

# **The acquisition of the sound qualities of /I/ and /i/ by Japanese English learners**

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## **Abstract**

The purpose of this study are 1. to investigate whether post-adolescent Japanese English learners (JEL) can acquire the difference of the sound qualities of /I/ and /i/, 2. whether the familiarity of the consonants around the vowels affect the learnability or not, and 3. which is better for Japanese learners to acquire those sounds, the traditional instruction or the computer-assisted instruction. The subjects are from the first to fourth grade undergraduate students of Waseda University. The subjects took the first perception and production test as the pretests, and the second perception and production test as the posttests. Between the first and the second set of the tests, subjects underwent either the traditional or the computer-based instruction to correct their pronunciation of /i/ and /I/. As for the result of the perception test, the number of the correct answers was recorded, and the result of the pre and the posttest were compared. The production test was analyzed on the formant patterns with a computer software to check whether the subjects were successful to differentiate the vowels in the pre and the posttest. The result showed that adult JELs seemed to be able to acquire the difference of /i/ and /I/ both in perception and production, the consonantal environment around the vowels can affect the learnability. The difference of the efficacy of the computer-based instruction and the traditional instruction is still uncertain.

## **Introduction**

As the increasing opportunities of NNS (Non-Native Speaker)-NNS interaction in English, the problem of mutual intelligibility is getting higher in these days. In order to avoid communication breakdowns in conversational situations, to acquire the distinction of some phonological contrasts is very important. Especially /i/ and /I/ are one of the most crucial pairs, and the failure in their distinction affects smoothness of the communication. According to Higgins, the number of minimal pairs including the contrast of /i/ and /I/ is 471, and this is the largest number among all the pairs of vowel contrasts (<http://www.marlodge.supanet.com/wordlist/>). Gimson also includes those vowels in the phonemes that should be acquired for minimal intelligibility (Gimson, 2001).

The difference of /i/ and /I/ lies both in the quantity and the quality, but the latter is far more important than the former. Dolton and Seidhofer argue that /i/ in 'seat' and /I/ in 'sieve' may last for the same length because the former is shortened because of 'the shortening effect' of the fortis /t/ following it, although phonemically /i/ should be longer than /I/ (Dolton and Seidhofer, 1994). This argument indicates that actual length of /i/ and /I/ are changed under different phonological environment in spite of the phonemic premise. Also the quality of vowels should differ according to individuals (i.e. some people speak much faster and some much slower than others). Therefore learners should be more careful to acquire the difference of the sound quality of /i/ and /I/ rather than

to the quality.

Nevertheless it seems that many JELs (Japanese English Learners) cannot notice the difference of the quality of /i/ and /I/, and they are likely to substitute /I/ with shortly produced /i/. According to Fujii, /i/ has a similar sound in Japanese phonological system, but /I/ does not (Fujii, 1986). Therefore it is asserted that it is easier and more comfortable for JELs to produce /i/ sound than /I/. However it is necessary for them to notice the qualitative difference of /i/ and /I/ and learn to produce both of them properly for attaining intelligibility.

In addition, it should be noticed that JEL's may be likely to percept /i/ and /I/ distinction better in certain phonological conditions. Fujii indicated the diversity of the difficulty in the acquisition of the morphemes in English, and from his remarks it is asserted that the perception and the production skill of the vowels by the learners should vary under the preceding and the following consonantal environment.

There is also the problem of teachability. Most JELs commence studying English in junior high school, so they acquire English sounds mainly in their post-adolescence, many years after so-called the critical period. Therefore it is important to study the teachability of the qualitative distinction of /i/ and /I/, and if it is teachable, what kind of instruction should be the most appropriate.

Regarding the possibility of perception, production and teaching, the research question of this study are the following: 1. to investigate whether post-adolescent JELs can acquire the difference of the sound qualities of /I/ and /i/, 2. whether the consonantal environments would affect the perception and the production of /i/ and /I/, and 3. to investigate which is better for Japanese learners to acquire those sounds, the traditional instruction or the computer-assisted instruction. According to the result, it seemed that post-adolescent JELs can acquire the qualitative distinction of /i/ and /I/, and the consonantal environment do not affect their perceptive and productive ability, but the data did not show the clear answer to the latter question.

