The Role of Mishearing in Adults' L2 Phonology Acquisition

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1. Introduction

It has long been found that native English speakers tend to say the rhyme /ɪŋ/ as /ɪn/ in informal conversation, such as *doing* as *doin'*, *going* as *goin'*, and *something* as *somethin'* (Trudgill, 1974). Knowingly or unknowingly, English learners also tend to do so on casual occasions. However, it seems that some English learners cannot accurately pronounce minimal pairs like *sin/sing, win/wing, and kin/king*; specifically, most adult learners have difficulty saying words with the /ɪŋ/ rhyme. Accordingly, they tend to say words like *bring* as *brin'*, *spring* as *sprin*, and *ring* as *rin*, regardless of whether they speak in formal or informal settings.

Following the above primary observation, the question that arises is how the L2 speech misproduction of the rhyme /ɪŋ/ as /ɪn/ occurs. Previous studies have attempted to provide explanations for pronunciation errors from the perspectives of negative L1 transfer (e.g., Suter, 1976; Purcell & Suter, 1980; Weinberger, 1990; Hancin-Bhatt, 1994) and a universal tendency toward articulatory simplicity, as implied in the preference for CV patterns (Tarone, 1980), Unmarking Principle (Labov, 1994), and Natural Phonology (Stampe, 1979). This paper, however, presents a more comprehensive picture of the L2-learning environment in which unaware and unintentional mishearing is a significant cause of L2 speech misproduction (cf. Schmidt, 1990, 1992, 1995). Based on this account, a concept called *auditory mechanism* is proposed to addresses the effects of distinct sounds on the human ear and the subsequent pronunciations of these patterns (cf. Ohala, 1981). This concept is deployed to integrate prior perspectives in order to better understand the causality of interphonology. I will address this concept in more detail in the next section.

2. Auditory mechanism

Ohala (1981, 1990, 1992, 1993, 2001) has been employing the notion of mishearing to account for historical sound changes. He asserts that sound changes occur "due to 'innocent' misapprehensions about the interpretation of the speech signal"—that is, due to listeners' inexperience which causes mishearing (1990, p. 266). He explains that listeners occasionally misparse (misapprehend) what speakers intend, i.e., what is predictable and what is not predictable in the speech signal. When the misparsing forms the basis for listeners' own pronunciation when they speak, a new pronunciation results. As Ohala (2001) puts it,

> Occasionally listeners err: they may fail to properly parse the speech signal made ambiguous by the short cuts of the speaker and by the physical constraints of the speech production mechanism. In this case the contextually-caused distortion is taken "at face value," i.e., as it is heard. This--I propose--is the origin of most sound changes. John J. Ohala (2001)

Simply stated, a sound change is an innocent and inadvertent error made by listeners.

Accordingly, Ohala (1992) proposes an auditory account of sound changes, in contrast to Natural Phonology, which emphasizes minimal effort on the speaker (Stampe, 1979). More specifically, he maintains that a listener-initiated model can be adopted to explain sound assimilation and dissimilation in terms of listeners' hypo- and hyper-correction, respectively. He remarks that phonological changes are initiated by listeners' misapprehensions of what speakers intend, and observes that in normal speech perception, listeners usually can reconstruct "colored" speech signals. But when listeners fail

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to correct a variant signal, interpreting it at face value (hypocorrection), or exaggerating it inappropriately (hypercorrection), a different phonological structure may come into existence.

In fact, Ohala's listener-initiated model has been employed by a host of scholars in their studies of diachronic sound changes and synchronic phonological variations. Many experimental studies of sound changes under controlled conditions have been successful. For instance, Beckman et al. (1992) conduct perception experiments to account for the diachronic sound changes that are conditioned by the prosodic environment, such as the voicing of voiceless fricatives in unstressed syllables in Proto-Germanic. Their findings support acoustic-perceptual accounts of stop spirantization, voiceless obstruent voicing, and even the insertion of an intrusive stop in clusters such as /ns/ in some prosodic environments. To summarize, Ohala's perceptual model provides insight into origins of phonological changes in the context of continuous phonetic variation.

Built on Ohala's listener-directed accounts of phonological changes, this study investigates the effect of mishearing on adults' L2 phonology acquisition of the English rhyme /ɪŋ/. To evaluate the explanatory validity of Ohala's perceptual model, I began with this hypothesis:

Mishearing is a vital reason for adults' L2 speech misproduction of the rhyme /ɪŋ/ for /ɪn/.

Put simply, it is postulated that the mishearing of the sound input causes misrecognition and/or misassociation in the brain, resulting in mispronunciation. Ohala's perceptual model will be supported if such mishearing occurs to a large extent. To test this hypothesis, I conducted a language experiment, which is specified in the following section.

