. The age range of the participants was between 20 and 30 years old. All of them had been taught English in a formal educational environment from junior high school through university for over 10 years. All of subjects were free from any medically significant speech or hearing problems. The background information on individual participants is provided in Appendix A.

The eight Mandarin speakers residing in Canada were all included in the experienced group of speakers. All of them had been in Victoria at least one year. When they arrived in Victoria, they were over the age of 16. They all took undergraduate or graduate courses instructed in English at the University of Victoria and communicated with local people in English. They had all passed the Test of English as a Foreign Language (TOEFL) with a minimal score of 550 to enter the university.

The eight Mandarin speakers in China comprised the group of inexperienced speakers. All of them were graduate students in Materials Engineering at the Beijing University of Science and Technology. They had never been to an English speaking country. The English they learned in class was focused on training their reading and writing abilities, and they seldom used English to communicate with others outside their English class.

3.1.2 Stimulus materials

One hundred and forty English words were selected for the test. All the words are true words with lexical meanings. The words were shown to the subjects with phonetic transcriptions of vowels, as shown in Appendix B. Forty words are in the syllable pattern LVC, forty words CVL and sixty words CVCL. In syllable patterns LVC and CVL, the vowels contained in the tested words are /i/, /ε/, /o/ and /u/. Each vowel occurs ten times in each unit of the speech production test combined with various consonants. In the syllable pattern CVCL, the consonants preceding the syllabic /l/ are /p/,

/b/, /t/, /d/, /k/ or /g/. Each consonant occurs ten times in the speech production test. There are a total of 2,240 tokens in the word list reading task (10 LVC × 4 vowels × 16 participants + 10 CVL × 4 vowels × 16 participants + 10 CVCL × 6 consonants × 16 participants = 2,240 tokens).

3.1.3 Procedure

The subjects were tested one at a time in a sound booth. At first, the subject heard accurate productions of the test words, presented by an experienced phonetician, an adult female native English speaker from Victoria, Canada. This step ensured that the subject received the correct input. Then, the subject did a trial reading in order to become familiar with the word patterns. After that, the subject read the word list. The productions were recorded into a computer using PRAAT, a program for speech analysis and synthesis written by Paul Boersmaoch and David Weenink at the Department of Phonetics of the University of Amsterdam.

Two native speakers of English were asked to identify whether the /l/s produced by the Mandarin speakers were identical to the ones made by the professional native speaker. If an /l/ did not match native production, the judges needed to indicate how the /l/ was mispronounced. Since native speakers of American English have no preference for dark or light /l/ on the basis of its appropriateness to the context (initial or final syllable position), they are scarcely able to discriminate between them (Whalen et al., 1997; p. 505). This study focused on whether Mandarin speakers accurately pronounce

the phoneme /l/ in initial, final and syllabic positions. If the judges were not in agreement in their transcriptions, an acoustic analysis was performed using PRAAT.

3.2 Dialogue reading task

3.2.1 Participants

The same subjects participated in the dialogue reading task as in the word list reading task.

3.2.2 Stimulus materials

Three dialogues were prepared containing the target words with syllable initial /l/, syllable final /l/, and syllabic /l/ (See Appendix C). The target words all occurred at the end of sentences. In other words, all of them occurred before a pause, creating a rhyming pattern in the dialogues. The purpose of this arrangement is to minimize differences from the effects of the following environment. The results of the pronunciations of three of the words in the dialogues were not considered: the person's name *Phil* when it occurred the first time in the first dialogue, the word *well* when it occurred the second time in the first dialogue and the person's name *Paul* when it occurred the first time in the second dialogue. This is because the pronunciation of syllable final /l/ in the words *Phil* and *well* might be influenced by the syllable initial /l/s at the beginnings of the following words, *look* and *let*, respectively. If the speaker speaks

quickly, the two adjacent words will be linked together. The syllable final /l/ of the word *Phil* would be changed into the syllable initial /l/ of the word *look*. The same process of assimilation could also apply to the syllable final /l/ in the word *well*. Therefore, the accuracy rate of these tokens would possibly be higher than that of other tokens with syllable final /l/ following a front vowel. The person's name *Paul* was followed by the word *would* which begins with the glide /w/, which might trigger vocalization of syllable final /l/. Therefore, the accuracy of the token could potentially be lower than others with the syllable final /l/ following a back vowel.

3.2.3 Procedure

The procedure is similar to that of the preceding experiment. First, the subjects heard accurate production of the test sentences, presented by an adult female native English speaker from Victoria, Canada. This step ensured that the subjects received the correct input. Then they were asked to translate the English dialogues into Mandarin in order to force them to focus their attention on the meaning of the content rather than just the pronunciations of the words. After that, they read the dialogues as if they were a natural conversation. There were a total of 400 tokens from the mini-dialogue reading task (3 LVC × 16 participants + 5 C/l/L × 16 participants + 4 C/ε/L × 16 participants + 5 C/u/L × 16 participants + 5 C/o/L × 16 participants + 3 CVCL × 16 participants = 400 tokens).

As in the previous experiment, the productions were recorded into a computer. The same two native speakers of English were asked to identify whether the /l/s produced by the Mandarin speakers were as native-like as the ones produced by the native speaker. If a token of /l/ did not match native production, the judge needed to indicate how the /l/ was mispronounced. If the judges disagreed in their transcriptions, an acoustic analysis was performed.

After the word list reading and mini-dialogue reading tasks, the Mandarin speakers were asked to self-evaluate their pronunciations of the phoneme /l/ in the different syllable positions, and to tell the researcher where the tip of their tongue was when they tried to pronounce the /l/s.

3.3 Acoustic judgments

In the present study, the program PRAAT was used to generate spectrograms for tokens. The coda segments were identified in the following ways:

Phoneme /l/: F2 drifts downward in frequency, which indicates a back tongue position.

F3 of syllable final /l/ drifts upward, indicating a movement of the tip of the tongue up to the alveolar ridge.

Vocalized /l/: F2 lowers, as the tongue position is relatively back and the lips are relatively rounded, and the F2 angle towards the vowel is steeper than with syllable final /l/. F3 does not show a rising tendency.

Deleted /l/: The F2 and F3 of the vowel in the nucleus do not change after finishing the production of the target word.

Retroflex /r/: F3 lowers and F2 rises, which indicates that the tip of the tongue curls.

3.4 Statistical analysis

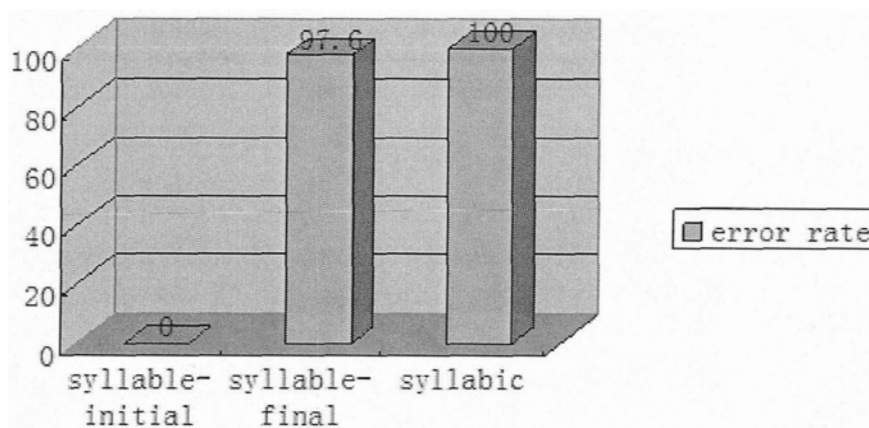
A t-test was used to calculate the significant levels of difference between two samples, such as the error rates of production of syllable final /l/ and syllabic /l/ by Mandarin speakers. A chi-square test was used to test whether the various factors (preceding vowels, gender, experience, and style) had an effect on the Mandarin speakers' preferences for different modification strategies (vocalization, retroflexion, and deletion). The probability (p) value for this study is set at .05. Any *p*-value which is less than .05 is considered significant.

Chapter Four RESULTS AND ANALYSIS

This chapter reports the results of the production experiments. Section 4.1 describes the error rates for the production of phoneme /l/ in different syllable positions (syllable initial, syllable final, and syllabic) by Mandarin speakers. Section 4.2 shows the types of errors produced in modifying the /l/. The effects of several linguistic and social factors on the occurrence of different error types are investigated.

4.1 Error rates

Figure 4-1. Error rates for production of the phoneme /l/ in different syllable positions



From Figure 4-1, we can see that all of syllable-initial /l/s were produced correctly by Mandarin speakers. Also, all of the syllabic /l/s were incorrectly produced. In syllable final position, the subjects produced the phoneme /l/ with a slightly lower

error rate (97.6%) than in syllabic position (100%).

Figure 4-2. Error rates of production of the syllable final /l/ with different preceding vowels in word list and mini-dialogue tasks

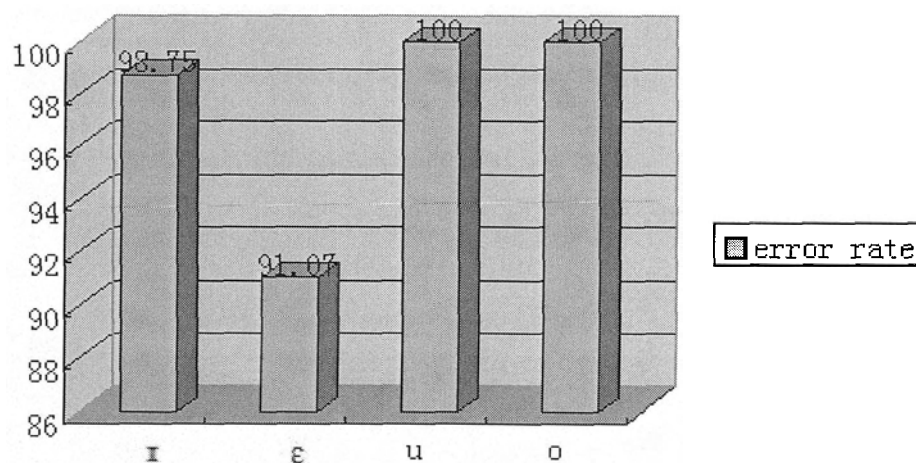


Figure 4-2 clearly shows that some Mandarin speakers produced some words ending with /l/ correctly. However, all the correct productions of syllable final /l/ occurred after the vowels /i/ and /ε/. None of the participants produced the syllable final /l/ after the vowel /o/ or /u/ correctly. There was a significant difference between the syllable final /l/ after the preceding vowel /i/ and the syllable final /l/ after the preceding vowel /ε/ with respect to the error rate, $t(442) = 3.787, p < .05$.

Furthermore, none of the participants were consistently able to pronounce syllable final /l/ correctly with a preceding vowel. For example, they sometimes pronounced final /l/ correctly with the preceding vowel /ε/, but sometimes produced it

incorrectly.