## **Subjects**

The subjects are ten students from the first to the fourth grade students in the education department, the literature department and the school of social sciences of Waseda University. They were divided into two groups: 1. the group to take the traditional instruction, and 2. the group to take the computer-assisted instruction.

## **Method**

The research was completed in the following method: 1. First Perception test, 2. First Production test, 3. Instruction, 4. Second Perception Test, 5. Second Production Test. Three to seven days of interludes were inserted between each step, but First Production Test and Instruction were held on the same day. The perception tests are identification tasks. Each of the perception tests have twenty items and the production test eight tokens. Both the perception and the production tests are

composed of the following sections: 1. /easy consonants/ + /i/, /I/ + /easy consonants/, 2. /easy consonants/ + /i/, /I/ + /difficult consonants/, 3. /difficult consonants/ + /i/, /I/ + /easy consonants/, 4. /difficult consonants/ + /i/, /I/ + /difficult consonants/. One set of the perception test has five words for each section, and the production test two. Both the perception and the production tests are composed of the different tokens in the first and the second. The outcomes of the production tests were analyzed on the formant patterns with the computer software Onsei Rokubunken, Version 2.3.0., and whether the subjects can differentiate /i/ and /I/ was checked by calculating the gap of the first and the second formant of /i/ and /I/ of each token by the subjects.

## Result

### 1. The Perception Tests

The results of the each section of First and Second Perception Test are shown on Graph 1 and 2, and the results of the whole tests are shown in Graph 3. The number of the subjects who got higher marks in the second than the first is shown on Graph 4. In Group  $\times$  Vowels (/i/ and /I/) ANOVA, there was no main effect of Group, Vowels and no correlation between Group and Vowels both in all the sections in First and Second Perception Test. In Group  $\times$  Test (First and Second) ANOVA, there was a main effect of Group,  $F(1,79)=.001$ ,  $P<.01$ , but there was no main effect of Test,  $F(1, 79)=.27$ ,  $p>.05$ , and no correlation between Group and Test,  $F(1, 79)= .27$ ,  $p>.05$ .

### 2. The Production Tests

The result of the production tests are shown respectively on the following four sections:

Section 1: /easy consonants/ + /i/, /I/ + /easy consonants/

Section 2: /easy consonants/ + /i/, /I/ + /difficult consonants/

Section 3: /difficult consonants/ + /i/, /I/ + /easy consonants/

Section 4: /difficult consonants/ + /i/, /I/ + /difficult consonants/

The result is analyzed in Group  $\times$  Vowel ANOVA.

The result of the First Production Test is shown in Graph 5, 6, 7, 8, 9 in Appendix 1, and they shown the mean value of the frequency gap between the first and the second formant of /i/ and /I/. In Section 1, there was no main effect of Group,  $F(1, 39)= .463$ ,  $p> .05$  and Vowel,  $F(1, 39)= .884$ ,  $p> .05$ , but there was a correlation between Group and vowel,  $F(1, 39)= .028$ ,  $p< .05$ . In Section 2, there was a main effect of Group,  $F(1, 39) = .002$ ,  $p< .01$ , but no main effect of Vowels,  $F(1, 39)= .68$ ,  $p> .05$ . There was no correlation between Group and Vowels,  $F(1, 39)= .68$ ,  $p> .05$ . In Section 3, there was a main effect of Group,  $F(1, 39) = .0006$ ,  $p< .01$ , but no main effect of Vowel,  $F(1, 39)= .252$ ,  $p> .5$ . There was no correlation between Group and Vowel,  $F(1, 39)= .18$ ,  $p> .05$ . In section 4, there was no main effect of Group,  $F(1, 39) = .21$ ,  $p> .05$ , Vowel,  $F(1, 39)= .37$ ,  $p> .05$ , and the correlation of Group and Vowel  $F(1, 39) = .13$ ,  $p> .05$ . As a whole, there was no main effect of Group,  $F(1, 159) = 1.45$ ,  $P> .05$ , Vowel,  $F(1, 159) = .32$ ,  $P> .05$ , and the correlation of Group and Vowel,  $F(1, 159) = .61$ ,  $P> .05$ .