2. Language experiment

2.1 Participants

30 volunteers, 15 females and 15 males, participated in this study. The participants ranged in age from 21 to 36. They have no physical hearing trouble, nor difficulty in verbal expression by using their first languages.[1] Of these subjects, 6 were native speakers of Mandarin from China, 6 of Mandarin from Taiwan, 6 of Japanese, 6 of Korean, and 6 of English as a control group. These language groups were selected because each of them has different word-final nasal endings. Chinese and Korean learners of English were selected because of their ability to distinguish the rhyme /ɪŋ/ from /ɪn/ (Yang, 2000; Lee, 1973). This allows the researcher to examine whether mishearing is constrained by positive transfer for accurate pronunciation. In Japanese, however, only the rhyme /ɪn/ exist (Vance, 1987), and Taiwanese Mandarin has merged the rhyme /ɪŋ/ with /ɪn/ (Tse, 1992; Yang, 2000). This permits the researcher to investigate whether negative L1 transfer facilitates mishearing and mispronunciation of the rhyme /ɪn/ for /ɪŋ/.

2.2 Instruments

Six instruments were prepared for this language experiment. The first instrument was designed to test the participants' pronunciation of the rhyme /ɪŋ/. It was a list of 55 English words which were randomly mixed (15 base words with the rhyme /ɪŋ/, 15 verbs with the suffix /ɪŋ/, 15 words with the rhyme /ɪn/, and 10 irrelevant words). The English words used to test the pronunciation accuracy are shown in Table 1.

The second instrument was designed to understand to what extent the participants' L1s would influence the pronunciation of the rhyme /ɪŋ/ when they learned a new word with an /ɪŋ/ ending. It was a list of 40 pseudo-English words mixed randomly (15 /ɪŋ/ endings, 15 /ɪn/ endings, and 10 irrelevant endings). By doing so, I would like to compare the results and see whether pronouncing *new* words would differ from pronouncing *known* words.[2] The pseudo-English words for this purpose are shown below:

[1] This information was gained from a questionnaire prior to the language experiment. The questionnaire appears in appendix 1.

[2] In the interview after the language experiment, every participant were given a list of the 55 English words to identify the words, and the results show that they know all of the test words.

Table 1. English words used to test pronunciation accuracy

With the rhyme /ɪn/	With the rhyme /ɪŋ/	With the rhyme /ɪŋ/
1. kin	1. king	1. washing
2. sin	2. sing	2. going
3. skin	3. evening	3. working
4. win	4. morning	4. singing
5. begin	5. spring	5. writing
6. pin	6. bring	6. driving
7. thin	7. thing	7. missing
8. twin	8. ring	8. listening
9. origin	9. wing	9. typing
10. Latin	10. darling	10. opening
11. engine	11. interesting	11. closing
12. fin	12. meaning	12. testing
13. bin	13. something	13. dying
14. spin	14. nothing	14. teaching
15. magazine	15. anything	15. studying

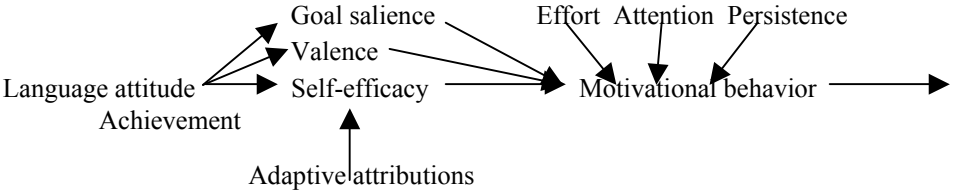
Table 2. Pseudo-English words

With the rhyme /ɪn/	With the rhyme /ɪŋ/
1. hin	1. hing
2. stin	2. sping
3. lin	3. tring
4. flin	4. ning
5. vin	5. fring
6. koolin	6. spoming
7. blamin	7. huning
8. dotim	8. voning
9. spomin	9. feaming
10. glurin	10. stooking
11. jolin	11. joling
12. chomin	12. choming
13. dorin	13. doring
14. wutin	14. wuting
15. labin	15. labing

The third instrument was a questionnaire of 44 questions, which was designed to collect information regarding my participants' sociolinguistic backgrounds.[3] From the self-reported questionnaire, I can know how such factors as L1, the start age of learning English, length of stay in English-speaking countries, gender, English learning experience, overall English proficiency, and motivation will affect mishearing. The questions designed to assess motivation are based on Schmidt's model (2000), which is adapted from Tremblay & Gardner (1995). In this model, motivation is linked with goal salience (reasons to learn an L2), valence (value of learning an L2), and self-efficacy (self-confidence in learning an L2 well), along with other related factors. Figure 1 shows how this model works:

[3] It should be noted that self-reports may be influenced by social desirability. However, this influence is minimal in a context where there is no strong reason for participants to present themselves in a favorable way (Gardner & MacIntyre, 1991). Additionally, in my study, the participants were told in the general instructions that all of their answers and language performance would never be disclosed and would be used only for the researcher to understand the nature of second language acquisition.