4.2 Error types

As shown in section 4.1.1, it was difficult for Mandarin speakers to produce syllable final /l/ and syllabic /l/ correctly. In this section, we will see how they produce /l/ incorrectly in those two syllable positions. The results for each type of dark /l/ will be presented separately. Several linguistic and social factors which may affect the results of production are also investigated.

4.2.1 Error types in producing syllable final /l/

First, we need to look at how to pronounce syllable final /l/ accurately. According to Sproat and Fujimura (1993), the articulation of the /l/ has two gestures: a consonantal apical gesture (the tip of the tongue touches the alveolar ridge) and a vocalic dorsal gesture (the dorsum of tongue retracts).

In the production experiment, we found that there were three strategies used by Mandarin speakers to modify syllable final /l/: vocalization, deletion and retroflexion.

These terms are defined as follows:

Vocalization: The apical gesture is lost and the dorsal gesture is maintained. The tip of the speaker's tongue does not touch the alveolar ridge, but the body of the tongue retracts and lowers. The vocalized sounds like the vowel /u/ or /o/.

Deletion: The two gestures of articulation of /l/ are totally lost, leaving no segment in coda position.

Retroflexion: The tip of the tongue is curled and is behind but not touching the alveolar ridge. The body of the tongue raises and the root of the tongue retracts. The retroflexed /l/ sounds like retroflexed /r/.

Table 4-1. Variations in vocalization

Preceding vowel	Syllable final /l/				Syllabic /l/
	ɪ	ɛ	u	o	---
Type of vocalization	/ou/	/o/, /u/	/o/, /ou/	/u/	/ou/, /əu/
Exception	/u ^r / /ɣ/	/u ^r / /ɣ/	---	---	---

As shown in Table 4-1, various vowels were substituted for syllable final /l/ in the production test. The vowel /ou/ consistently replaced syllable final /l/ when the vocalization of /l/ occurred after the vowel /ɪ/. The vowel /u/ or /o/ was used to modify the /l/ when the vocalization of /l/ occurred after the vowel /ɛ/. The vowel /o/ or /ou/ substituted for the /l/ when the vocalization happened after the vowel /u/. The diphthongs /ou/ and /əu/ were used by Mandarin speakers to modify the syllabic /l/. There were exceptions, however: Ten tokens ended with the back vowel /ɣ/ after the front vowel /ɪ/, and ten tokens with /ɣ/ after the front vowel /ɛ/. Five tokens ended with /u^r/ after the vowel /ɪ/ and eighteen tokens ended with /u^r/ after the vowel /ɛ/.

Several linguistic and social factors which may affect the Mandarin speakers' use of strategies for modifying syllable final /l/ are also considered. The results of production are presented according to these different factors.

Table 4-2. Linguistic and social factors under investigation

Categories	Factor groups
Linguistic	Vowel backness High front vowel /I/ Mid front vowel /E/ High back vowel /u/ Mid back vowel /o/
Social	Gender Female Male Experience Experienced (Chinese students in Canada) Inexperienced (Chinese students in China) Style Formal style (word list reading) Casual style (mini-dialogue reading)

In the following tables, I will use the letters L for correct production of the phoneme /l/, V for vocalization, R for retroflex /ɾ/ and D for deleted /l/.

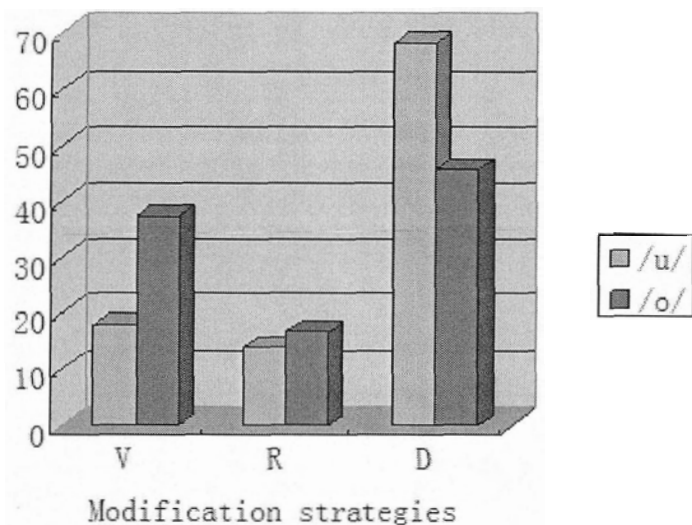
1) The effect of vowel backness

Table 4-3. Percentages of occurrences of vocalization, deletion, and retroflexion when the syllable final /l/ occurs after different vowels, with the numbers of tokens in parentheses

Preceding Vowels				
	/ɪ/	/ɛ/	/u/	/o/
L	1.25 (3)	8.9 (20)	0 (0)	0 (0)
V	98.75 (237)	91.1 (204)	17.9 (43)	37.5 (90)
R	0 (0)	0 (0)	13.8 (33)	16.7 (40)
D	0 (0)	0 (0)	69.3 (164)	45.8 (110)
Total	100 (240)	100 (224)	100 (240)	100 (240)

The row of correct productions shows that Mandarin speakers had great difficulties pronouncing /l/ after any vowel, especially after the back vowels /u/ and /o/. We can also see that Mandarin speakers used the same strategy of vocalization to modify the syllable final /l/ which occurred after both of the front vowels /ɪ/ and /ɛ/. They used three different strategies to modify the /l/ after the back vowels /u/ and /o/.

Figure 4-3. Percentages of occurrences of vocalization, deletion, and retroflexion with different preceding back vowels /u/ and /o/



The strategy of deletion was most frequently employed in these two cases. The vocalization strategy came next, and the retroflexion strategy was the one least used to modify syllable final /l/ after /u/ and /o/. Comparing the percentages of vocalization of syllable final /l/ after the vowels /u/ and /o/, it was found that the percentage of vocalization after the vowel /o/ was twice as great as the percentage of vocalization after the vowel /u/. The difference between the occurrences of deletion to modify the /l/ after the vowels /u/ and /o/ is also significant, $t(478) = 4.798, p < .05$.

2) Effects of experience

Table 4-4. Percentages of occurrences of vocalization, deletion, and retroflexion by students with different levels of English experience, with the numbers of tokens in parentheses

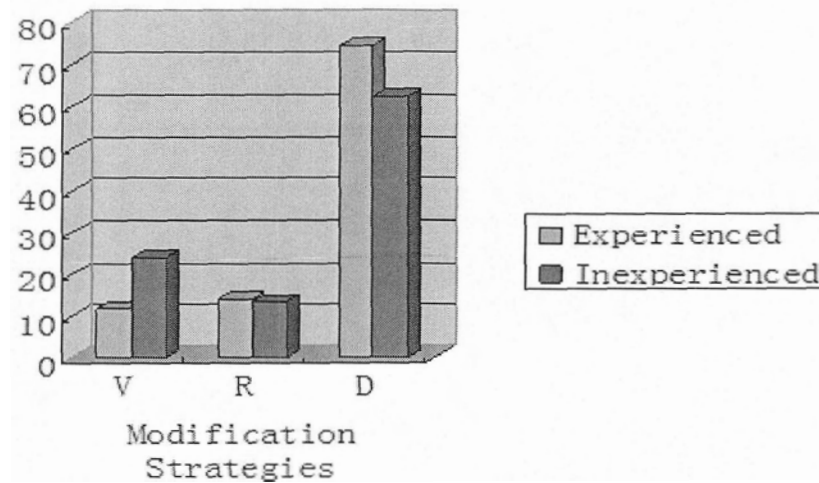
L2 experiences		Preceding Vowels			
		/ɪ/	/ɛ/	/u/	/o/
Experienced	L	1.7 (2)	8.9 (10)	0 (0)	0 (0)
	V	98.3 (116)	91.1 (102)	11.7 (14)	42.5.5 (52)
	R	0 (0)	0 (0)	14.1 (17)	2.5 (2)
	D	0 (0)	0 (0)	74.2 (89)	55 (66)
	Total	100 (120)	100 (112)	100 (120)	100 (120)
Inexperienced	L	0.8 (1)	8.9 (10)	0 (0)	0 (0)
	V	99.2 (119 ²)	91.1 (102 ³)	24.1 (29)	31.7 (38)
	R	0 (0)	0 (0)	13.4 (16)	31.7 (38)
	D	0 (0)	0 (0)	62.5 (75)	36.6 (44)
	Total	100 (120)	100 (112)	100 (120)	100 (120)

This results of a chi-square analysis show that there is a statistically significant difference between the experienced group and the inexperienced group in their choices of strategies to modify syllable final /l/ occurring after the vowel /u/, $\chi^2 (2) = 6.458, p < .05$, and after the vowel /o/, $\chi^2 (d) = 38.978, p < .05$.

² Ten tokens ended with the back vowel /ɜ/. / Five tokens ended with /u^r/

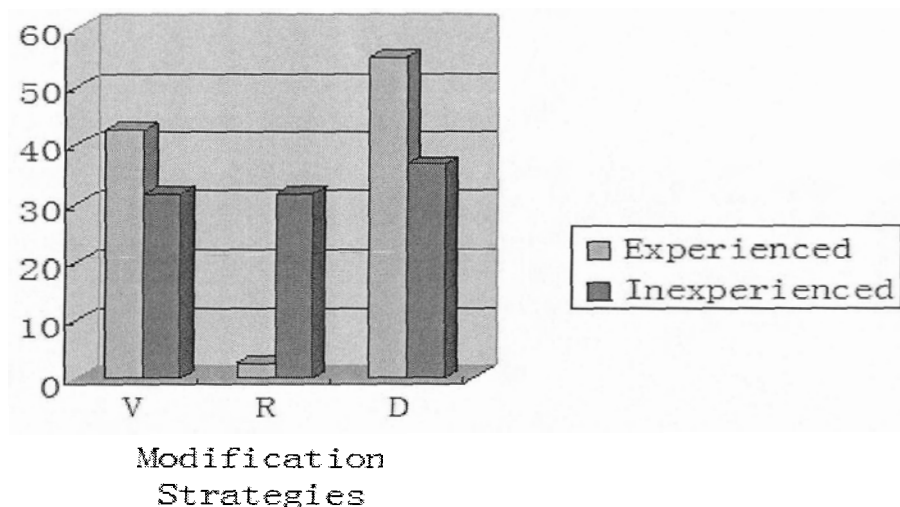
³ Ten tokens ended with the back vowel /ɜ/. Eighteen tokens ended with /u^r/

Figure 4-4. Effects of experience on the percentages of occurrence of vocalization, deletion, and retroflexion to modify /l/ after the vowel /u/



The results of a t-test show that there was no significant difference between the percentages of occurrence of retroflexion, $t(238) = 0.157, p > .05$, or deletion, $t(238) = 1.909, p > .05$, between the experienced and inexperienced groups. However, the difference between the percentages of occurrences of vocalization reached a significant level, $t(238) = 2.506, p > .05$.