The result of the Second Perception Test is shown in Graph 9, 10, 11, 12 in Appendix 1. They show the mean value of the frequency gap between the first and the second formant of /i/ and /I/. In Section 1, there was a main effect of Group,  $F(1, 39) = .01, p < .05$ , but there was no main effect of Vowel,  $F(1, 39) = .64, p > .05$ . There was no correlation between Group and Vowel,  $F(1, 39) = .62, p > .05$ . In Section 2, there was no main effect of Group,  $F(1, 39) = .89, p > .05$ . There was a main effect of Vowel,  $F(1, 39) = .01, p > .05$  and correlation of Group and Vowel,  $F(1, 39) = .01, p > .05$ . In Section 3, there was no main effect of Group,  $F(1, 39) = .06, p > .05$ , Vowel,  $F(1, 39) = .07, p > .05$ , and correlation between Group and Vowel,  $F(1, 39) = .1, p > .05$ . In Section 4, there was a main effect of Group,  $F(1, 39) = .01, p < .05$ , but no main effect of Vowel,  $F(1, 39) = .46, p > .05$  and correlation of Group and Vowel,  $F(1, 39) = .69, p > .05$ . As a whole, there was a main effect of Group,  $F(1, 39) = .01, p > .05$ , and Vowel,  $F(1, 39) = .001, p < .01$ , and there was a correlation between Group and Vowel,  $F(1, 39) = .004, p > .01$ .

## Discussion

In the perception tests, Group  $\times$  Vowel ANOVA resulted in no main effect of Group, Vowel and in no correlation between Group and Vowel, both in all the sections in the First and the Second. On the other hand, in the Test  $\times$  Group ANOVA, there was no main effect of Test, and no correlation between Group and Test, but was a main effect of Group. In addition, all the subjects in the traditional instruction group got higher marks in the Second test than the First, but there were only 2 subjects in the computer-based instruction group who had higher marks in the Second test than the First.

Regarding the result, it seems that it was not that either /i/ or /I/ was more difficult for subjects to percept than the other in all the sections in both the First and the Second Perception Test, and the consonant before /i/ or /I/ does not affect the perceptual skill. However the main effect of Group may show that despite there was no main effect of Test, the subjects in the traditional instruction got higher rate of improvement than the subjects in the computer-based instruction group, but there is a problem to make the assertion.

There might have been a problem in the regulation of the pre-test perceptual skill of the subjects. In Test  $\times$  Group ANOVA, there was the main effect of Group because the subjects in the computer-based instruction group got higher marks than the subjects in the traditional instruction group. It made the rate of improvement of the former group smaller, thus lead to the apparent effectiveness of the traditional instruction. The reason why the subjects in the computer-based instruction group showed better perceptual ability may be because the average age of the former group is higher, and they have studied English for longer time than the subjects in the latter group.

As for the Production test, there is a main effect of Groups or the correlation of Group and the Vowel in some sections in the first trial. Nevertheless there was no main effect of Vowel in any section, and there was no main effect of Group and of Vowel. There was no correlation of Group and

Vowel as a whole either. Therefore it seems that although there is a main effect of Groups in some sections, it does not mean that one group is better than the other in the production test. The ANOVA that showed there was no main effect of Vowel in all the sections and in the whole of the test indicates that the subjects in the both groups were not successful in the differentiation of /i/ and /I/.

In the Second Production Test, regarding the ANOVA of the whole outcomes of all the sections, it seems that both groups improved compared with the First test. However the main effect of Group was seen only in section 1 and 4, so it cannot be asserted that 2 groups showed any difference in the efficiency of the instructions they received. Also it seemed difficult for Japanese learners to differentiate /i/ and /I/ under such phonetic environment as Section 3 and 4, for there was no main effect of Vowel in these sections.

Regarding the analysis, the answer to the research questions should be as follows: 1. It is highly possible for post-adolescent Japanese English learners to acquire the difference of /i/ and /I/, 2. The familiarity of the consonants before/after the vowels affects the production of the vowels, 3. Regarding the result of the perception tests, the traditional instruction seems to be better. However it cannot be asserted which is better in the production tests.