Figure 1. Motivational model (adapted from Schmidt 2000).



The participants used a 5-point scale to answer the questions designed to understand the degree of their motivation. Some of the questions are represented as follows:

Language attitude
1) I learn English because I want to know more about Western life and culture.
Goal salience
2) My goal of learning English is to achieve proficiency in all aspects of English.
Valence
3) I learn English because it is useful.
Self-efficacy
4) I believe that if I study hard I can learn English well.
Adaptive attributions
5) I really enjoy learning English.
6) Success in English learning depends on having a good teacher.
Effort
7) Success in English learning depends on my own efforts.
Attention
8) I study English very hard.
Persistence
9) I study English regularly.

In addition, a list of 30 English words was used to test the participants' overall English pronunciation proficiency. I would like to examine to what extent overall pronunciation accuracy can constrain the mishearing of the rhyme /ɪŋ/as /ɪn/. Table 3 indicates why the 30 words were selected for this study.

Moreover, a list of 10 Cantonese phrases was used to test the participants' aptitude for oral mimicry. I would like to explore the relationships between my informants' verbal imitation and their mishearing of the rhyme /ɪŋ/as /ɪn/. Cantonese words were selected because none of my participants know the language.[4] However, Suter (1976, p 241) notes that it is possible that, on an oral mimicry test, certain speakers will have an advantage because the phonetic inventory of their native language more closely resembles those test sounds (here, presumably native speakers of Mandarin because Cantonese and Mandarin have tone but Japanese and Korean do not). For this reason, 10 unusual Cantonese sound sequences were used for the test to avoid possible associations with words or utterances from native speakers of Mandarin. These sound sequences appear in Table 4:

[4] Linguistically, Cantonese is regarded as one of Chinese dialects. While Cantonese and Mandarin share the same writing system, both are not mutually intelligible.

Table 3. English words to test overall English pronunciation accuracy

1. Asia (Notice the *s*-sound)
2. Illinois (Notice the deletion of /s/.)
3. pizza (Notice the second onset /ts/.)
4. soften (Notice the deletion of /t/.)
5. thirty (Notice the *th*-sound.)
6. virgin (Notice the *g*-sound.)
7. version (Notice the *s*-sound.)
8. discover (Notice the unaspiration of /k/.)
10. discount (Notice the aspiration of /k/.)
11. write (Notice the vowel /aɪ/.)
12. ride (Notice the vowel /aɪː/, which is longer than that of *write*.)
13. run (Notice the onset /r/.)
14. low (Notice the vowel.)
15. law (ibid.)
16. lawyer (Notice the first vowel.)
17. bat (Notice the vowel.)
18. bet (ibid.)
19. bait (ibid.)
20. sheep (ibid.)
21. ship (ibid.)
22. A, B, C (Notice the vowel of A (/e/) and the syllable of C.)
23. E, F, G (Notice the vowel of F and the syllable of G.)
24. another (Notice the syllable division: /a.nother/)
25. context (Notice /n/.)
26. conscious (ibid.)
27. certificate (Notice the stress.)
28. occur (ibid.)
29. New York (ibid.)
30. New York City (ibid.)
30. although (ibid.)

Table 4. 10 Cantonese words used to test aptitude for oral mimicry

Cantonese	Gloss
1. /gau̲.dim/	1. “It’s done.”
2. /ba.wan/	2. “white cloud.”
3. /hen.yam.go/	3. “soft music.”
4. /han.fa.tun/	4. “Han-fa village.”
5. /yu.jin.ho/	5. “linguistics.”
6. /he.fan.lu̲e.han/	6. “like to travel.”
7. /mou̲.gau̲.ho.fan/	7. “very worried (about something)”
8. /go.hai̲.san.ŋin/	8. “(get something) by all means.”
9. /kou̲e.hai̲.go.sai̲.lau̲/	9. “He is my brother.”
10. /nei̲.ji.ka.hou̲ei̲.bin.do/	10. “Where are you going?”

Furthermore, three questions were designed for the participants to rate their own level of aptitude. The 3 questions are represented as follows:

1) I am very good at imitating the sounds of different languages.
2) I like to imitate the way people speak.
3) I have a good memory for names.