Figure 4-5. Effects of experience on the percentages of occurrence of vocalization, deletion, and retroflex to modify the /l/ after the vowel /o/



Obviously, the inexperienced Mandarin speakers used the retroflexed /r/ to substitute for syllable final /l/ more frequently than the experienced Mandarin speakers did, $t(238) = 6.007, p < .05$. The difference between the percentages of occurrence of deletion between the experienced group and the inexperienced group was not as obvious as in the case of retroflexion. It was, however, still shown significant, $t(238) = 2.861, p < .05$. There was no statistically significant difference in the percentages of occurrences of vocalization between these two groups, $t(238) = 1.732, p > .05$.

3) Effects of gender

Table 4-5. Percentages of occurrence of vocalization, deletion, and retroflexion by speakers of different genders, with the numbers of tokens in parentheses

Gender		Preceding Vowels			
		/ɿ/	/ɛ/	/u/	/o/
Female	L	2.5 (3)	17 (19)	0 (0)	0 (0)
	V	97.5 (117)	83 (93)	35 (42)	49.2 (59)
	R	0 (0)	0 (0)	7.5 (9)	8.3 (10)
	D	0 (0)	0 (0)	57.5 (69)	42.5 (51)
	Total	100 (120)	100 (112)	100 (120)	100 (120)
Male	L	0 (0)	1 (1)	0 (0)	0 (0)
	V	100 (120)	99 (111)	0.8 (1)	25 (31)
	R	0 (0)	0 (0)	20 (24)	25 (30)
	D	0 (0)	0 (0)	79.2 (95)	50 (59)
	Total	100 (120)	100 (112)	100 (120)	100 (120)

There was a significant difference between males and females in the frequency of accurate production of syllable final /l/ at the .05 critical level, $t(886) = 4.437, p < .05$. Also, the chi-square test shows that gender does have an effect Mandarin speakers' choices of strategies to modify syllable final /l/ after the vowel /u/, $\chi^2(2) = 50.033, p < .05$, and after the vowel /o/, $\chi^2(2) = 19.293, p < .05$.

Figure 4-6. Effects of gender on the percentages of occurrence of vocalization, deletion, and retroflexion to modify /l/ after the vowel /u/

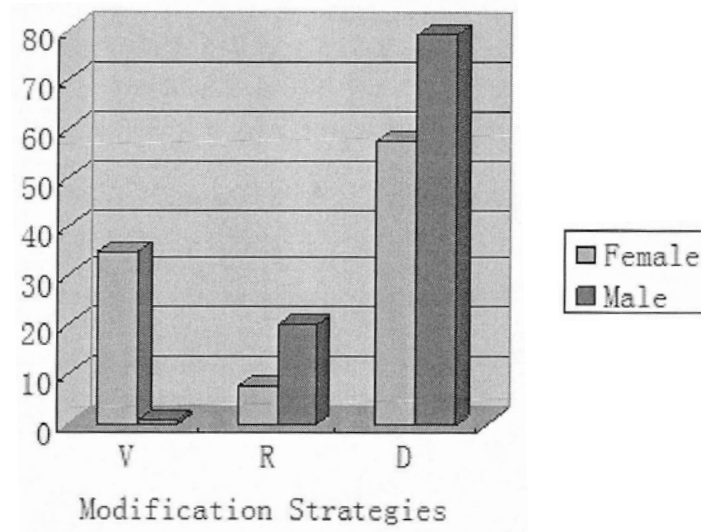
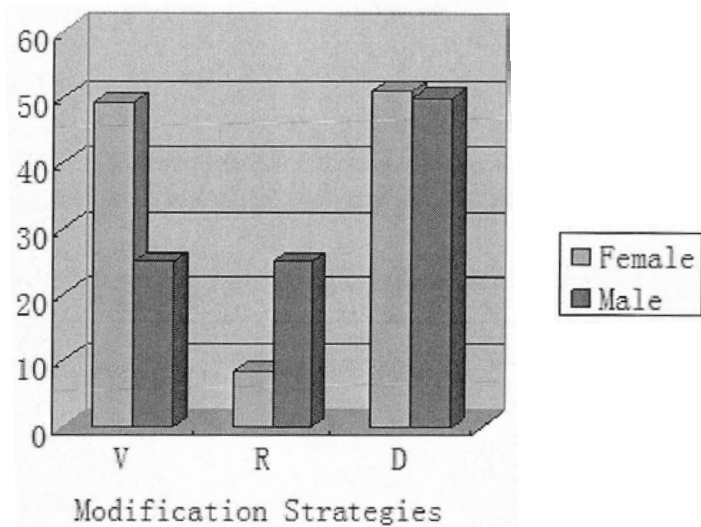


Figure 4-7. Effects of gender on percentages of occurrence of vocalization, deletion, and retroflexion to modify /l/ after the vowel /o/



From Figure 4-6 and Figure 4-7, we can see that females did not use the strategy of retroflexion as frequently as males did. Female speakers more frequently vocalized syllable final /l/ after the vowels /u/ and /o/. The difference between the percentages of occurrence of deletion after the vowel /u/ between females and males is significant, $t(238) = 3.614, p < .05$. However, the difference between the genders in percentages of occurrence of deletion after the vowel /o/ did not reach a significant level, $t(238) = 1.165, p > .05$.

4) Effects of style

Table 4-6. Percentages of occurrence of vocalization, deletion, and retroflexion in different reading styles, with the number of tokens in parentheses

Style		Preceding Vowels			
		/i/	/e/	/u/	/o/
Formal	L	0.6 (1)	10.6 (17)	0 (0)	0 (0)
	V	99.4 (159)	89.4 (143)	23.1 (37)	43.7 (70)
	R	0 (0)	0 (0)	15.6 (25)	16.9 (27)
	D	0 (0)	0 (0)	61.3 (98)	39.4 (63)
	Total	100 (160)	100 (160)	100 (160)	100 (160)
Casual	L	2.5 (2)	4.7 (3)	0 (0)	0 (0)
	V	97.5 (78)	95.3 (61)	7.5 (6)	25 (20)
	R	0 (0)	0 (0)	10 (8)	16.25(13)
	D	0 (0)	0 (0)	82.5 (66)	58.75 (47)
	Total	100 (80)	100 (64)	100 (80)	100 (80)

Using a t-test, I did not find a significant difference in error rates in production of syllable final /l/ between formal and casual styles at the .05 critical level, $t(942) = 1123, p > .05$. However, the chi-square test shows that style does have an effect on Mandarin speakers' preferred strategies for modifying syllable final /l/ after the vowel /u/, $\chi^2(2) = 12.019, p < .05$, and after the vowel /o/, $\chi^2(2) = 9.381, p < .05$.

Figure 4-8. Effects of style on the percentages of occurrence of vocalization, deletion, and retroflexion to modify /l/ after the vowel /u/

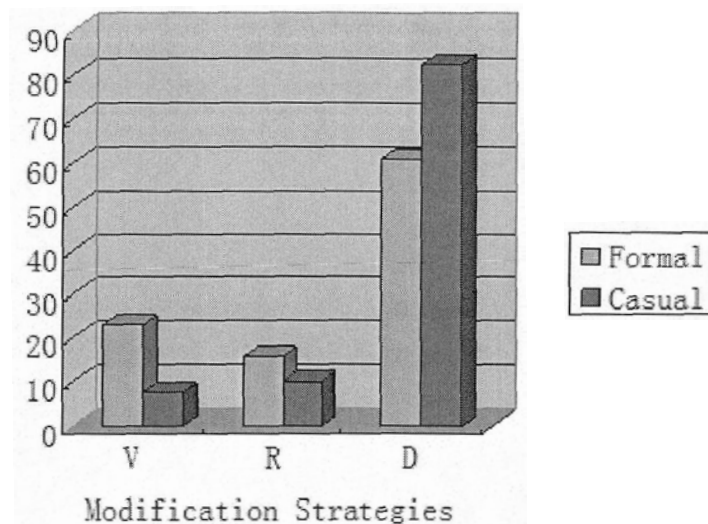


Figure 4-9. Effects of style on the percentages of occurrence of vocalization, deletion, and retroflexion to modify /l/ after the vowel /o/

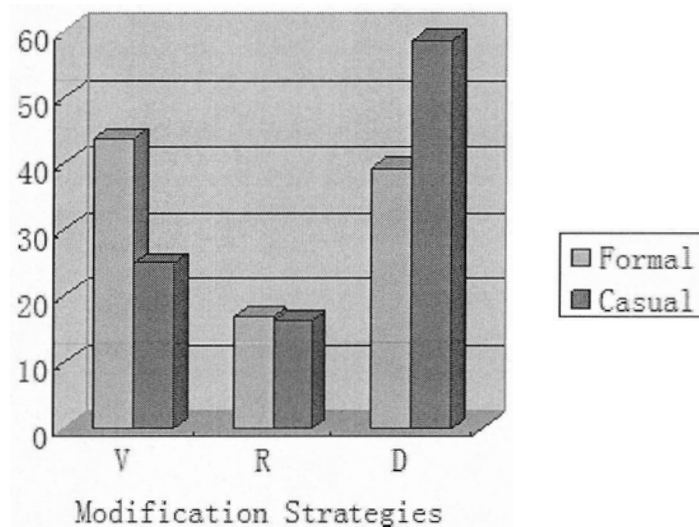


Figure 4-8 and Figure 4-9 show a significant difference in the degree of use of certain strategies when modifying syllable final /l/ after back vowels. Mandarin speakers are more likely to vocalize the /l/ after the vowel /u/, $t(238) = 2.972, p < .05$, and the vowel /o/, $t(238) = 2.821, p < .05$, in the formal style than in the casual style. Meanwhile, the occurrences of deletion in the formal style were significantly increased over those in the casual style for syllable final /l/ after the vowels /u/, $t(238) = 3.329, p < .05$, and /o/, $t(238) = 3.634, p < .05$. There was a significant threefold increase in the deletion of syllable final /l/ after the vowel /o/ in the style shift from casual to formal. There was no significant difference between the percentages of occurrence of the retroflexion strategy in the two styles, either after the vowel /u/, $t(238) = 1.168, p > .05$, or after the vowel /o/,

$t(238) = 0.127, p > .05$.