## Conclusion

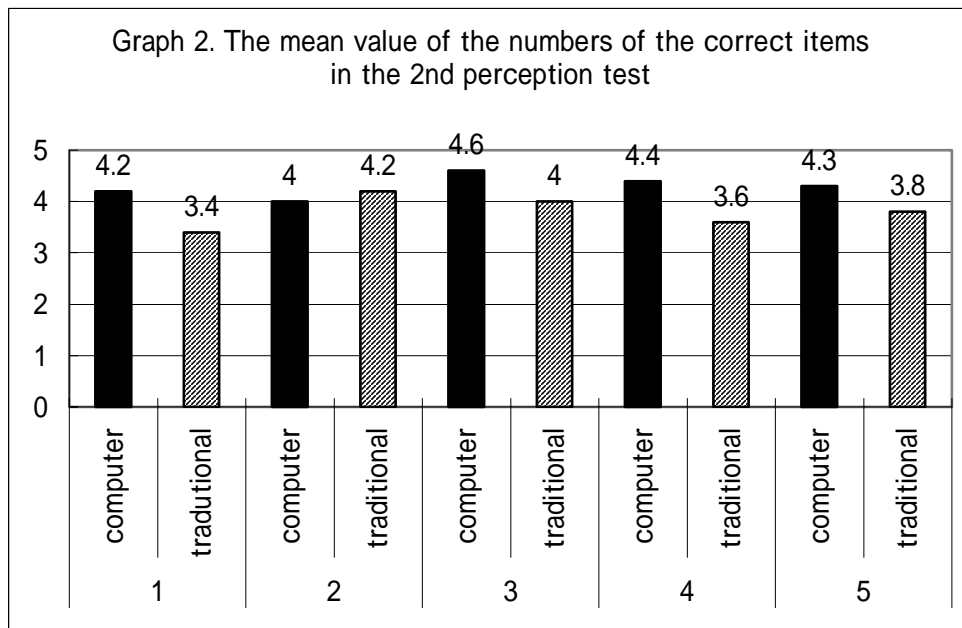
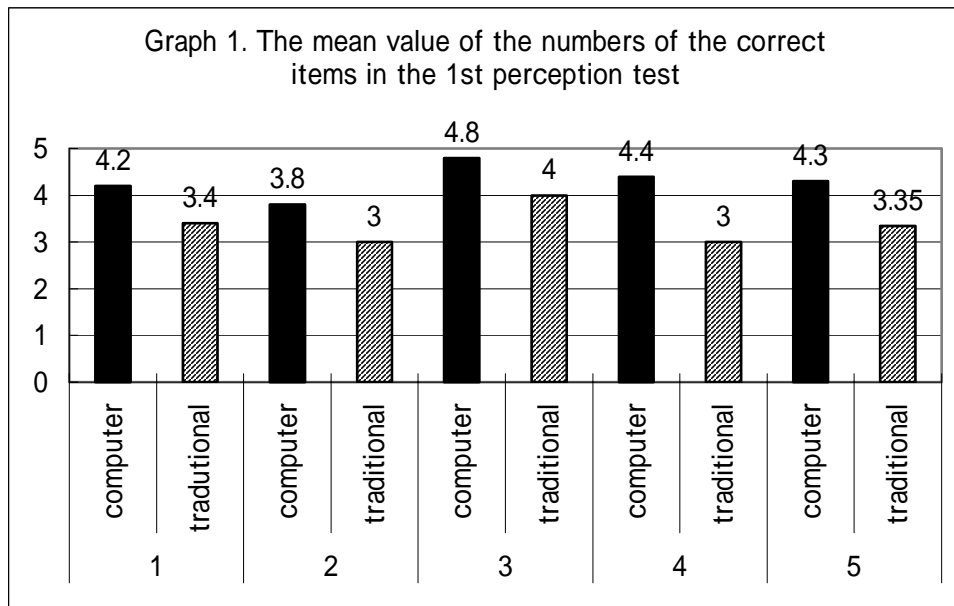
Adult JELs seem to be able to improve in their skills in differentiating the English vowels /i/ and /I/ both in perception and production, though their productive skills may be affected by the familiarity of the preceding/following consonantal environment. It is still uncertain which is better for learners, the computer-based instruction or the traditional instruction in phonetic acquisition, but traditional instruction seems to be more helpful regarding the enhancement of perception skill.

