

Production and Perception of /i/ and /ɪ/ by Japanese Learners of English

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Abstract

This study is an investigation of the production and perception of English /i/ (E /i/) and /ɪ/ by Japanese learners of English. The researchers examined the roles of length and quality in the area of production. Thirty-two female native speakers of Japanese, ages 19 and 20, served as subjects. Ten minimal pairs of words contrasting E /i/ and /ɪ/ were given to each subject for production and perception tests. The subjects experienced little or no difficulty perceiving E /i/ and /ɪ/. They consistently and systematically produced E /i/ and /ɪ/ distinctly though not target-like. The present study suggests that Japanese learners employ length rather than quality to distinguish E /i/ and /ɪ/.

Introduction

The domain of interlanguage (IL) phonology has been neglected for a variety of reasons. The belief that IL phonology is strongly influenced by negative transfer from the L1 causes teachers to feel that there is little value in teaching target language pronunciation. Indeed, L2 pronunciation is viewed as not being very important (Farone 1978). Additionally, with the rise of sociolinguistics, the idea of recognizing varieties of English in their own right allows for a more tolerant view of non-target like pronunciation (Ozasa et al. 1982). Recently, however, the area of IL phonology has been receiving attention from perspectives other than Contrastive Analysis (CA). As yet, there have been few studies of learners of particular L1's learning specific L2's. This study attempts to fill a small portion of this vacuum by examining the difficulties Japanese learners have with the English vowel sounds /i/ and /ɪ/.

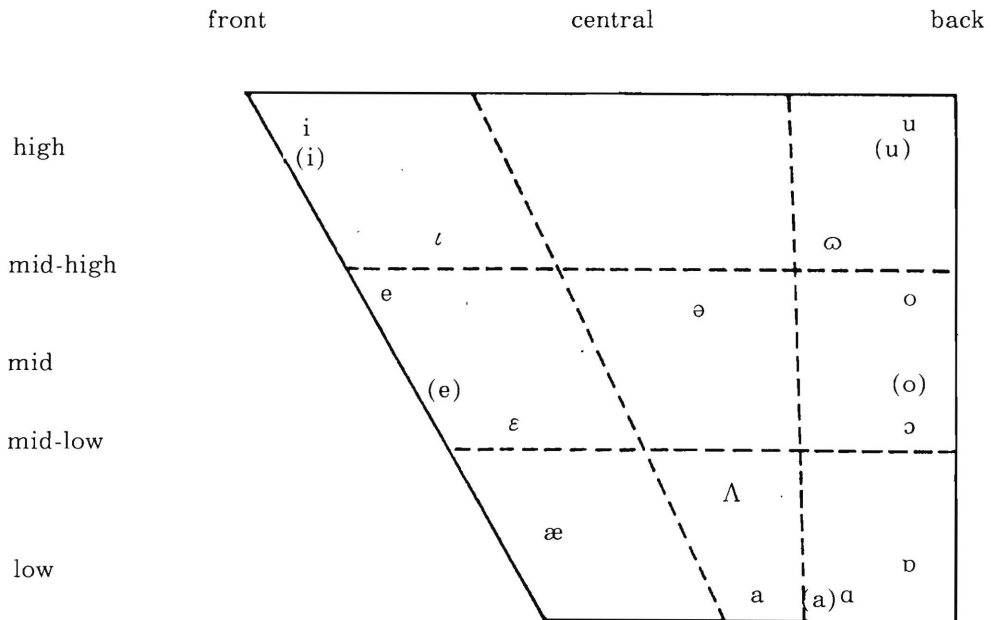
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Background Rationale

Japanese have five vowels: /a/, /e/, /i/, /o/, /u/ (the Japanese /u/ is unrounded), while English has twelve vowels and four diphthongs. Although many phoneticians employ some or all of the symbols /a/, /e/, /i/, /o/, /u/, to represent English vowels as well as Japanese vowels, none of these vowels is identical across the two languages. The pair of /i/'s in both language is not an exception and, indeed, the Japanese /i/ (J /i/) and English /i/ (E /i/) sound different (Takefuta 1984). Moreover, though all three of these vowels (J /i/, E /i/, /ɪ/) are classified as “high front vowels”, they differ on several points. A description of these sounds based on Ladefoged (1982) and Vance (1987) follows.

Firstly, in terms of place of articulation, E /i/ is highest and frontest of the three. English /ɪ/ is slightly lower than E /i/, about half way between E /i/ and /ɪ/. J /i/, on the other hand, is articulated as high as E /i/ but slightly backer. Figure 1 shows the articulatory position of the three sounds as well as other vowels.