4.2.2 Error types in producing syllabic /l/

The effect of a preceding consonant on the production of syllabic /l/ was also investigated. The preceding consonants under consideration were labial /p, b/, alveolar /t, d/, and dorsal /k, g/. The errors made by the Mandarin speakers in the production of syllabic /l/ in the first experiment were consistent. Syllabic /l/s were always changed into the diphthongs /ou/ or /əu/, regardless of the place feature of the preceding consonant. This phenomenon is very different from the manner in which syllabic /l/ is produced by native speakers of English. As mentioned in my review of the literature, Australian speakers tend to vocalize syllabic /l/ most frequently when it is preceded by a dorsal consonant in the onset. They do this less frequently when syllabic /l/ occurs after a coronal onset. Vocalization of syllabic /l/ occurs least frequently after a labial consonant. (Borowsky, 2001)

4.2.3 Feedback from Mandarin speakers

After they finished the production test, the Mandarin speakers were asked to self-evaluate of their pronunciations of the phoneme /l/ in syllable initial, syllable final, and syllabic positions. None of the speakers reported feeling that it was difficult to

pronounce syllable initial /l/. However, most of them thought that they did not pronounce the syllable final and syllabic /l/s correctly. Three participants even told me before they began doing the production test that they could not produce the /l/ in those two syllable position correctly. The Mandarin speakers were also asked to describe the position of the tip of the tongue in producing syllable final /l/ and syllabic /l/. Since the subjects were not linguistics students, they could not determine the exact position of the tongue or describe it in linguistic terms. Some of them said that the tip of the tongue was behind the lower teeth. Others stated that the tip of the tongue tended to move upward toward the alveolar ridge, but stopped in the middle of the vocal cavity before it reached the ridge. Furthermore, they attributed their incomplete articulations to laziness. One female speaker said there was no need for her to extend her tongue after pronouncing a segment which sounds like an /l/. If she were to extend her tongue to touch the alveolar ridge in pronouncing word-final /l/, it would have to be a conscious effort to correct her pronunciation. One observation is particularly interesting: None of participants who used retroflex /r/ to substitute for /l/ realized that they had changed the /l/ to /r/. They unconsciously used /r/ to modify /l/.

Chapter Five DISCUSSION

This study aims to investigate the difficulties Mandarin speakers have in producing English /l/ in different syllable positions. From the results of the one designed experiment described in Chapter Four, we can say that the research hypotheses are fully supported. This chapter, I will discuss the data in relation to the research hypotheses listed in Chapter One. This discussion will be divided into the following sections. Section 5.1 discusses the error rates of production of the phoneme /l/ as it occurs in different syllable positions. Section 5.2 discusses about how and why linguistic and social factors affect the production of syllable final /l/ by Mandarin speakers. Section 5.3 is a discussion of the implications of this study for teaching English as a second language to Mandarin speakers.

5.1 Error rates in different syllable positions

It is clear that Mandarin speakers do not have any difficulties in producing the phoneme /l/ correctly in syllable initial position. The positive influence of their L1 phonology can successfully explain why they show 100% accuracy in producing English syllable initial /l/. Since Mandarin has the same phoneme /l/ in its consonant inventory and the /l/ occurs in syllable initial position, the speakers of Mandarin positively transfer this pronunciation habit from Mandarin to English.

Sharply different from the error rate in producing syllable initial /l/, the error rates for syllable final /l/ and syllabic /l/ are extremely high. The former was found to have nearly 0% accuracy and the latter had accuracy of 0%. There are two reasons to explain this phenomenon: phonological influence and phonetic influence.

Let us consider L1 phonological influence first. In Mandarin, the phoneme /l/ cannot occur in syllable final or syllabic position. Mandarin only allows nasal consonants and retroflex /r/ in coda position. No other consonant or consonant cluster is permitted in coda position. Therefore, Mandarin speakers might find it difficult to pronounce the /l/ in a new syllable position. However, this is not an entirely convincing explanation as to why they cannot produce syllable final /l/ and syllabic /l/ correctly. Certain other consonants also occur only in syllable initial position in Mandarin, but they can still be pronounced with a high accuracy rate by Mandarin speakers when they occur in syllable final position in English. For example, over 80% of the syllable final voiceless stops in Hansen's (2001) study were pronounced correctly by Mandarin speakers. Therefore, the new syllable position is not a sufficient explanation for this phenomenon.

Thus, we should take phonetic influence into account as well. Syllable final /l/ and syllabic /l/ are not only different from syllable initial /l/ in syllable position, but also different in manners of articulation that do not apply to voiceless consonants. The phoneme /l/ has two articulatory gestures: consonantal apical gesture and vocalic dorsal gesture. Both of these are oral gestures, whereas the voiceless stops have only one oral

gesture (Browman & Goldstein, 1991). Furthermore, the oral gestures of the /l/ can be considered as two lingual gestures which no other consonants in English (except /r/) have. Therefore, the articulation of phoneme /l/ is more ‘complex’ (Gick, 2004). Also, there is a time lag between the two lingual gestures of syllable final /l/ and syllabic /l/, whereas the two gestures occur almost simultaneously in producing syllable initial /l/. Since simultaneous gestures are easier to produce (Kelso et al., 1979), syllable initial /l/ is easier to produce than syllable final /l/ and syllabic /l/.

In sum, Mandarin speakers’ difficulty in pronouncing syllable final /l/ and syllabic /l/ correctly is due to the fact that /l/ does not occur in these positions in Mandarin syllable structure patterns, and to the manners of articulation of the phoneme /l/.

Although syllable final /l/ is almost always mispronounced by Mandarin speakers, a small percentage of /l/s following the mid front vowel /ɛ/ are pronounced correctly. The reason for this relatively higher accuracy will be discussed in the next section.

5.2 Error types in different syllable positions

In the following sections, the various types of errors made in producing syllable final /l/ and syllabic /l/ will be discussed separately.

5.2.1 Error types for syllable final /l/

From Chapter Four, we know that three strategies were used by Mandarin speakers to modify the syllable final /l/: *vocalization*, in which the substituted segments are the monophthong vowel /u/, /o/ or the diphthong /ou/; *deletion*, which leaves no consonant in coda position; and *retroflexion*, where the substitute segment is the retroflex consonant /ɾ/. Now we need to consider why Mandarin speakers employ these strategies. The reasons are quite complex, and must be explained from both linguistic and social perspectives.

5.2.1.1 Linguistic factors

In the literature reviewed, researchers found five linguistic factors that affect vocalization of syllable final /l/ for Australian speakers, to different degrees (Horvath, 1997; Horvath and Horvath, 1997, 2001, 2002). In the present study, the designed words all end with singleton /l/ as the coda, so the effect of following consonants is not investigated. All words are isolated in the word list reading task, or occur before the pause in the mini-dialogue reading task, so the effects of following environments do not apply in this study. Mandarin participants in this study tended to lengthen the short vowels /ɪ/ and /ɛ/ in their production, so the length of preceding vowels is not taken into account.

The only linguistic factor which is investigated in the present study is the backness of preceding vowels. Four vowels are considered: /i/, /ɛ/, /u/ and /o/. The vowels /i/ and /ɛ/ are front vowels. The vowels /o/ and /u/ are back vowels. This factor played a significant role in determining the error types for syllable final /l/. The following section discusses how the factor of the backness of preceding vowels plays a role in determining what kinds of modification strategies are used by Mandarin speakers.

Vocalization

The strategy of vocalization is used frequently in modifying syllable final /l/, no matter what kind of vowel precedes it. The vowel /ou/ is substituted for syllable final /l/ when the /l/ occurs after the vowel /i/. The vowel /o/ or /u/ is used to modify the /l/ when the /l/ occurs after the vowel /ɛ/. The vowel /o/ or /ou/ replaces the /l/, when the vocalization takes places after the vowel /u/, while the vowel /u/ is used to modify the /l/ after the vowel /o/. These substitutions are quite consistent for all Mandarin speakers using vocalization in the study. However, there are two exceptions. One male in the inexperienced group of speakers used the vowel /y/ to modify the /l/ after the vowels /i/ and /ɛ/. One female and one male in the inexperienced group used /u^l/ to modify the /l/ after /i/ and /ɛ/.

This kind of modification can be explained by phonological influence and phonetic influence. Two types of phonological influence predispose vocalization: one is universal syllable structure, and the other is Mandarin syllable structure. The universally least marked syllable structure is the CV syllable (Yavas 1994). Vocalizing the /l/ in coda position can be attributed to the effect of universal preference for open syllables. After being vocalized, the CVL pattern becomes CVV, which is an open syllable. Furthermore, no consonants are permitted in syllable final position in Mandarin, except nasal /n/, /ŋ/, and retroflex /r/. Therefore, L1 syllable structure patterns enhance the high probability of Mandarin speakers' choosing the strategy of vocalization.

Different from stops, which attract an epenthetic schwa to form an extra CV structure (Hansen, 2001; Lin 2001, 2003), syllable final /l/ has articulatory manners which make it possible for /l/ itself to be vocalized rather than being attached with a vowel. As mentioned before, syllable final /l/ has two articulatory gestures, a consonantal apical gesture and a vocalic dorsal gesture. In syllable final position, the vocalic gesture tends to be stronger and the consonant gesture tends to be weaker. The vocalic gesture also occurs before the consonantal gesture in producing syllable final /l/ (Sproat & Fujimura 1993; Browman & Goldstein 1995). Therefore, it is more likely for Mandarin speakers to lose the consonantal gesture and maintain the vocalic gesture in syllable final position. The tip of the tongue of the Mandarin speakers might not touch or approach the alveolar ridge to produce an extreme obstruction after the dorsum of the tongue retracts.

Now we need to consider why the vowels /u/ and /o/ (and sometimes their diphthong) are selected to be the substitutes for syllable final /l/. The two vowels share the features of [+back, + round]. According to articulatory phonology, /u/ and /o/ have two articulation gestures. One is a lip gesture; the other is a dorsal gesture. When speakers pronounce these two vowels, their lips become round and the dorsum of their tongue retracts. Thus, the vowels cause the dorsal gesture of syllable final /l/ to be retained and the apical gesture of syllable final /l/ to be lost. Also, /u/ and /o/ have only one lingual gesture, the dorsal gesture. Therefore, the back vowels show a pattern of “lingual simplification” (Gick, 2004). Due to the advantages of similarity of dorsal shape with syllable final /l/ and the simpler manner of pronunciation, /u/ and /o/ are chosen to modify syllable final /l/.

However, phonetic influence cannot explain the strong preference for one vowel over the other to modify syllable final /l/ when it follows different vowels, such as /i/, /ε/, /u/ and /o/. To account for this, we need to look back to the influence of the L1 phonology. In the Mandarin vowel system, the monophthongs /i/, /o/ and /u/, the diphthong /ou/ (some Mandarin speakers pronounce the diphthong /əu/ instead of the diphthong /ou/) and the triphthong /iou/ exist. The vowel /ε/ only occurs after the vowels /i/ and /y/. No back vowels can follow the vowel /ε/.