## References

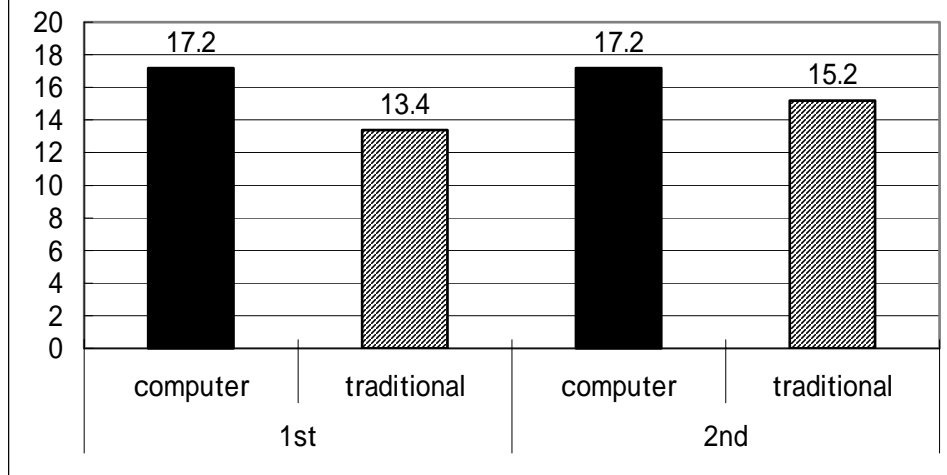
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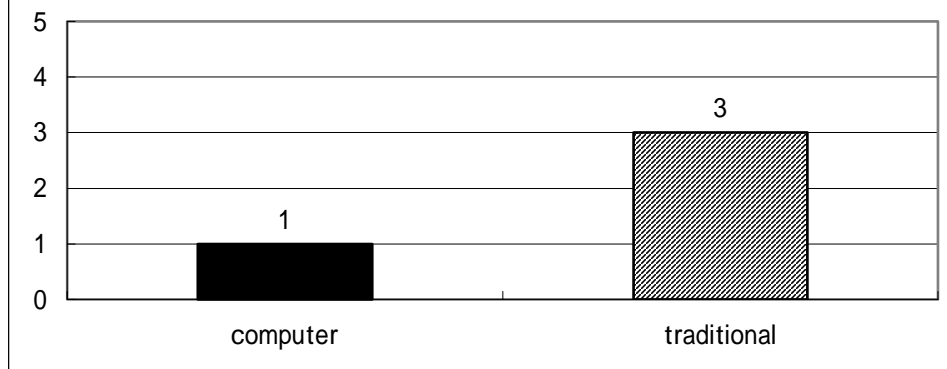
**Appendix  
Appendix 1**



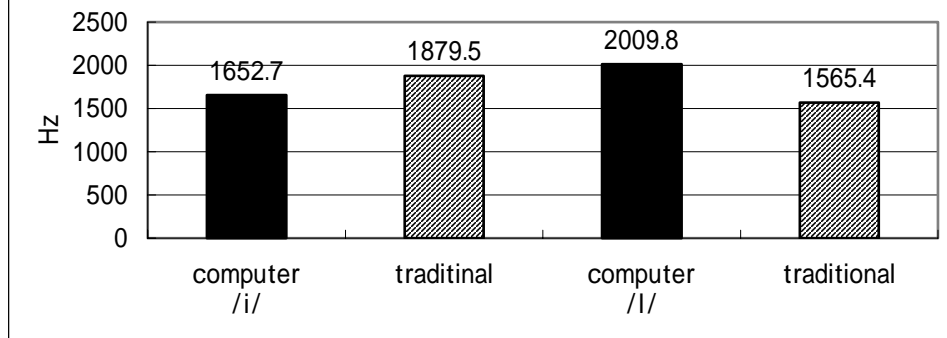
Graph 3. The mean value of the correct items in the 1st and the 2nd perception test.