According to Carroll (1981, 1990), language aptitude may be measured by testing 4 components: 1) phonetic coding ability, 2) grammatical sensitivity, 3) rote-learning ability for L2 materials, and 4) inductive language learning ability. Of these components, phonetic coding ability is closely related to phonology learning aptitude. Phonetic coding ability is defined as "the ability to identify and store, in long-term memory, new language sounds or strings of sounds" (Carroll, 1971, p. 4). Hence, with regard to my study of L2 pronunciation proficiency, I considered only this component on the premise that phonological aptitude is not the same as other language aptitudes as shown in syntactic analysis, reading, and writing, although it overlaps to some extent with them. In sum, each speaker's aptitude for oral mimicry was measured by both a sound imitation test and self-reports.

The final instrument was an informal interview which was aimed to understand the participants' overall English-learning experiences in detail that was not possible with a written questionnaire and a quantitative method. Another purpose was to understand to what extent the participants were aware of the phonetic distinction between the rhymes /ɪŋ/ and /ɪn/ and of the social variations used by native speakers of English.[5] Specifically, I asked the participants to read some words with the rhyme /ɪŋ/ and then asked them if they had ever noticed the phonetic differences between /ɪŋ/ and /ɪn/. I also asked them whether they had been aware of the social variations between /ɪŋ/ and /ɪn/, that is, whether they knew anything about the relation of the variations to formality, class, education, geographical variation, gender, etc. If not, it would be expected that they did not distinguish /ɪŋ/ from /ɪn/. By doing so, I was able to understand the level of my participants' awareness of the social variations between /ɪŋ/ and /ɪn/. Additionally, in the earlier questionnaire, the participants were also asked to self-rate their strength of concern about pronunciation accuracy by using a 5-point scale. Four questions were designed for this purpose:

6.1) Improving my English pronunciation is very important to me for my (future) job.
6.2) Improving my English pronunciation is very important to me because it would be easier for me to befriend more English speakers.
6.3) Improving my English pronunciation is very important to me because I'm aware that my social status in the United States is frequently determined by how well I pronounce English.
6.4) I have been very concerned about my pronunciation. When I learn a new English word, I would consult a "talking" English dictionary or a Standard English speaker.

From the participants' self-reports, I can better understand the degree of the participants' concern for pronunciation accuracy.

2.3 Procedures

Participants were interviewed one at a time. To begin with, s/he was asked to read general instructions while listening to them read by a native speaker of American English.[6] The instructions specified the six tasks in this experiment, which are summarized as follows:

1) The participant will repeat 55 tape-recorded English words read by the native speaker.
2) In the second task, the participant will repeat 40 pseudo-English words.
3) Next, the participant will be given a list of the 55 English words used in the first task. S/he will be asked to mark the words which s/he does not know.
4) Then, the participant will repeat 10 tape-recorded Cantonese words read by a native speaker of Cantonese from Guang-Tong of mainland China.
5) After that, the participant will answer a questionnaire which consists of 44 questions.
6) Finally, the researcher will have an informal interview with the participant to understand to what extent the participant is aware of the phonetic difference between the rhymes /ɪŋ/ and /ɪn/, and of the social variations used by native speakers.[7]

[5] The questions used in the interview were presented in Appendix 1.
[6] The general instructions appear in Appendix 2.
[7] The questions used in the interview appear in Appendix 3.

The experiment started from the first task to the sixth to keep the effects of one task upon performance in another to a minimum.

2.4 Analysis

A native speaker of American English judged the speakers' pronunciation accuracy. He was asked to focus on whether the speakers correctly pronounced words with the /ɪŋ/ endings. His judgments were compared with the researcher's transcriptions. Disagreements between the two were simply eliminated from this study.

As for the test of aptitude for oral mimicry, a native speaker of Cantonese rated each speaker's production of the 10 Cantonese words on a 1-5 point scale from best to worst. The researcher also rated each speaker's pronunciation on a 1-5 point scale by transcribing it and comparing it with the phonetic properties of the target sound sequences. Additionally, to avoid possible phonetic similarity between the test utterances and L1 sounds, each speaker's score was converted to a score which reflected his or her performance against only those other speakers who shared his or her native language. Finally, each speaker's score was gained by the average of the total scores obtained from the native speaker's score, the researcher's score and self-reports.