The Mandarin speakers’ tendency to transfer their L1 phonological structures to their L2 yields the vowel /ou/ after the vowels /i/ (Here, Mandarin speakers change the

vowel /ɪ/ to vowel /i/), and the vowel /u/ after the vowel /o/ in the vocalization process. The reason why the vowels /o/ and /ou/ are preferred to modify syllable final /l/ after the vowel /u/ is quite straightforward: In order to make a segment sound like a syllable final /l/ and also sound different from the nucleus, the vowel /o/ is chosen rather than the vowel /u/. The diphthong /ou/ is created by the closing procedure of the monophthong /o/.

Since there is no Mandarin syllable pattern that has a diphthong like /ɛu/ or /ɛo/, there should be no L1 syllable structure transfer to influence Mandarin speakers' choice between the vocalization options /u/ and /o/. Therefore, Mandarin speakers choose either of these vowels to modify syllable final /l/. The relatively high accuracy rate of syllable final /l/ after the vowel /ɛ/ produced by Mandarin speakers can also be attributed to the lack of negative transfer of L1 phonological structure.

An interesting substitution is observed in two of the Mandarin speakers. They substitute /u^r/ to modify syllable final /l/ after the vowels /ɪ/ and /ɛ/. The substitute's first articulation feature is the back rounded vowel /u/, and its second articulation feature is the retroflex /r/. This means that when the speakers tried to produce the target segment, the posterior body of the tongue retracted, the lips got rounded and the tip of the tongue curled. The sound /u^r/, with three gestures, is more difficult to produce than the liquid /l/, with two gestures. The source of making such a complex and difficult sound might be sought in the influence of Mandarin syllable structure. In Mandarin, the retroflex /r/ can

be attached to the back vowels /u/ and /o/ as a secondary articulation (Duanmu, 2000). These two speakers tried to produce the dorsal gesture of /l/, but also rounded their lips. Meanwhile, they misproduced the consonantal gesture of /l/ by retroflexing the tip of their tongue rather extending it to the alveolar ridge.

Another of the Mandarin speakers consistently produced syllable final /l/ as a back unrounded vowel /ɤ/ after a front vowel /i/ or /ɛ/. This is not a unique way of modifying syllable final /l/. In African American English, a similar central vowel /ə/ is used to substitute for syllable final /l/, as in *bea* [beə] for ‘bell’ and *pia* [piə] for ‘pill’ (Green, 2002; p. 120). The speaker may have noticed that the target /l/ has no lip rounding gesture, but still failed to produce the apical gesture. Therefore, the dorsum of his tongue retracted but without rounding of his lips.

Deletion

I found that the preceding vowels /i/ and /ɛ/ are strong inhibitors of deletion, while the preceding vowels /u/ and /o/ promote deletion. This may be due to ‘laziness’ of articulation. Since the dorsum of the tongue is already retracted in order to produce the preceding vowel /u/ or /o/, Mandarin speakers might not find it necessary, in this circumstance, to raise the tip of the tongue towards the alveolar ridge to make a constriction in the vocal tract just to produce the apical gesture of syllable final /l/. Therefore, the /l/ is deleted. Another explanation for the deletion of /l/ is the perceptual

difficulty of hearing syllable final /l/ when it occurs after back vowels. Mandarin speakers might not hear the /l/ after back vowels, and ignore the /l/ in their production. A future study needs to be conducted to prove the perceptual motivation for the deletion of /l/.

Retroflexion

As is the case with deletion, the preceding vowels /ɪ/ and /ɛ/ are strong inhibitors of the substitution of syllable final /l/ with retroflex /r/, while the preceding vowels /u/ and /o/ promote the modification to retroflex /r/. However, I am aware of one contradiction to this observation, coming from a male Mandarin speaker who was not a participant in this study. He pronounced the word *bill* as *beer* when asking for the bill in a restaurant. In Mandarin, the retroflex /r/ is one of the few consonants permitted in coda position. Both liquid /l/ and retroflex /r/ belong to the category of liquid consonants. Therefore, some Mandarin speakers sometimes transfer the retroflex /r/ from their L1 syllable structure to modify the syllable final /l/.

Unlike the strategies of vocalization and deletion, which do not change the lexical meaning of the original English words, retroflexion might change the meaning of words when syllable final /l/ is changed into syllable final /r/, as in *bill-beer*. Therefore, the strategy of retroflexion can be a potentially confusing way to modify the /l/.

5.2.1.2 *Social factors*

Three social factors are investigated in this study: experience, gender, and style.

Experience

In the present study, the Mandarin speakers are divided into two groups based on their different levels of language experience. One group is called the experienced group, which means that all members of the group have been in an English-speaking environment (Canada) for at least one year. The other group is the inexperienced group, whose members have never lived in an English-speaking country. The inexperienced members only got English input and output experience in their English learning classroom. In contrast, the experienced members not only had had English input and output from taking classes (both ESL classes and academic classes), but also from their living environment. Therefore, the difference in L2 experience between the two groups can be considered significant.

Comparing the results from the test of production of syllable final /l/ by the two groups, we find that there is no significant difference in error rate, but that there is more variation in the types of errors made by the inexperienced group than by the experienced group. Members of the experienced group quite consistently used the back and rounded vowels /u/ and /o/ and the diphthong /ou/ to substitute the syllable final /l/ when it occurs after the front vowels /i/ and /ε/. In contrast, two members of the inexperienced group

tended to retroflex the tips of their tongues when they produced the segment /u/. One member of the same group consistently pronounced the syllable final /l/ as the back and unrounded vowel /ɥ/.

There is also a significant difference in the frequency of using the retroflexion strategy to modify syllable final /r/ after the back vowel /o/ between the experienced and inexperienced groups. As mentioned in the section 5.2.1.1, this strategy is “dangerous” to make an effective communication because it might produce a lexical misunderstanding for listeners.

The types of errors made by the inexperienced group are less intelligible than those of the experienced group, as we might expect. Therefore, we can see that the experience of living in an English-speaking country helps people to pronounce syllable final /l/ more like the English /l/. This finding suggests a way to improve Mandarin speakers’ pronunciations of English /l/ in syllable final and syllabic positions.

Gender

In the present study, female Mandarin speakers made correct pronunciations of syllable final /l/ significantly more frequently than male Mandarin speakers did. Also, females used the retroflexion strategy less frequently than males did. As mentioned in the linguistic factors section, retroflex /r/ as a substitution for syllable final /l/ is more consistent with a “Chinese accent” than other substitutions. Therefore, we can say that

female Mandarin speakers outperformed male Mandarin speakers in pronouncing syllable final /l/.

Previous research has shown females to be less conservative than males, and more open to linguistic influences from outside the immediate social group (Watt and Milroy, 1999; p. 41). Therefore, females have more chances to get input and output of English and are more likely to benefit from these chances. It has also been found that female L2 speakers tend to show higher frequencies of using proper or standard forms of speech and pronunciation than males (Gussenhoven, 1979; Leather and James, 1996; Broeder, 1982). The present study can be regarded as further evidence that females have more chances to acquire Standard English pronunciation, and pay more attention to using it. The males, on the other hand, do not seem to care about their accent as much as the females do; therefore, their errors in pronunciation of syllable final /l/ are more accented.

Style

Several studies (Broselow et al., 1998; Lin, 2001, 2003; Major, 1994; Weinberger, 1987) have compared production of consonants or consonant clusters in different producing styles of production. Using formal and casual parameter of speech style, three production styles were considered. From the most formal degree to the most casual degree, the order of the three styles is: word list reading (minimal pair reading), sentence reading (paragraph reading), and storytelling (conversation).

The “formal equals accurate” axiom proposes that L2 learners achieve greater accuracy or produce more native-like output as their speech style becomes more formal. However, the present study did not find that the error rate in production of syllable final /l/ increased when the reading style shifted from word list reading to mini-dialogue reading. In other words, Mandarin speakers in the study did not produce more correct tokens of the /l/ when the reading style was more formal.

However, the study found that a significant change took place when the reading style became formal. The syllable final /l/ after back vowels was more frequently vocalized or retroflexed in the word list reading task. Since there was no linguistic context in the word list environment, speakers paid attention to the spelling of the word and made every segment clearly audible. According to the sonority sequence hierarchy (SSH), vowels and retroflex /r/ are more sonorous than liquid /l/. Therefore, the Mandarin speakers chose vowels and retroflex /r/ in order to make their “/l/” more salient.

5.2.2 Error types for syllabic /l/

Syllabic /l/ is the hardest type of /l/ to produce correctly for both native speakers of English and L2 speakers. In the present study, the error rate is 100%. As noted in the literature review, adult native speakers of Australian English show a high probability of vocalizing syllabic /l/ (Borowsky, 2001). The substitute for the syllabic /l/ observed in

their study is the short vowel /ʊ/. English speakers from Kenya, Uganda, Tanzania, Zambia and Malawi produce the syllabic /l/ as the vowel /o/, while English speakers from Nigeria produce it as the vowel /u/ (Bobda, 2002). Other studies have shown that children learning English as their first language also have trouble acquiring syllabic /l/. They tend to pronounce it like /u/ or /w/. Adolescents bilingual in Punjabi and English modify syllabic /l/ to a palatalized /l/ and epenthesis a front vowel /e/ before the /l/. Therefore, both L1 and L2 speakers have difficulty producing the syllabic /l/ correctly and modify the /l/ in different ways.

In the present study, Mandarin speakers consistently produced syllabic /l/ as the diphthongs /ou/ or /əu/. The explanations for such modifications can be observed from both phonological and phonetic perspectives. Let us consider phonological influence first. Since syllabic /l/ is in nucleus position, it is most likely to be vocalized. Native speakers of British English also pronounce syllabic /l/ as /əl/ (Toft, 2002). This means that they insert a schwa before syllabic /l/ and push the /l/ from the nucleus to coda position.

There is no syllabic /l/ present in Mandarin syllable structure. Therefore, Mandarin speakers vocalized it as the vowel /o/ whose articulatory manners are similar to those of syllabic /l/. In Mandarin syllable patterns, the vowel /o/ cannot combine with an obstruent in onset position individually. Although *pinyin* shows po, bo, mo and so on, there is a glide /w/ inserted between the stop and the vowel /o/ in transcription: po /pwo/. Therefore, Mandarin speakers produced a diphthong /ou/, which can combine with a

consonant, to match their L1 syllable structure. Since many native speakers of English also pronounce syllabic /l/ as a syllable final /l/ preceded by a schwa (Toft, 2002), Mandarin speakers got such input from these native speakers. Then they changed the /əl/ into /əu/, which also matches Mandarin syllable structure.

5.3 Implications for pedagogy

In this section, I will discuss what kinds of errors influence the effective communication. Based on this, I will make suggestions for English teachers on how to teach English syllable final /l/ and syllabic /l/ to Mandarin speakers.

5.3.1 What kinds of errors influence the comprehension of listeners?

Three types of production error were made by Mandarin speakers in modifying syllable final /l/. Here, we need to treat their errors differently.