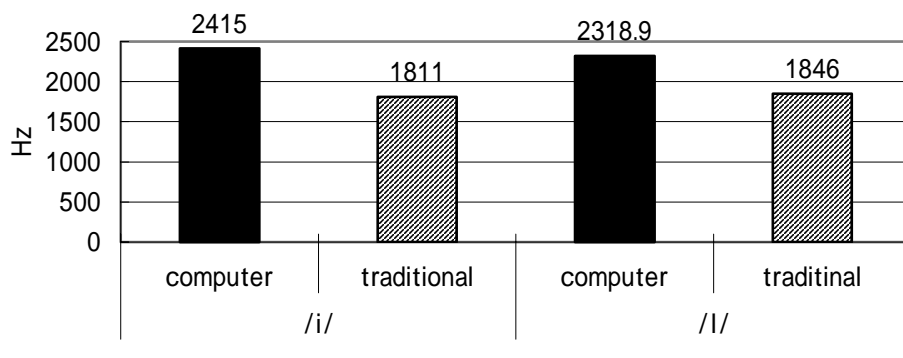
Graph 4. The number of the subjects who got higher marks in the 2nd perception test than in the 1st.



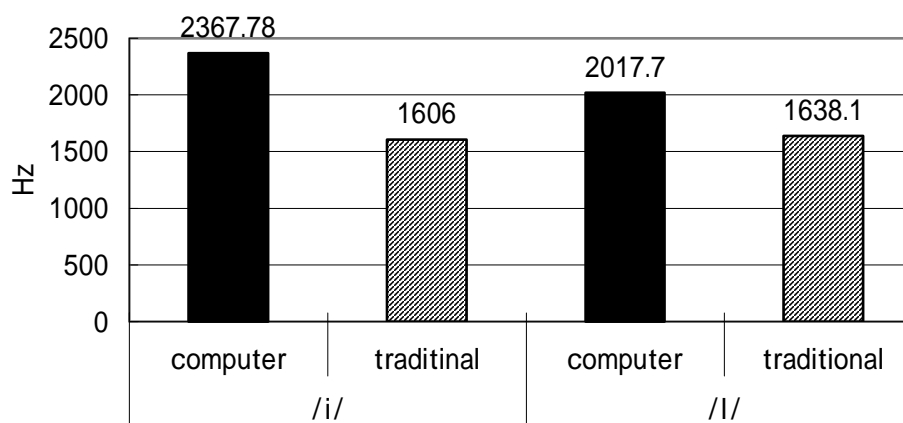
Graph 5. The mean value between the gap of the 1st and the 2nd formant in the tokens in Section 1 (the First Production Test)



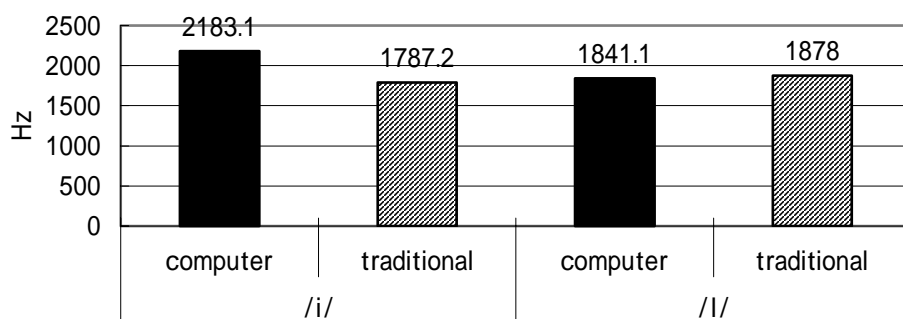
Graph 6. The mean value of the gap between the 1st and the 2nd formant in the tokens of Section 2 (the First Perception Test)