3. Results and discussion

The findings demonstrate that all informants, excluding the control group, tend to mishear the rhyme /ɪŋ/ as /ɪn/ and mispronounce the test English words accordingly, in support of Ohala's auditory model. Furthermore, mishearing exacerbates in the cases of the Taiwanese Mandarin and Japanese informants because L1 transfer might also foster such mishearing. In comparison, the cases with the Chinese Mandarin and Korean subjects challenges L1 transfer for failing to explicate why the rhyme /ɪŋ/ gives way to /ɪn/, rather than in the reverse direction. It is hence suggested that the mispronunciation of the ending /ɪn/ for /ɪŋ/ by Chinese Mandarin and Korean learners of English might merely reflect a universal phonological process—a place assimilation where the syllable-final velar nasal is fronted to the alveolar/dental nasal due to the previous front vowel /ɪ/. More information about the results is as follows:

Table 5. Findings of the language experiment
Participants from China

	C1	C2	C3	C4	C5	C6	
1	1.45	1.54	2.45	2.15	2.0	2.18	
2	2	1.5	2	1.5	1	2.5	
3	2.0	2.15	2.15	2.0	2.10	3.10	
4	Never noticed	Never Noticed	Never noticed	Never noticed	Never noticed	Never noticed	
5	18/30	17/30	17/30	16/30	15/30	25/30	
6	3/30	2/30	3/30	2/30	1/30	11/30	Average: 12%
7	1/15	1/15	1/15	1/15	1/15	2/15	Average: 8%

Participants from Japan

	J1	J2	J3	J4	J5	J6	
1	2.18	2	2.10	2.20	1.50	2	
2	2.5	1.15	1	2	1.75	1.5	
3	1.95	1.5	3.2	2.2	1	1.7	
4	Never noticed	Never noticed	Never noticed	Never noticed	Never noticed	Never noticed	
5	28/30	14/30	12/30	12/30	12/30	12/30	
6	11/30	1/30	2/30	2/30	1/30	1/30	Average: 10%
7	1/15	0	0	0	1/15	0	Average: 2%

Participants from Korea

	K1	K2	K3	K4	K5	K6	
1	2.75	2.05	2.15	2	2.5	2	
2	2.75	1.5	2.25	2	1.5	2.25	
3	3.75	3.65	1.97	1.2	1.5	1	
4	Partly noticed	Never noticed	Never noticed	Never noticed	Never noticed	Never noticed	
5	30/30	17/30	19/30	18/30	15/30	18/30	
6	10/30	1/30	2/30	1/30	1/30	1/30	Average: 9%
7	4/15	0	1/15	1/15	0	0	Average: 6%

Participants from Taiwan

	T1	T2	T3	T4	T5	T6	
1	2.45	2.15	4	2.5	2	1.5	
2	1.75	3.75	1	1.75	1.25	1.5	
3	1.95	3.4	1.75	1.5	1	1.75	
4	Never noticed	Partly noticed	Never noticed	Never noticed	Never noticed	Never noticed	
5	16/30	27/30	10/30	17/30	12/30	11/30	
6	1/30	11/30	0	1/30	0	0	Average: 7%
7	0	0	0	0	0	0	Average: 0

NB: Numbers are represented as follows:
1. Degree of motivation (1=highest; 5=lowes)
2. Strength of concern for overall pronunciation accuracy (ibid.)
3. Aptitude for oral mimicry (ibid.)
4. Level of awareness of the phonetic distinction between the rhymes /ɪŋ/ and /ɪn/
5. Overall pronunciation accuracy of the 30 English words
6. Pronunciation accuracy of repeating the 30 English words with the rhyme /ɪŋ/
7. Pronunciation accuracy of repeating the 15 pseudo-English words with the rhyme /ɪŋ/

It is also noteworthy that the mishearing of /ɪŋ/ as /ɪn/ is found to occur to a great extent, irrespective of their sociolinguistic backgrounds. The discovery of the inadvertent mispronunciation by three of the subjects who had lived in the US for more than ten years vitiates Major's (1987) "ontogeny model," which states that the early substitutions which occur due to native language influence will gradually yield to developmental processes toward interlanguage and eventually is replaced by L2-like structure.

Moreover, from the perspective of sound markedness, the mishearing of /ɪŋ/ as /ɪn/ presents a sound shift from marked to unmarked sounds (/ɪŋ/ → /ɪn/), and such misperception/mispronunciation

can significantly be derived from L1 transfer when only unmarked sounds exist in L2 adults' mother tongue, as shown in the language groups of Taiwanese Mandarin and Japanese. In comparison, when marked and unmarked sound patterns or, by extension, only marked ones, appear in adult learners' native languages, the universal process of articulartory accommodation exerts a greater influence than L1 transfer on L2 speech misproduction, as shown in the language groups of Chinese Mandarin and Korean. Taken together, mishearing is a cardinal reason for L2 speech mispronunciation.