The first and most common strategy is vocalization. A back rounded vowel /o/ or /u/, or one of their diphthongs, is substituted for syllable final /l/ after the vowels /ɪ/, /ɛ/, /u/ and /o/. This strategy was used consistently by all the participants in the study, regardless of gender, speech style, or English experience. Previous studies on English dialects demonstrate that vocalizing dark /l/ is also a common strategy for native speakers of English. Therefore, vocalization of /l/ does not necessarily hinder communication, at least between native speakers of English. Therefore, we might assume

that this might be a communicatively less harmful mistake.

The second strategy is deletion. It is only used after the back rounded vowels /u/ and /o/. This phenomenon is also found in some varieties of English, such as African American English and Southern American English. In studies, the deletion of syllable final /l/ was considered ‘hick’ or ‘low-class’ (Wells, 1982; p. 550). In the present study, our two judges’ feelings about the words produced by our test subjects without syllable final /l/ are very interesting. For example, the /l/ in the word ‘cool’ is frequently deleted by Mandarin speakers. Our judges observed that this deletion sounds like baby talk and seems cute to them. The attitude of native speakers of English towards such deletions made by Mandarin speakers is positive. English speakers can understand the difficulty the L2 speakers have producing a new sound. They do not treat the incomplete sounds as ignorant or uneducated speech.

The third strategy is retroflexion. Unlike the two strategies above, the retroflex /r/ as a substitute for syllable final /l/ has never been described in previous studies of native English speakers. This kind of mispronunciation by Mandarin speakers is much more erroneous than the first two strategies. Retroflexing the /l/ might change the lexical meaning of the word (e.g. *pool* to *poor*), whereas vocalization and deletion do not.

5.3.2 How should dark /l/ be taught to Mandarin speakers?

From the listeners’ perspective, it is not necessary to stop Mandarin speakers

from vocalizing syllable final /l/ and syllabic /l/, changing /l/ to the monophthong vowel /o/, /u/, or one of diphthongs /ou/ and /əu/, or from deleting the syllable final /l/ when the preceding vowel is /u/ or /o/. Although those modifications might sound accented, they do not disrupt intelligibility.

Teachers need to pay attention to the errors created by using retroflex /r/ instead of vocalized /l/ or deleted /l/, since this substitution can cause a lexical confusion. It comes from difficulty with controlling the shape of tongue. Here, I suggest that English teachers train their students who pronounce /l/ as /r/ to do minimal pair practice, in order to emphasize the articulatory differences between the two segments. This practice will help Mandarin speakers to feel just how different the /l/ and /r/ are in manner of articulation.

Chapter Six CONCLUSION

Chapter Six is organized as follows: Section 6.1 summarizes the thesis. Section 6.2 proposes future research on the acquisition of English /l/ based on the results and limitations of the present study. Section 6.3 presents the contributions of the study.

6.1 Summary

This study examined the production of English /l/ in different syllable positions by Mandarin speakers. A review of the literature related to this subject showed that vocalization of English /l/ in syllable final position and syllabic position has already been noticed in the field of English dialectology. Previous studies have found several linguistic and social factors that affect the degree of frequency of the vocalization of /l/. However, researchers in second language acquisition have paid little attention to how L2 speakers acquire the English phoneme /l/ in syllable final position and syllabic position, although many studies have focused on the production and perception of syllable initial /l/ by L2 speakers. The acquisition of syllable final stops and consonant clusters by Mandarin speakers has also been broadly investigated, but the acquisition of syllable final /l/ has not. Therefore, the lateral /l/ was chosen for the present study to examine and compare how Mandarin speakers to produce English /l/ in different syllable positions. The effects of two linguistic factors and three social factors on the production of the phoneme /l/ are

investigated in the production analysis.

One experiment with two reading tasks was designed for the purpose of the study. A total of 16 Mandarin speakers with the same linguistic background (all of them speak Northern dialects) and different social backgrounds (by English experience and gender) were asked to pronounce English words with /l/ in syllable initial, syllable final or syllabic positions, using two speech styles, word list reading and mini-dialogue reading.

It was determined that Mandarin speakers have no difficulties in producing syllable initial /l/ correctly, because the phoneme /l/ exists in the Mandarin consonant inventory and also occurs in syllable initial position. Therefore, the positive L1 transfer guarantees the accuracy of the phoneme /l/ in syllable initial position. However, Mandarin speakers do have difficulties in producing the phoneme /l/ in syllable final and syllabic positions. The diphthong /ou/ is consistently used to modify the /l/ occurring after the vowel /ɪ/. The monophthong /o/ or /u/ is employed to modify the /l/ after the vowel /ɛ/. In attempting to pronounce syllable final /l/ after the back vowels /o/ and /u/, Mandarin speakers employ three strategies: vocalization, deletion and retroflexion. In pronouncing syllabic /l/, Mandarin speakers consistently misproduce the /l/ as a diphthong /əu/ or /ou/. The common problem for Mandarin speakers in producing syllable final /l/ and syllabic /l/ is the loss of alveolar contact.

In considering the effect of the backness of the preceding vowel, it was found

that vocalization is the most common strategy for modifying the /l/ after different vowels. Deletion and retroflexion of /l/ only occur after back rounded vowels. Vocalized /l/ can be manifested as the rounded vowels /o/, or /u/, or their diphthongs, all of which maintain the dorsal gesture of syllable final /l/ but do not include the apical gesture. Since making the back rounded vowels /u/ and /o/ already requires the dorsal gesture required for /l/, and Mandarin speakers do not add the apical gesture after the dorsal gesture to signal the /l/. Therefore, the syllable final /l/ is deleted. Since retroflex /ɾ/ belongs to the same feature category as the lateral /l/- liquid-, Mandarin speakers employ the retroflex /ɾ/ from their L1 phonology.

Considering the effect of L2 experience on choice of modification strategies, there are two major differences between the two groups' production. It was found that experienced speakers only used /u/ or /o/, or their diphthongs, to modify syllable final /l/ when it occurs after a front vowel. In contrast, inexperienced speakers used a greater variety of vocalized /l/s, which are: /u/, /o/, /y/ and /u^ɪ/. The second difference is that the inexperienced group used retroflex /ɾ/ to substitute for lateral /l/ more frequently than the experienced group when the /l/ occurs after the vowel /o/. The vowels /u/ and /o/ are considered as "unambiguous" substitutions, whereas /ɾ/ is a dangerous substitution which might change the lexical meaning of the word. Therefore, I offer the conclusion that the productions made by experienced speakers are closer to the target phoneme /l/. Some L2 experience does help L2 speakers improve their pronunciation of syllable final /l/.

It was also observed that female Mandarin speakers produced accurate or nearly accurate syllable final /l/ more frequently. This might be due to female speakers' tendency to use the proper or standard forms, which has been described as 'the single most consistent finding to emerge from sociolinguistic studies over the past twenty years' (Trudgill, 1983; p. 162).

Mandarin speakers more frequently vocalized syllable final /l/ after the back rounded vowels /u/ and /o/ in the word list reading task than they did in the mini-dialogue reading task. In the word list reading task, which lacked a content environment, the readers paid attention to the spelling and tended to pronounce every segment clearly and audibly. In the mini-dialogue reading task, the readers paid attention not only to the pronunciation of every segment, but also to the meaning of the sentence. Therefore, they read the sentence in a natural way. Where syllable final /l/ occurs after the rounded back vowels /u/ and /o/, it is not salient from a perceptual perspective, so the /l/ is deleted.

From a lexical perspective, vocalization and deletion do not inhibit communication although they do enhance "foreign accent", since the meanings of the English words do not change with the use of these strategies. Retroflexion, however, does prevent listeners from interpreting words with syllable final /l/ effectively, since the meaning of the words might be changed. Therefore, the substitute /r/ is labeled as a 'dangerous' sound, and requires that English teachers pay attention to helping their

students to correct it.

6.2 Future studies

This present study is the first to systematically examine the production of English /l/ in syllable final and syllabic positions by Mandarin adult speakers. Since it is a small pilot study in the field, the topic of the acquisition of English /l/ in syllable final and syllabic positions by L2 speakers needs to be studied further and more deeply in the future.

Due to the limitation on selection of participants, the native language background is restricted to the Northern dialects of Chinese. These subjects all speak standard Mandarin Chinese. However there are small variations in the use of Chinese tones in some words. In future research, it would be better to select participants from the Beijing area in order to eliminate minor dialectical variations. Also, 16 Mandarin speakers (8 inexperienced and 8 experienced, 8 male and 8 female) participated in the present study. Future researchers should recruit a large study pool in order to make the results more general and more convincing, and to reduce statistical uncertainties.

I think it would be worthwhile in a further study to examine the influence of universal constraints on people from different language backgrounds. In order to do this, I suggest conducting a cross-language study. The first language of participants will not be only from Mandarin, which has syllable initial /l/, but no syllable final /l/ and syllabic /l/,

but also from Korean, which has syllable final /l/, but no syllable initial or syllabic /l/, and Japanese, which has no syllable initial /l/, syllable final /l/ or syllabic /l/. For Comparing the results from these three groups, it might be found that L1 phonology predicts what kind of /l/ that L2 speakers usually produce wrongly. Regarding syllable initial /l/, Korean and Japanese speakers have difficulty to produce it correctly. For syllable final /l/, Mandarin and Japanese speakers may not pronounce it and for syllabic /l/, speakers from all three groups may have difficulty to pronounce it. However, the error types might be different among the three groups. The types of errors available for producing phoneme /l/ might be determined by phonetic influence and L1 phonological influence.

In the present study, we depended on the judgment of only two native speakers and the acoustic analysis program PRAAT. I suggest conducting a study using ultrasound to investigate the tongue's movement when L2 speakers to produce syllable final /l/ and syllabic /l/.

Only the effects of two linguistic factors and three social factors on the singleton /l/ are investigated in the present study. One linguistic factor is the backness of the preceding vowel for the syllable final /l/. The other is the feature of the preceding consonant for the syllabic /l/. Future researchers are encouraged to investigate the effects of more linguistic factors, such as the length of the preceding vowel for the syllable final /l/, height of the preceding vowel for the syllable final /l/, the feature of following

consonant for the syllable final /l/ in consonant cluster. As for social factors, age would be a valuable factor to examine.

6.3 Contributions

This is the first study to look at the production of English /l/ in different syllable positions (syllable initial, syllable final and syllabic) by adult speakers of Mandarin Chinese. It was found that Mandarin speakers do have difficulties in pronouncing the /l/ in syllabic and syllable final positions and show many variations in how they modify the /l/ in those two syllable positions. Furthermore, it provides an explanation as to why Mandarin speakers employ their modification strategies from phonological and phonetic perspectives. The findings suggest that researchers should study the acquisition of English syllable final /l/ and syllabic /l/ by L2 speakers more deeply in the future.