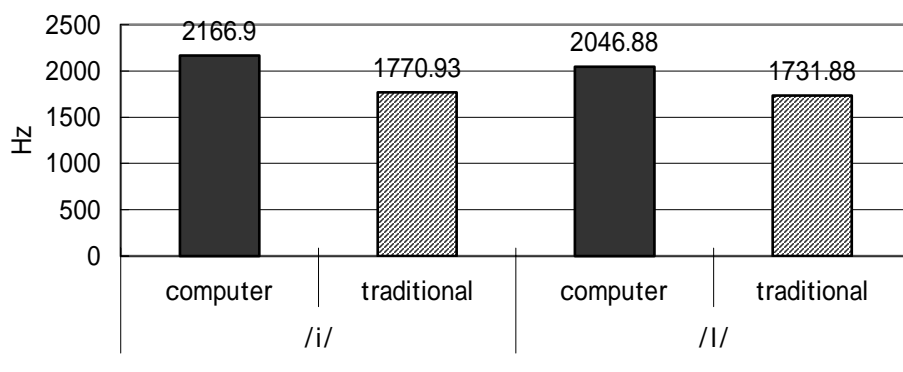
Graph 7. The mean value of the gap between the 1st and the 2nd formant in the tokens of Section 3 (the First Production Test)



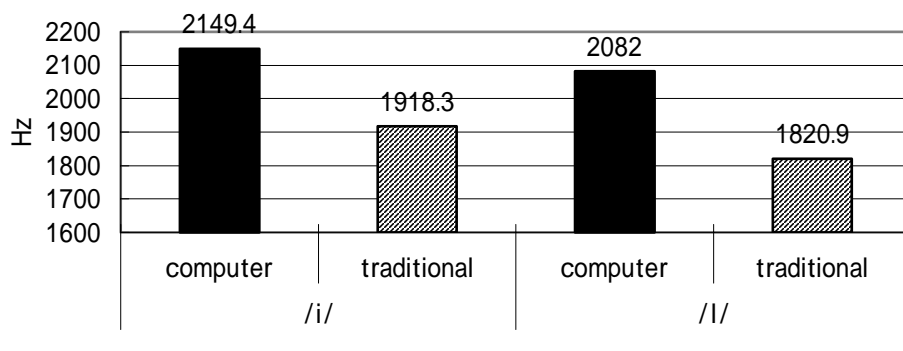
Graph 8. The mean value of the gap between the 1st and the 2nd formant in the tokens of Section 4 (the First Production Test)



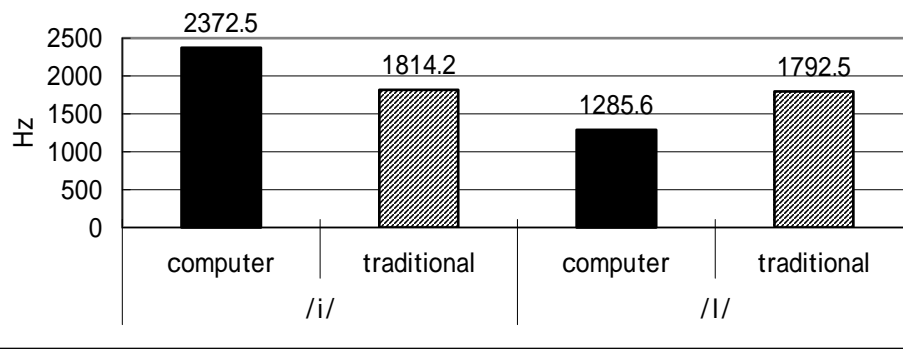
Graph 9. The gap between the 1st and the 2nd formant as a whole (the First Production Test)



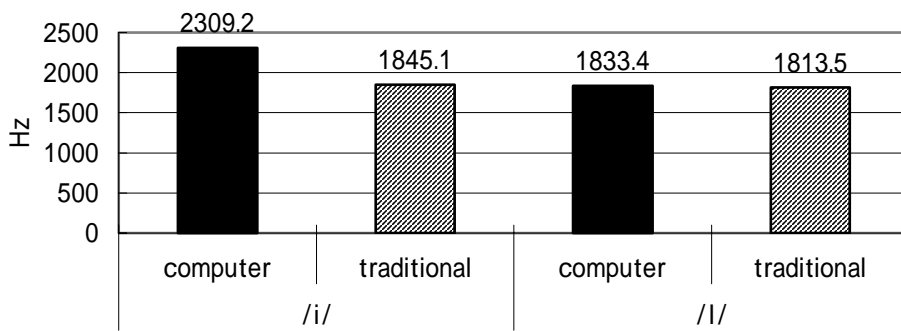
Graph 10. The mean value of the gap between the 1st and the 2nd formant in the tokens of /easy consonants/ + /i/, /I/ + /easy consonants/ (the Second Production Test)