However, some individual differences are found in the general tendency toward the mishearing in question. For example, subjects C6, J1, K1, and T2 did not tend to mishear and mispronounce the English words with the /ɪŋ/ rhyme. Upon closer inspection, we can find that these subjects shared a learning style in common; that is, they were all relatively strongly concerned about their pronunciation. In other words, stronger concern for overall pronunciation accuracy may constrain the mishearing and predict better performance in repeating real English words. Nevertheless, it is found that higher aptitude for oral mimicry did not reflect better performance in repeating the pseudo-English words, as revealed in cases of J3, K2 and T2. It seems that low concern about pronunciation facilitates the mishearing, in spite of higher verbal imitation, as shown in J3 and K2. The case with T2 is intriguing because she was concerned about her pronunciation, but she still scored zero in repeating the pseudo-English words. It seems that she was affected by her L1 sound patterns. Finally, the case of T3 is also striking because he had a higher motivation of learning English, but he did not do a good job in repeating the test English words. The reason may be that he had a lower concern about his pronunciation.

As a whole, we may make three hypotheses from the above cases of individual differences. First, stronger concern about pronunciation can predict better pronunciation, and the consciousness of test sound features and patterns can further enhance pronunciation proficiency, as shown in K1 and T2. Second, without consciousness of test phonological contrasts, learners of a foreign language tend to be influenced by their negative L1 transfer and the universal process of articulatory simplicity. Third, higher motivation may not necessarily predict higher pronunciation accuracy. These hypotheses, however, need to be verified by follow-up empirical studies.

In short, once common patterns are known, individual differences remain. Individual differences could be an added resource. Problems in the analysis of language may be better understood if individual differences are taken into consideration as a vantage point from which to address questions of method and theory in the study of language in general. Accordingly, attention to them would be a matter of completeness. I have pointed out some cases of individual differences, in an attempt to stimulate further research on other specific cases which may lead us closer to a coherent and integrated view of individual differences and L2 phonology acquisition.

4. Pedagogical implications

The findings of this study imply that most adult learners of English tend to mishear the rhyme /ɪŋ/ as /ɪn/. Accordingly, there is a need to make them aware of the phonological contrast between the rhymes /ɪŋ/ and /ɪn/. For this purpose, it would be a good idea to use minimal pairs, such as *sin/sing,*[8] *win/win, king/kin, going/goin',* and *something/somthin'*. It would also be useful to practice words with the /ɪŋ/ endings, such as *spring, darling, bring,* and *Washington*. Unfortunately, it seems that the /ɪŋ/-/ɪn/ rhyme contrast is missing in most ESL pronunciation textbooks, based on the researcher's primary survey during the time this langauge experiment was conducted.

Nevertheless, knowledge does not necessarily lead to better pronunciation performance. How, then, can teachers help their students improve the pronunciation of words with the /ɪŋ/ rhyme? From my teaching experience, I found the following methods quite effective:

1) L2 teachers may begin by asking their students to relax their articulatory muscles which are fixed due to habit formation of L1 production.

[8] In fact, the word *sing* sounds like *seen*, particularly in informal conversation.

2) To improve students' L2 perception, L2 teachers can ask students questions like "How do you spell…?" and "What does …mean?".
3) Visual instructions may help increase pronunciation accuracy. A chart which shows the contrast between the word-final alveolar and velar nasals can be used to help students adjust their articulatory organs and pronounce the rhyme /ɪŋ/. Teaching materials which combine visual trainings are better than those which include audio-only drills. In fact, this method is supported by many studies (e.g., Markham & Nagano-Madsen, 1996; Hardison, 1997)

5. Limitations and suggestions for future research

However, this study has some limitations; first, other alternative measurements than self-report questionnaires (Crookes & Schmidt, 1991) may be needed to better assess such abstract concepts as motivation, aptitude, and awareness. In addition, this study intends only to explore adults' pronunciation errors; therefore, one may doubt whether the concept of auditory mechanism can be employed to explain children' speech misproduction.

Furthermore, this study only investigated how the subjects repeated the test words. Therefore, the question is whether the findings would be different if the subjects were only asked to mark from some given choices the words which they thought to be the most possible ones they heard. Additionally, more cross-linguistic studies are needed to examine the effect of mishearing on the acquisition of the rhyme /ɪŋ/.

Most significantly, although the results of this study support Ohala's auditory model in accounting for the adults' speech misproduction of the rhyme /ɪŋ/ as /ɪn/, one may wonder whether one can also explicate the pronunciation errors of other English sound segments in terms of mishearing. Put another way, the question remains how far the findings of this study may be generalized to the acquisition of other English sound patterns. New or better data, particularly gained from a quantitative survey, may substantially revise the present study.