The results of this study may also contribute to research on the phonology of loan words which are borrowed from English to Mandarin. The syllable final /l/ in the loan words are changed to a vocalized vowel, such as /tuo fu:/ for “TOEFL”; deleted, such as /ku:/ “cool”; retroflexed /r/, such as /i: mei ər/ “e-mail”. They suggest that Mandarin speakers’ ways of producing English syllable final /l/ and syllabic /l/ might be the source for creating the renditions of loan words.

REFERENCES

- Anderson, J. (1987). The markedness differential hypothesis and syllable structure difficulty. In G. Ioup & S. Weinberger (Eds.), *Interlanguage phonology: The acquisition of second language sound system* (pp. 279-291). Rowley, MA: Newbury House.
- Aoyama K. (2003). Perception of syllable initial and syllable final nasals in English by Korean and Japanese speakers. *Second Language Research*, 19(3), 251-265.
- Asher, J. J., & García, R. (1969). The optimal age to learn a second language. *The Modern Language Journal*, 53, 334-341.
- Ash, S. (1982). The vocalization of intervocalic /l/ in Philadelphia. *SECOL Review*, 6, 162-175.
- Bailey, G., & Thomas, E. (1998). Some aspects of African-American Vernacular English phonology. In S. Mufwene, J. Rickford, G. Bailey, & J. Baugh (Eds.), *African American English: Structure, History, and Use* (pp. 85-109). London: Routledge.
- Bauer, L. (1986). Notes on New Zealand English phonetics and phonology. *English World Wide*, 7, 225-258.
- Bauer, L. (1994). English in New Zealand. In R. Burchfield (Ed.), *The Cambridge History of the English Language. Volume 5: English in Britain and Overseas: Origins and Development* (pp. 382-429). Cambridge: Cambridge University Press.
- Bayley, R. (1996). Competing Constraints on Variation in the Speech of Adult Chinese Learners of English. In R. Bayley & D. Preston (Eds.), *Second Language Acquisition and Linguistic Variation* (pp. 97-120). John Benjamin, B.V.
- Beckman, J. (1998). *Positional Faithfulness*. Ph.D. dissertation. University of Massachusetts, South College.
- Benson, B. (1988). Universal preference for the open syllables as an independent process in interlanguage phonology. *Language Learning*, 38, 221-35.
- Bladon, R. A., & Al-Bamerni, A. (1976). Coarticulation resistance in English /l/, *Journal of Phonetics*, 4, 137-150.

- Bobda, A. (2001). East and Southern African English Accents. *World Englishes*, 20(3), 269-284.
- Borden, G., Gerber, A & Milsark, G. (1983). Production and Perception of the /r/-/l/ Contrast in Korean Adults Learning English. *Language Learning*, 33(3), 499-526.
- Borowsky, T., & Horvath, B. (1997). L-vocalisation in Australian English. In F. Hinskens, R. van Hout & W.L. Wetzels (Eds.), *Variation, Change and Phonological Theory* (pp. 101-123). Amsterdam: Benjamins.
- Borowsky T. (2001) The vocalisation of dark-l in Australian English. In D. Blair & P. Collins (eds), *English in Australia* (pp. 69-87). Amsterdam/Philadelphia: John Benjamins.
- Bowyer, R. (1973). *A Study of Social Accents in a South London Suburb*. MPhil dissertation. University of Leeds.
- Bradlow, A., Pisoni, D., Yamada, R., & Tohkura, Y. (1997). Training Japanese listeners to identify English /r/ and /l/: IV. Some effects of perceptual learning on speech production. *Journal of the Acoustical Society of America*, 101, 2299-2310.
- Bradlow, A., Akahane-Yamada, R., Pisoni, D. & Tohkura, Y. (1999). Training Japanese Listeners to Identify English /r/ and /l/: Long-Term Retention of Learning in Perception and Production, *Perception and Psychophysics*, 61(5), July, 977-985.
- Broeders, A. (1982). Engels in nederlandscoren: Uitspraakvoorkeur bij nederlands estudenten engels in *Toegepaste Taalkunde in Artikelen* (pp. 127-128). Amsterdam: Vu Boekhandel.
- Broselow, E., Chen, S., & Wang, C. (1998). The Emergence of The Unmarked in Second Language Phonology. *Studies in Second Language Acquisition*, 22, 261-280.
- Browman, C. P., & Goldstein, L. (1992). Articulatory Phonology: An Overview. *Phonetica*, 49, 155-180.
- Browman, C. P., & Goldstein, L. (1995). Gestural Syllable Position Effects in American English. In F. Bell-Berti & L. J. Raphael (Eds.), *Producing Speech: Contemporary Issues*. (pp. 19-34). Woodbury, NY: American Institute of Physics.
- Brown, A. (1989). Giving your Students /l/. *English Language Teaching Journal*, 43(4), 294-301.

- Campbell, F., & Gick B. (2003). A labial gesture for /l/. *Journal of the Acoustical Society of America*, 113(5), 2257.
- Carlisle, R. S. (2001). Syllable Structure Universals and Second Language Acquisition. *International Journal of English Studies*.1, 1-19.
- Carter, P. (2003). *Structured Variation in British English Liquids: the Role of Resonance*. PhD dissertation. The University of York.
- Clements, G. N. (1990). The role of the sonority cycle in core syllabification. In Kingston & M.Beckman (Eds.), *Papers in Laboratory Phonology* (Vol. 1, pp. 283-333). Cambridge: Cambridge University Press.
- Eckman, F. (1977). Markedness and the contrastive analysis hypothesis. *Language Learning*, 27, 315-330.
- Eckman, F. (1991). The structural conformity hypothesis and the acquisition of consonant clusters in the interlanguage of ESL learners. *Studies in Second Language Acquisition*, 13, 23-41.
- Eckman, F., & Iverson, G. (1993). Sonority and markedness among onset clusters in the interlanguage of ESL learners. *Second Language Research*, 9, 234-252.
- Fasold, R., & Wolfram, W. (1970). Some linguistic features of Negro dialect. In R. Fasold & R. Shuy (Eds.), *Teaching Standard English in the Inner City* (pp. 41-86). Washington, DC: Center for Applied Linguistics.
- Flege, J. (1988). Factors affecting degree of perceived foreign accent in English sentences. *Journal of the Acoustical Society of America*, 84 (1) 70-79.
- Flege, J. (1991) Perception and Production: The Relevance of Phonetic Input to L2 Phonological Learning. In T. Hueber, (Ed.) *Crosscurrents in Second Language Acquisition and Linguistic Theories* (pp. 249-289). Amsterdam: John Benjamins.
- Flege, J. (1993) Production and perception of a novel, second-language phonetic contrast. *Journal of the Acoustical Society of America*, 93 (3), 1589-1608.
- Flege, J., Bohn, O. & Jang, S. (1997). Effects of experience on non-native speakers production and perception of English vowels. *Journal of Phonetics*, 25, 437-470.

- Flege, J., & Davidian, R (1984). Transfer and developmental processes in adult foreign language speech production. *Applied psycholinguistics*, 5, 323-347.
- Flege, J., & Eefting, W. (1987). Cross-language switching in stop consonant perception and production by Dutch speakers of English. *Speech Communication*, 6(3), 185-202.
- Flege, J., & Wang, C. (1989). Native-language phonotactic constraints affect how well Chinese subjects perceive the word final English /t/-/d/ contrast. *Journal of Phonetics*, 17, 299-315.
- Flege, J., MacKay, I. & Meador, D. (1990). Native Italian Speakers' Perception and Production of English Vowels. *The Journal of the Acoustical Society of America*, 106 (5), Nov, 2973-2987.
- Flege, J., & Liu, S. (2001). The effect of experience on adults' acquisition of a second language. *Studies in Second Language Acquisition*, 23, 527-552.
- Frieda, E., Walley, A., Flege, J. & Sloane, M. (2000). Adults' Perception and Production of the English Vowel /ɪ/. *Journal of Speech, Language, and Hearing Research*, 43(1), Feb, 129-143.
- Gess, R. (1998) Compensatory lengthening and structure preservation revisited. *Phonology*, 15, 353-366.
- Gess, R. (2001) *On re-ranking and explanatory adequacy in a constraint-based theory of phonological change*. MS thesis, University of Utah.
- Gick, B. (2004). Responding to physical constraints on speech production. Paper presented at the Department of Linguistics Colloquium Series, the University of Victoria, February, 2004.
- Gick, B., Kang, A. M., & Whalen, D. H. (2002). MRI and X-RAY Evidence for Commonality in the Dorsal Articulations of English Vowels and Liquids. *Journal of Phonetics*, 30, 357-371.
- Gnanadesikan A. (1996) Child Phonology in Optimality Theory: Ranking Markedness and Faithfulness Constraints. *Proceedings of the 20th Boston University Conference on Language Development*. Somerville: Cascadilla Press.
- Green, L . (2002). *African American English : a linguistic introduction*. Cambridge [UK];

New York : Cambridge University Press.

Goto, H. (1971) Auditory perception by normal Japanese adults of the sounds "l" and "r", *Neuropsychologia*, 9, 317-323.

Gussenhoven, C. (1979). Pronunciation preference among Dutch students. Paper presented at the Second International Conference on the Teaching of Spoken English, University of Leeds.

Hancin-Bhatt, B., & Bhatt, R. (1997). Optimal L2 Syllables. *Studies in Second Language Acquisition*, 19, 331-378.

Hansen, J. G. (2001). Linguistic Constraints on the Acquisition of English Syllable Codas by Native Speakers of Mandarin Chinese. *Applied Linguistics*, 22, 338-365.

Hardcastle, W., & Barry, W. (1989). Articulatory and perceptual factors in /l/ vocalizations in English. *Journal of the International Phonetic Association*, 15, 3-17.

Hattori, S. (1984). *Onseigaku*. Tokyo: Iwanami Shoten.

Heselwood, B., & McChrystal, L. (2000). Gender, Accent Features and Voicing in Panjabi-English Bilingual Children. *Leeds Working Papers in Linguistics and Phonetics*, 8, 45-70.

Horvath, B. and Horvath, R. (1997). The geolinguistics of a sound change in progress: /l/ vocalisation in Australia. In M. Meyerhoff, C. Boberg and S Strassel (Eds.), *Working Papers in Linguistics: A Selection of Papers from NWAWE 25* (pp. 105-124). Philadelphia: University of Philadelphia Press.

Horvath, B. & Horvath, R. (2001) A multilocality study of a sound change in progress: The case of /l/ vocalisation in New Zealand and Australian English. *Language Variation and Change* 13, 37-57.

Horvath, B. & Horvath, R. (2002). The geolinguistics of /l/ vocalization in Australia and New Zealand. *Journal of Sociolinguistics* 6, 319-346.

Hudson, R. & Holloway, A. (1977). *Variation in London English: Final Report to the Social Sciences Research Council*. London: Department of Phonetics and Linguistics, UCL.