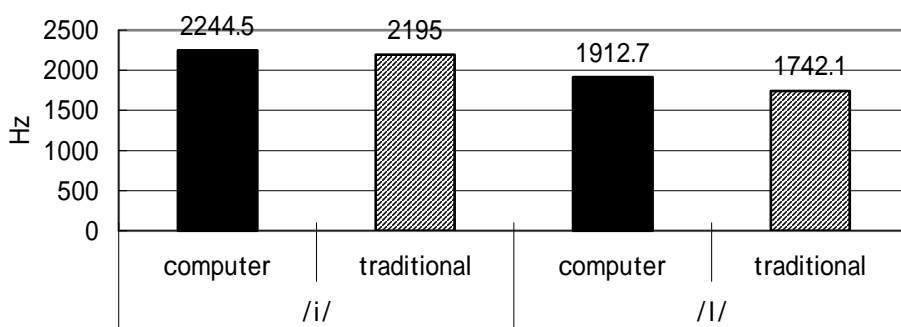
Graph 11. The mean value of the gap between the 1st and the 2nd formant in the tokens of Section 2 (the Second Production Test)



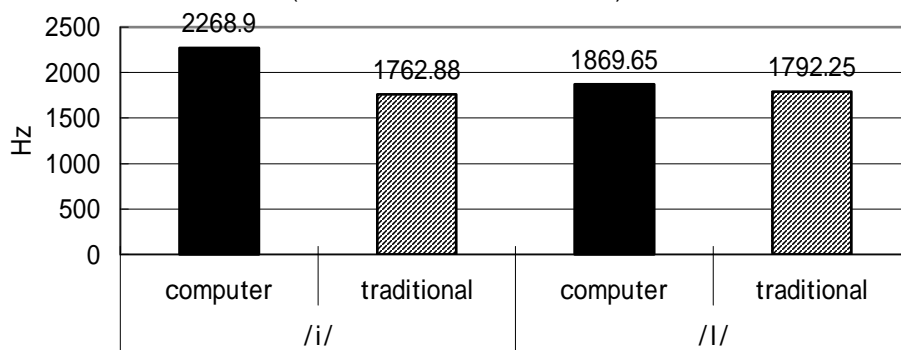
Graph 12. The mean value of the gap between the 1st and the 2nd formant in the tokens of Section 3 (the Second Production Test)



Graph 13. The mean value of the gap between the 1st and the 2nd formant in the tokens of Section 4 (the Second Production Test)



Graph 14. The mean value of the gap between the 1st and the 2nd formant as a whole (The Second Production Test)



## Appendix 2.

### 1. The First Perception Test

You will hear either one of two words. Circle the word that you hear.

Example: pin / pen

In this case the speaker said 'pen', so you should circle 'pen'.

1. meat / mitt
2. deem / dim
3. beach / bitch
4. neap / nip
5. sheep / ship
6. beads / biz
7. keen / kin
8. piece / piss
9. beef / biff
10. teen / tin
11. leak / lick
12. weak / wick
13. reap / rip
14. cheat / chit
15. seal / sill
16. fees / fizz
17. wean / win
18. leave / live
19. reef / riff
20. scene / sin

### 2. The Second Perception Test

(The same explanation with the First Perception Test)

1. gene / gin
2. teat / tit
3. cede / Sid
4. reel / rill
5. sheep / ship
6. peach / pitch
7. sheen / shin
8. beef / biff
9. seal / sill
10. leave / live
11. seat / sit
12. seek / sick
13. neat / knit
14. wean / win
15. reef / riff
16. scene / sin
17. keep / kip
18. heat / hit
19. jean / gin
20. teak / tick

### 3. The First Production Test

1. peep / pip
2. beat / bit
3. keen / kin
4. teen / tin
5. week / wick
6. leap / lip
7. fees / fizz
8. wees / whiz

### 4. The Second Production Test

meat / mitt

2. deal / dill
3. peach / pitch
4. bees / biz
5. cheap / chip
6. reek / rick
7. wean / win
8. scene / sin