Figure 1 . The vowels of English and Japanese



Adapted from Ladefoged (1982: 34, 204). Japanese vowels are parenthesized. For the English mid-high front unrounded vowel, Ladefoged uses /ɪ/, whereas the researchers use /i/ in this paper.

Quality and length are two distinct features in describing a vowel. In Japanese, length is phonemic, i.e., a difference in length of the same vowel quality makes that vowel into a different vowel. For example, “ojisan” means “uncle”, but “oji:san” means “grandfather”. In English, though E /i/ is often longer than /ɪ/, the distinctive feature is a quality feature of tenseness; E /i/ is characterized as [+tense] and /ɪ/ as [-tense]. Tenseness is a crucial distinctive feature in English; however, in Japanese, length, not tenseness, is key.

In summary, two points are of particular importance concerning E /i/, /ɪ/ and J /i/--first, these three vowels sound different from one another, and second, the two English vowels are primarily distinguished by their quality while Japanese vowels are distinguished by length. [1]

How, then, did CA studies view vowels, specifically E /i/, /ɪ/ and J /i/, and learners' problems with these vowels? Kohmoto's (1969) contrastive analysis of problems that Japanese learners were likely to encounter due to differences between the corresponding vowels in the two languages. Although Kohmoto refers to differences in vowel tenseness in his parallel description (p.46) , he labels all three vowels the same way in his consideration of learning problems: “high front, unrounded” (p.137) . Therefore, he concludes that “no problem arises... in the Japanese learning American vowels, as far as their positions are concerned”, and that “there arises very little difficulty in learning these English vowels regardless of their positions although English short vowels [ɪ, ε, ʊ] and mid and low back vowels [o, ɔ] are somewhat difficult to form the habit of precisely correct pronunciation [sic]” (p.137 -138) . E /i/ and /ɪ/ were not included among the vowels tests for replacement and degrees of difficulty.

Murakawa (1981) pointed out differences in terms of the tongue height, duration, and the degree of tension among E /i/ and /ɪ/ and J /i/. Based on an analysis of sound quality, she predicted that Japanese learners would have difficulty pronouncing both E /i/ and /ɪ/. She used sound spectrograms for her research and measured the frequency formants of consonants and vowels, and the duration of the vowels produced by native speakers of English. From her research it is clear that the quality and length of English vowels, including E /i/ and /ɪ/ as recorded for Japanese learners, differs from those of native speakers. However, her conclusion that Japanese learners substitute J /i:/ for E /i/ and J /i/ for /ɪ/ is not fully substantiated in her explanation of her results. She thus infers more from her data than can reasonably be inferred.

Now let us consider other IL phonology studies. Ozasa et al. (1982) reviewed a number of studies and pointed out three components that form IL phonology. One component is negative transfer from the learner's L1, which seems to have the greatest influence on IL phonology. The second component is approximation in learner attempts to produce target phonemes. For example, Beebe (1984) found that

most learners' pronunciation errors did not involve substitution of any one phoneme in the L1 or L2 for another. Instead, they involved approximation or overgeneralization of a target sound. It should be noted that this view contradicts the conclusions of Murakawa (1981), which identified Japanese sounds for the English vowels. The third component in IL phonology (specifically addressed by Sheldon and Strange in 1982) is that of the L1 acquisition. Some aspects of development of L2 phonology seem to be identical with those of the L1 (Ozasa et al. 1982).

Whereas some L1 acquisition researchers support the claim that sound production precedes and shapes the child's auditory perceptual abilities, Sheldon and Strange tested this hypothesis on L2 IL phonology and discovered that Japanese learners who were already able to produce /r/ and /l/ appropriately still failed to perceive the pair correctly.

While both Kohmoto (1969) and Murakawa (1981) described Japanese and English sounds in detail and indicated differences in quality, length, and certain other features, their CA-based studies are defective on three issues. First, in the stage of prediction, Kohmoto (1969) overlooked the differences and assumed that learners would have little difficulty with E /i/ and /ɪ/, since they are articulated at *similar* points, though not at the *same* points. Secondly, Murakawa (1981) predicted certain difficulties for learners, but identified their IL phonemes with the L1 sounds, thereby oversimplifying the nature of IL phonology without support from her data. Finally, for both Kohmoto and Murakawa, the relationship between reception and production was not of interest.