- Ingram, J. & Park, S. (1997). Cross-Language Vowel Perception and Production by Japanese and Korean Learners of English. *Journal of Phonetics*, 25(3), July, 343-370.
- Johnson, W. and Britain, D. (2003). L vocalisation as a natural phenomenon *The University of Essex Research Reports in Linguistics*. Retrieved October 22, 2004 from <http://privatewww.essex.ac.uk/~dbritain/9.pdf>.
- Kim, D., & Yuntaek, J. (1998). Adult ESL Korean speakers' interlanguage acquisition of consonant clusters. *SECOL Review*, 22(2), 150-169.
- Leather, J., & James, A. (1991). The acquisition of second language speech. *Studies in Second Language Acquisition*, 13(3), 305-341.
- Lee, M. (1976). Pronunciation Problems Are Different and Similar Among Cantonese and Mandarin Speakers. *TESL Reporter*, 9(4), Sum, 3-6.
- Lin, H. (2001). A Grammar of Mandarin Chinese. LINCOM EUROPA Press.
- Lin, H. (2001). Stress and the distribution of the neutral tone in Mandarin. In D. Xu (Ed.), *Chinese Phonology in Generative Grammar* (pp. 139-161), San Diego: Academic Press.
- Lin, H. (1999). Putonghua qingsheng diaozhi de zonghe fenxi. In S. Lu (Ed.), *Xiandai Yuyinxue Lunwenji*, Beijing, (pp. 175-183). China: Golden City Press.
- Lin, H. (1998). Diaosu lun ji Putonghua liandu biandiao. *Zhongguo Yuwen*, (1), 31-39.
- Lin, H. (1997). The impact of syllable simplification among Chinese dialects. *The Thirtieth International Conference on Sino-Tibetan Languages and Linguistics*. Beijing, China, August, 1997.
- Lin, H. (1996). Phonetics or phonology: Mandarin neutral tone revisited. *Proceedings of the Fourth International Conference on Chinese Linguistics* (Vol 2, pp. 219-233). University of Wisconsin.
- Lin, Y. (2001). Syllable Simplification Strategies: A Stylistic Perspective. *Language Learning*, 51, 681-718.
- Lin, Y. (2003). Interphonology Variability: Sociolinguistic Factors Affecting L2 Simplification Strategies. *Applied Linguistics*, 24(4), 439-464.

- Llisterri, J. (1995). Relationships between Speech Production and Speech Perception in a Second Language. *Proceedings of the XIIIth International Congress of Phonetic Sciences* (pp 12-19), Stockholm, Sweden.
- Major, R. C. (1994). Chronological and stylistic aspects of second language acquisition of consonant clusters. *Language Learning*, 44, 655- 680.
- Major, R. C. & Faudree, M. (1996). Markedness in Second Language Acquisition of Consonant clusters. In R. Bayley & D. Preston (Eds.), *Second Language Acquisition and Linguistic Variation* (pp. 97-120). John Benjamin B.V.
- Major, R. C., & Kim, E. (1999). The Similarity Differential Rate Hypothesis. *Language Learning*, 49, supplement 1, 151-183.
- Menn, L. (1971) Phonotactic rules in beginning speech. *Lingua*, 26, 225-241.
- Meuter, A. (2002). *L-Vocalisation and labiodental variants of /r/ in the speech of Colchester primary school children – the acquisition of a sound change?* MA thesis. Essex University.
- Neufeld, G. (1988) Phonological asymmetry in second language learning and Performance. *Language Learning*, 38(4), 531-559.
- Oh, S. (2002). Cross-language blending of /l/ gestures by Korean-English bilingual children. *26th Boston University Conference on Language Development (BUCLD)*, 2, 473-484.
- Pater, J. (1997). Minimal violation and phonological development. *Language Acquisition*, 6(3), 201-253.
- Piske, T., Mackay, I., & Flege, J. (2001). Factors affecting degree of foreign accent in a second language: A review. *Journal of Phonetics*, 29, 191-215.
- Przedlacka, J. (2001). Estuary English and RP: Some recent findings. *Studia Anglica Posnaniensia*, 36, 35-50.
- Recasens D. (1996) An Articulatory-Perceptual Account of Vocalisation and Elision of Dark /l/ in the Romance Languages. *Language and Speech*, 39(1), 63-89.
- Rochet, B. (1995). Perception and Production of Second-Language Speech Sounds by

- Adults. In S. Winifred [Ed.], *Speech Perception and Linguistics Experience: Issues in Cross-Language Research* (pp. 379-410), Timonium, MD: York Press, Inc.
- Schmidt, A., & Meyer, K. (1995). Traditional and phonological treatment for teaching English fricatives and affricates to Koreans. *Journal of Speech and Hearing Research*, 38, 828-838.
- Sheldon, A., & Strange, W. (1982). The acquisition of /r/ and /l/ by Japanese learners of English: evidence that speech production can precede speech perception. *Applied Psycholinguistics*, 3, 243-261.
- Sheldon, A. (1985) The relationship between production and perception of the /r/-/l/ contrast in Korean Adults learning English. A reply to Borden, Gerber and Milsark. *Language Learning*, 35(1), 107-113.
- Smith N.V. (1973) *The Acquisition of Phonology: A Case Study*. Cambridge: CUP.
- Spero M. (1996). *L-vocalisation in Southeastern Britain*. MA Thesis, University of Essex.
- Sproat, R. & Fujimura, O. (1993) Allophonic Variation in English /l/ and Its Implications for Phonetic Implementation. *Journal of Phonetics*, 21(3), July 291-311.
- Sudbury, A. (2001). Falkland Islands English: a Southern Hemisphere variety? *English World Wide*, 22, 55-80.
- Tahta, M. W., and Loewenthal, K. (1981). Foreign accents: factors relating to transfer of accent from the first language to a second language. *Language & Speech*, 24, 265-272.
- Thompson, I. (1991). Foreign accents revisited: the English pronunciation of Russian immigrants. *Language Learning*, 41, 177-204.
- Trudgill, P. (1986). *Dialects in Contact*. Oxford: Blackwell.
- Tollfree, L. (1999) South East London English: discrete versus continuous modeling of consonantal reduction. In P. Foulkes & G. Docherty (Eds.) *Urban Voices* (pp.163-184), London: Arnold.
- Velten, H. (1943). The growth of phonemic and lexical patterns in infant language. *Language*, 19, 281-292.

- Walsh, D. L. (1997). *The Phonology of Liquids*. PhD dissertation, UMASS.
- Wang, C. (1995). *The acquisition of English word-final obstruents by Chinese speakers*. PhD dissertation, State University of New York at Stony Brook.
- Wang, L. & Lin, T. (2003). *Yuyinxue Jiaocheng*. Peking University Press.
- Weinberger, S. (1987). The influence of linguistic context on syllable simplification, In Gioupand S. & Weinberger (Eds.), *Interlanguage phonology: The acquisition of second language sound system* (pp. 401-417). Rowley, MA: Newbury House.
- Weinberger, S. (1994). Functional and phonetic constraints on second language phonology, In M. Yavas (Ed.), *First and second language phonology* (pp. 283-302). San Diego, CA: Singular Publishing group.
- Watt, D., & Milroy, L. (1999). Phonetic variation in three Tyneside vowels: Is this dialect leveling? In P. Foulkes and G. J. Docherty (Eds.) *Urban voices: Accent Studies in the British Isles* (pp. 25-46). London: Arnold.
- Wells, J. (1982). *Accents of English*. Cambridge: Cambridge University Press.
- West, P. (1993). Perception of Distributed Coarticulatory Properties of English /l/ and /l(turned r)/. *Journal of Phonetics*, 21(3), July, 291-311.
- Williams, L. (1979). The Modification of Speech Perception and Production in Second-Language Learning. *Perception and Psychophysics*, 26(2), Aug, 95-104.
- Yeon, S. (2004), Perception of English palatal codas by Korean speakers of English. *Journal of Pan-Pacific Association of Applied Linguistics*, 8, 110-123.

APPENDIX A

Background information on the participants

No.	Age	Studying Location	Gender	Birth Place
1.	23	Canada	M	Shandong
2.	23	Canada	M	Liaoning
3.	22	Canada	M	Liaoning
4.	27	Canada	M	Beijing
5.	23	Canada	F	Heilongjiang
6.	25	Canada	F	Henan
7.	28	Canada	F	Liaoning
8.	29	Canada	F	Shanxi
9.	25	China	M	Shandong
10.	25	China	M	Jilin
11.	27	China	M	Shandong
12.	30	China	M	Inner Mongolia
13.	24	China	F	Henan
14.	24	China	F	Beijing
15.	24	China	F	Shandong
16.	30	China	F	Hebei

APPENDIX B

Word list

1) Syllable initial /l/

lit /ɪ/	lip	lid	lit	lip	lid	lit	lip	lid	lit
leg /ɛ/	let	led	let	leg	let	led	leg	let	Led
loot /u:/	loop	look	loot	loop	look	loot	loop	look	loot
lock /o/	lot	log	lot	lock	log	lot	lock	log	lot

2) Syllable final /l/

bill /ɪ/	hill	kill	till	bill	kill	till	bill	kill	hill
bell /ɛ/	cell	dell	tell	sell	bell	dell	tell	sell	bell
cool /u:/	pool	fool	tool	pool	cool	fool	pool	tool	cool
ball /o/	fall	mall	tall	call	fall	wall	ball	mall	hall

3) Syllabic /l/

people	apple	couple	maple	apple	people	maple	couple	apple	maple
noodle	needle	candle	needle	noodle	candle	noodle	needle	candle	needle
babble	rubble	bubble	dibble	rubble	bubble	dibble	pebble	rubble	babble
little	battle	shuttle	nettle	battle	little	nettle	settle	little	Nettle
tangle	mangle	fangle	eagle	mangle	tangle	eagle	fangle	eagle	mangle
ankle	winkle	tinkle	kinkle	winkle	ankle	tinkle	kinkle	ankle	tinkle

Appendix C

Three mini-dialogues (tested words in bold)

Dialogue One

A: Hi Phil! **Look** at my **laptop**. It is a **Dell**.

B: **Well!** That's **swell**, **Bill!** For how much did it **sell**?

A: It is a real **steal**. See the **bill**.

B: Cool **deal!** **Phil**. I want to buy one as well! Let's **call**.

Dialogue Two

A: Paul, would you **like** to play **basketball**?

B: me? **Look** at me. I am not that **tall**. I can't play **basketball**. I cannot play at **all**.

A: You're so dull. You're not **cool**.

B: You're so cruel. Are you thinking I'm a **fool**? I am not a **fool!** At **school**, I'm **cool!**

Dialogue Three

A: How many people did you invite for the dinner?

B: Two **people**.

A: Who are **they**?

B: A young **couple**.

A: what's **dessert**?

B: Each one of us has an **apple**.