Obviously, much work remains to be done to better understand the role of mishearing in L2 phonology acquisition.

Appendix 1
Questionnaire

This questionnaire has been designed to help the researcher know more about the role of individual differences in second language acquisition. Please give the researcher accurate and complete responses. All responses will be kept strictly confidential and will not be disclosed. Please do not include your name on this questionnaire.

1. Do you have hearing trouble? (yes or no)
2. Do you have difficulty in verbal expression by using your mother tongue? (yes or no)
3. Your gender is M or F?
4. What's your country?
5. What is your first language(s)?
6. Besides your first language(s), can you speak any other local dialect(s) as your mother tongue? If yes, what's the dialect(s)?
7. Did you study any foreign languages other than English? If yes, list these languages and indicate how well you speak them? (Pre-Basic, Basic, Intermediate, Inter-Advanced, Advanced.)
8. For how many years, in all, did you study English in school *before* living in an English-speaking country?
9. Please answer the following questions:
   1) At what age did you begin to receive formal classroom training in English *in your country?*
   2) Was your first English teacher a native speaker of English? (yes or no.)
   3) Was speaking, grammar, or both emphasized the most?
   4) For how many years did you study English under your first English teacher?

5) What about your subsequent English teachers?

10. Have you ever received formal classroom training in English *in an English-speaking country*? If not, skip to the next question.
    1) At what age did you begin to learn English in an English-speaking country?
    2) Was your English teacher a native speaker of English? (yes or no.)
    3) Was speaking, grammar, or both emphasized the most?
    4) For how many years did you study English under the first teacher?
    5) What about your subsequent teachers?
11. Have you ever studied English in *intensive English courses*—that is, courses in which you study English for at least half of the day on most days of the week? If not, skip to the next questions.
    1) How old were you when you first participated in an intensive English program?
    2) Was your first English teacher a native speaker of English? (yes or no.)
    3) Was speaking, grammar, or both emphasized the most?
    4) For how many years did you study English under the first teacher?
    5) What about your subsequent teachers?

12. Have you ever studied English by listening to *an English-learning radio program*? If not, skip to the next questions.
    1) At what age did you begin listening to the radio program?
    2) For how many years did you studied English that way?
    3) How often did you studied English that way: less than once a week, 1-3 times a week or 4-7 a week?
13. How old were you when you first began to live in an English-speaking country?
14. At what age were you first able to speak English well enough to carry on a meaningful conversation in English? (I mean more than just a few words—I mean sentences.)
15. For how many years, all together, have you lived in English-speaking countries?
16. Since you lived in an English-speaking country, how often have you **spoken** English at work or school?
    1) All the time.
    2) Most of the time.
    3) About half the time.
    4) Rarely.
    5) Never.
17. Since you lived in an English-speaking country, how often have you spoken English in your leisure time?
    6) All the time.
    7) Most of the time.
    8) About half the time.
    9) Rarely.
    10) Never.
18. If you had to count from 1 to 10 in your head, you would count in English….
    1) All the time.
    2) Most of the time.
    3) About half the time.
    4) Rarely.
    5) Never.
19. Have you ever lived with a native speaker of English? If so, for how long (total)?
20. Do you live with a native speaker of English now? (yes or no.)
21. Please self-rate your level of abilities in the following English skills:
    1) Grammatical analysis (poor, fair, good, excellent, as good as a native speaker)
    2) Reading comprehension (poor, fair, good, excellent, as good as a native speaker)
    3) Listening comprehension (poor, fair, good, excellent, as good as a native speaker)
    4) Writing (poor, fair, good, excellent, as good as a native speaker)

5) Oral proficiency (poor, fair, good, excellent, as good as a native speaker)
6) Pronunciation (poor, fair, good, excellent, as good as a native speaker)

22. Although you think you have no problem communicating in English, you were told that you have a heavy foreign accent. What would you do?
    1) I would like to improve it.
    2) I wouldn't change it.
    If you selected 2), please explain your reasons by selecting a letter (A-E) next to the following answer. (You may select as many given answers as you like.)
    A. Because I'm too old to change.
    B. Because my foreign accent represents my identity.
    C. Because I can already communicate adequately with my accented English.
    D. Because it's time-consuming to re-learn how to pronounce English words correctly.
    E. Because my foreign accent can draw extra attention and patience from native speakers.
23. What kind of jobs have you ever had for more than one year? (Please tell me the titles of the jobs.)
24. What kind of jobs do you now have or you like to have as your future career?
25. Do you care about your English pronunciation accuracy?
    If no, why not?
    If yes, why so? (Please specify your reasons.)
    Or if your answer is "it depends," please explain on which occasions you DO care about your pronunciation, and on which occasions you do NOT care about your pronunciation.