Present Study

The present study addresses the issue of the IL phonology of Japanese learners of English with respect to their production and perception of E /i/ and /ɪ/. The researchers raise the following research questions:

1. Do Japanese learners of English have difficulty perceiving the difference in Standard American English (SAE) pronunciation of E /i/ and /ɪ/?
2. Do Japanese learners have difficulty producing E /i/ and /ɪ/?
3. How do Japanese learners differentiate E /i/ and /ɪ/? Do they produce E /i/ and /ɪ/ with the same vowel quality yet of varying lengths?
4. What is the relationship between their perception and production of E /i/ and /ɪ/?

Method

Subjects

The subjects were 32 native speakers of Japanese studying Japanese literature at Sanyo Tanki Daigaku (Sanyo Women's Junior College) in Hiroshima, Japan (31 nineteen-year-olds and one twenty-year-old). The subjects were studying English as a second language in a three-week course at the University of Hawaii at Manoa's noncredit conversation ESL program offered under the Summer Session division called the New Intensive Course in English (N.I.C.E.). They were all young adult learners of English at the beginning level with extremely limited exposure to native English speakers. During their three-week stay, the subjects rarely used English outside of their four-hour class. All subjects were of similar socio-economic backgrounds. They were from the greater Hiroshima area and spoke a similar variety of Japanese commonly found in that area of Japan. The homogeneity of the group provided the ideal control of backgrounds of learner variables.

Materials

Each subject was given a paper with 10 minimal pairs of words contrasting the subject vowels E /i/ and /ɪ/ and a sentence in Japanese for a native language (NL) sample (see Appendix). The researchers consulted Grate (1974) as well as the subjects' instructor in order to select minimal pairs appropriate to their level and to reflect a variety of positions within the words in which the vowels appear, as well as a variety of phonological environments. Each subject was also given a biographical information questionnaire written in the NL and requesting responses in the NL.

To ensure that all subjects received identical oral input, an audio tape with instructions in the NL was recorded by one of the researchers, a native speaker of Japanese, for the production and perception portions of the test. The minimal pairs themselves, when used as examples in the production and perception tests and for the actual perception test itself, were recorded by the other researcher, a native speaker of English.

Procedure

The subjects were asked to read aloud the twenty words and the Japanese sentence. Each subject's production was taped. Next, they heard a recording of a native speaker saying three words: a minimal pair, with one of the two words repeated. The subjects were asked to circle the word repeated. Both researchers used Japanese at all times when addressing the subjects and took particular care to ease any apprehensions of the subjects about being "tested".

Analysis

After the data was collected, the researchers rated the production in terms of vowel length and quality employing consensus coding in order to exploit the strengths of each other's phonological judgment. Two features of the vowel of the minimal pair

were examined, length and quality. Firstly, the vowel length for the pair of words was judged as the same or different and next the vowel quality was judged as the same or different.

Results

Production

The results of the production test are shown on Table 1.

Table 1.
Coding of Minimal Pair Production

		Length	
		Different	Same
Q u a l i t y	D	A 0	B 0
	S	C 32	D 0

1) eat/it

		Length	
		Different	Same
Q u a l i t y	D	A 2	B 0
	S	C 28	D 2

2) feel/fill

		Length	
		Different	Same
Q u a l i t y	D	A 13 (6)	B 2 (2)
	S	C 17	D 0

3) heat/hit

		Length	
		Different	Same
Q u a l i t y	D	A 0	B 0
	S	C 32	D 0

4) deep/dip

		Length	
		Different	Same
Q u a l i t y	D	A 1 (1)	B 0
	S	C 30	D 0

5) ease/is
(one word omitted by subject)

		Length	
		Different	Same
Q u a l i t y	D	A 0	B 0
	S	C 30	D 2

6) reach/rich

		Length	
		Different	Same
Q u a l i t y	D	A 2	B 0
	S	C 30	D 0

7) feet/fit

		Length	
		Different	Same
Q u a l i t y	D	A 4	B 0
	S	C 17	D 11 (6)

8) he's/his

		Length	
		Different	Same
Q u a l i t y	D	A 2 (2)	B 0
	S	C 30	D 0

9) beat/bit

		Length	
		Different	Same
Q u a l i t y	D	A 0	B 0
	S	C 32	D 0

10) seek/sick

		Length	
		Different	Same
Q u a l i t y	D	A 24 (9)	B 2 (2)
	S	C 278	D 15 (6)

Grand Total

Each group of four cells represents one minimal pair. Cell A indicates the number of times both length and quality were different between the vowels in each minimal pair; cell B, the number of times the length was the same but the quality different; cell C, the number of times the length was different but the quality the same; and cell D, the number of times both length and quality were the same. The eleventh group of four cells represents the overall total for the ten items. The parenthesized numbers indicate frequencies of mispronunciations, e.g., “heart” for “heat”, “cause” for “ease”.

Clearly the subjects changed length in their differentiation of the vowels but rarely changed quality.

Perception

The results of the ten-item perception test are as follows:

Mean = 8.53

Range = 4

Standard Deviation = 1.02

The item facility for each item of the perception test was computed and the results are as follows:

1. 0.93	2. 0.80
3. 0.73	4. 1.00
5. 0.73	6. 0.87
7. 1.00	8. 0.67
9. 1.00	10. 0.80

As the production results show, the students performed well on this portion of the study.

Discussion

The results of the study will be discussed in the order of the research questions raised.

1. Do Japanese learners of English have difficulty perceiving the difference in SAE pronunciation of E /i/ and /ɪ/?

Within the limits of this experiment, the students experienced little or no difficulty in this area. Before further discussion, it should be noted that isolated minimal pairs out of context can provide useful information in the areas of perception and production. However, the researchers fully acknowledge the limitations of such methods for data collection.

The subjects had the most difficulty with items 3 (heat/hit), 5 (ease/is), and 8 (he's/his), although the item facility in none of these cases was below 0.67. In spite

of the researchers' efforts to keep all words used in the minimal pairs simple enough so that the subjects would have encountered them previously, it seems that the subjects' own lack of familiarity with the lexical item may explain some of the difficulty encountered. This explanation is supported by the fact that the subjects had difficulty producing the same words.

2. Do Japanese learners have difficulty producing E /i/ and /ɪ/?

In the area of production, the subjects consistently and systematically distinguished between E /i/ and /ɪ/, although their productions were not target-like. The distinguishing feature in nearly all instances was that of length, not quality.

3. How do Japanese learners differentiate E /i/ and /ɪ/? Do they produce E /i/ and /ɪ/, with the same vowel quality yet of varying lengths?

As stated previously, the researchers used only Japanese when conversing with the subjects and made every effort to make them feel relaxed. The intention was to obtain the production least affected by nervousness; however, in achieving this, they may not have elicited from the subjects their best English pronunciation. At the site, subjects were often near one another (although not always within listening distance) during the production task and, given the homogeneity of the group and the strong effect of peer pressure in not wanting to stand out in any way, the subjects seem to have been producing "Japanese" versions of the words, similar to English loanwords found in Japanese. This is clearly evidenced by the epenthetic vowel and small "tsu" plus glottal stop which appeared frequently. [2]

In cell C of each of the groups of four cells in Table 1, it is clear that indeed, the subjects did produce E /i/ and /ɪ/ with the same vowel quality yet of varying lengths. The researchers recognize that if they had used a more sophisticated means of measuring length and quality, they might have discovered other significant differentiation strategies employed by the subjects in their production.

4. What is the relationship between their perception and production of E /i/ and /ɪ/?

Since the group subjects scored consistently high in perception and displayed strikingly similar differentiation features in production, it is difficult to interpret clearly the relationship between their perception and production of E /i/ and /ɪ/.

Conclusion

The present study suggests that Japanese learners employ length rather than quality to distinguish E /i/ and /ɪ/. This may be due to transfer from Japanese vowels. Further study in this area is called for employing more elaborate measurement devices, a greater variety of subjects and more naturalistic data collection techniques all of which, the researchers feel, would provide more expansive insights into IL phonology.

Acknowledgment

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Notes

1. Devoicing of J /i/ is another noteworthy feature. J /i/ is devoiced between voiceless consonants and in the final position of a word after a voiceless consonant in an unaccented syllable (Kohmoto 1969: 46; Vance 1987: 48–55). This feature is outside the scope of this study.

2. Theoretically, as words in Japanese never end with a consonant (other than a nasal). English loanwords ending in a consonant are appended with a vowel. For example, the word *bed* becomes “beddo”. In the case of small “tsu”, the preceding vowel is pronounced shorter and becomes its own mora. Small “tsu” is transliterated as a double consonant as in the word “beddo”. The mora for “bedo” would be “be-do” but for “beddo” would be “be-#-do”. For further information see Vance (1983).

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Appendix

1.	eat	it
2.	feel	fill
3.	heat	hit
4.	deep	dip
5.	ease	is
6.	reach	rich
7.	feet	fit
8.	he's	his
9.	beat	bit
10.	seek	sick

To:hokujin no oji:san ga watashi no ojisan wa i:hito dato itta. (The original was written in Japanese)