****

Please answer the following questions by using a 5-point scale (i.e., by selecting one of the following numbers):

1. Strongly agree.
2. Agree.
3. No opinion.
4. Disagree.
5. Strongly disagree.

****

26. I am very good at imitating the sounds of different languages.
27. I like to imitate the way people speak.
28. I have a good memory for names.
29. Improving my English pronunciation is very important to me for my (future) job.
30. Improving my English pronunciation is very important to me because it would be easier for me to befriend more native English speakers.
31. Improving my English pronunciation is very important to me because I'm aware that my social status in the United States is frequently determined by how well I pronounce English.
32. I have been very concerned about my pronunciation. Before answering, consider the following two situations and see the extent to which you agree with them: (1) When I learn a new English word, I would consult a "talking" English dictionary or a native speaker of English in order to pronounce it correctly. (2) When I speak English, I worry very often whether my English pronunciation is correct or not.
33. I learn English because I would like to befriend more people whose first language is English.
34. I learn English because I want to know more about Western life and culture.
35. I think I really work hard to learn English.
36. I study English regularly.
37. Success in English learning depends on my own efforts.

38. Success in English learning depends on having a good teacher.
39. I really enjoy learning English.
40. I am interested in learning English.
41. I believe that if I study hard I can learn English well.
42. My goal of learning English is to achieve proficiency in all aspects of English.
43. I learn English because it is useful.
44. I am an outgoing (extrovert) person.

Appendix 2
General Instructions

Hi! I'm Truman. I'm the researcher's friend. Please feel free to adjust the volume to make yourself more comfortable. I'll be your guide as we proceed in this language experiment. Before we continue, let me tell you a little bit about myself. I was born and raised in Hawai'i, and am currently working at the Pacific and Asian Affairs Council, where I run an international speakers bureau. But enough about me, let's start the language experiment. In this experiment, you will have five tasks:

In the first task, I will read 55 English words for you to *repeat*. There will be a 7-second delay after each word allowing you time to repeat. I will also remind you before I read the next word by saying, "Ok, the next word is _____." If you cannot repeat a word in time, just skip it and get ready for the next word. This is NOT an exam. So, *please speak as you would in normal conversation.*

The second task is similar to the first task, but in this task, I will read 40 pseudo-English words for you to *repeat*. Pseudo-English words are English-like words but are not real English words. They were created for this experiment.

In the third task, the researcher will give you a list of 55 English words. Your task will be to *identify* the words which you do not know.

In the fourth task, imagine that you will be learning how to pronounce Cantonese sounds. A-Zhou, the researcher's friend, is a native speaker of Cantonese from Guang-Tong in mainland China. He will read 10 Cantonese words, and then you will *repeat* after him.

In the fifth task, you will answer *a questionnaire* which consists of 44 questions.

Finally, the researcher will have a short interview with you.

In order to gain accurate measurements for this study, please honestly answer all questions in the questionnaire. All of your answers in this language experiment will be used only for this study to understand second language acquisition and will NEVER be disclosed. Your individual identity will be safely protected by the researcher. Thank you very much for your participation. *Ok, now, please STOP the tape recorder and tell the researcher that you are ready to proceed.*

Note: Participants read these instructions in the written form while listening to them being read by a native speaker.

Appendix 3
Interview

smok**ing** v.s smok**in'**

1. Would you say this word "smoking" please?
2. Have you noticed hat sometimes people say *smoking* and sometimes they say *smokin'* ?
3. If yes, then are you aware of any differences associated with these pronunciations?

someth**ing** v.s someth**in'**

1. Would you say this word "something" please?
2. Have you noticed hat sometimes people say *something* and sometimes they say *somethin'* ?
3. If yes, then are you aware of any differences associated with these pronunciations?

morn**ing** v.s morn**in'**

1. Would you say this word "morning" please?
2. Have you noticed hat sometimes people say *morning* and sometimes they say *mornin'* ?
3. If yes, then are you aware of any differences associated with these pronunciations?

spr**ing** v.s spr**in'**

1. Would you say this word "spring" please?
2. Have you noticed hat sometimes people say *spring* and sometimes they say *sprin'* ?
3. If yes, then are you aware of any differences associated with these pronunciations?

th**ing** v.s th**in'**

1. Would you say this word "thing" please?
2. Have you noticed hat sometimes people say *thing* and sometimes they say *thin'* ?
3. If yes, then are you aware of any differences associated with these pronunciations?

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