



PERCEPTION OF MORA SOUNDS IN JAPANESE
BY NON-NATIVE SPEAKERS OF JAPANESE

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ABSTRACT

The listening test was performed on Japanese mora sounds with learners of Japanese. Their native languages were Chinese, Thai, Indonesian and Korean. Word accent pattern, vowel length, voiceless consonant length, nasal consonants and the nasalized vowel were examined. The results showed that word accent pattern was identified better by the subjects of tone languages than the other groups of subjects. Vowel length was identified better than voiceless consonant length, but the difference from their native languages were not found. According to nasals, two types of errors (confusions and omissions & additions) were examined. Compared to the Indonesian subjects, the Chinese and the Thai subjects made more errors of omission & addition, while the Korean subjects made more errors of both types. It is supposed that the monosyllable structure of Chinese and Thai have relation to the errors of omission & addition.

1. INTRODUCTION

For learners of Japanese, the problem of the mora sounds has often been noted. Japanese (in this paper the Tokyo dialect is meant by "Japanese") is said to have three mora phonemes: /N/, /Q/ and /H/.

/N/ appears in the syllable final position and before all kinds of vowels and consonants, and is manifested as a nasal consonant or a nasalized vowel whose place of articulation is assimilated to the following sound.

/Q/ appears in the syllable final position and before voiceless stop or fricative consonants except [h],[ç] and [ʃ], and is manifested as the same voiceless consonant as the following consonant.

/H/ appears after vowels, and is manifested as the same vowel as the preceding vowel.

What kinds of acoustic cues are used by Japanese for these mora sounds was studied by Fujisaki et al. (1973). In this study, it was shown that the Japanese discriminate between a single nasal and a geminate nasal using the duration of the nasal murmur as a cue, and between a single voiceless consonant and a geminate

consonant using the duration of the silence period or the fricative sound as a cue, and between a long vowel and a short vowel using the duration of the vowel as a cue. Moreover, the duration was discriminated in relation to the duration of the preceding mora. This result suggested that the mora sounds are generally discriminated using duration as an acoustic cue, though the acoustic characteristics of the sounds manifested are quite different from one another.

It is well known that the phonetic ability of learners of a second language is affected by their own native language. Language learners have difficulty in pronouncing and hearing sounds which they do not have in their native language.

Therefore, difficulty in hearing mora sounds in Japanese is expected to vary according to the learners' native language, and also according to the acoustic characteristics of the mora sounds themselves. Our purpose of this study is to examine these difficulties according to their native languages.

A listening test for mora sounds was carried out with the learners whose native language was one of the following four: Chinese, Thai, Indonesian and Korean. The listening test was performed on the following four points.

1. Identification of the word accent pattern.
2. Identification of a single voiceless consonant and corresponding geminates.
3. Identification of long and short vowels.
4. Identification between single nasal consonants, geminate nasal consonants and nasalized vowels.

2. METHOD

2.1 Stimuli

The stimulus word sets are shown in Table 1.

Set 1 and set 2 are a combination of long vowels and short vowels, with word accent pattern. Set 3 is a combination of single voiceless fricatives and geminates, with word accent pattern. Set 4 is a combination of single voiceless stops and geminates, with word accent pattern. Sets

5-8 are a combination of single nasal consonants, geminate nasal consonants and nasalized vowels. Set 5 and set 6 include the alveolar nasal, while set 7 and set 8 contain the velar nasal. The words in set 5 and set 7 have a flat accent pattern, while those in set 6 and set 8 have a falling accent pattern.

Table 1. Word list

set 1	set 2	set 3	set 4
kō:dai	çō:ko:	ɸçço:	ɸkko:
ko:dai	ço:ko:	ɷçço:	ɷkko:
kōdai	çōko:	ɸço:	ɸko:
kodai	çoko:	ɷço:	ɷko:
set 5	set 6	set 7	set 8
senno:	honno	hoŋŋan	keŋŋo
seŋo:	hoŋo	hoŋan	keŋo
se:no:	ho:no	ho:ŋan	ke:ŋo
se:o:	ho:o	ho:an	ke:o
seno:	hono	hoŋan	keŋo
seo:	hoo	hoan	keo

These words were embedded in the carrier sentence "Sore wa ___ to yomimasu (This is read ___)." These sentences were pronounced three times at a normal speed by four Japanese native speakers (2 males, 2 females) and were recorded.

Eight listening tapes were produced, one tape for each set, arranging the recorded sentences in a random order. Each sentence appeared three times. The interval between the stimuli was about three seconds, and a signal sound appeared every five stimuli. In each tape of sets 1-4, 144 stimuli were heard; in other words, three tokens of four sentences pronounced three times by four speakers. Likewise, in each tape of sets 5-8, 216 stimuli were heard.

2.2 Subjects

The subjects were learners of Japanese staying in Japan. Native languages, numbers, time studying Japanese, and age on the subjects are shown in Table 2. Time studying Japanese is the approximate period spent studying Japanese prior to this study.

The Thai and Indonesian subjects had been at the same Japanese school for 4 months, and they all were at the latter half of the beginner's course.

The Korean subjects were at the school of Japanese preparing for the entrance examination of a university, and were at the intermediate course. The six Korean subjects were all from Seoul.

Table 2. Subjects

Native language	Thai	Indonesian	Chinese	Korean
Number of subjects (male/female)	10 (8/2)	9 (8/1)	8 (2/6)	6 (5/1)
Time studying Japanese	4 mo.	4 mo.	2-3 yr.	1 yr.
Age	18-21	18-21	21-32	27-34

The Chinese subjects had completed the intermediate course of the school of Japanese, and were students of a university. One was studying for a master's degree, seven for a bachelor's degree, and they all used Japanese while attending courses and seminars. They had a high level of ability in Japanese, and they could be considered to be at an advanced level. Two of the Chinese subjects were native speakers of Mandarin; four were bilingual in Mandarin and Taiwanese; and two were native speakers of Taiwanese who could also use Mandarin.

2.3 Procedure

The listening test was carried out using the recorded stimuli. The stimuli were presented in a language laboratory via a speaker to the Thai and the Indonesian subjects, and in a soundproof chamber via a speaker to the Chinese and the Korean subjects.

On the answer sheets, there were 4 alternatives (sets 1-4) or 6 alternatives (sets 5-8) written both in kanji (Chinese character) and in katakana (the square phonetic Japanese syllabary), and lines were drawn under or over the katakana to the words of sets 1-4 to show the accent pattern. The subjects were asked to circle only one choice immediately after they heard each stimulus.

Rest was given between the tapes if necessary. Almost all of the subjects took one rest through the eight tapes. It took about two hours and ten minutes to listen to the eight tapes without rest.

3. RESULTS AND DISCUSSIONS

The error rate for the identification of word accent pattern, long vowels vs. short vowels, and single voiceless consonants vs. geminates (sets 1-4) are shown in Table 3. In the table, three error rates are shown; the right one for word accent pattern, the left one for long vs. short vowel or for single consonant vs. geminate, and the middle one for both.

3.1 Word accent pattern

The identification of the word accent pattern was better in the Chinese and Thai subjects than in the Korean and Indonesian subjects. Since Chinese and Thai are tone languages, it was concluded that the phonological use of pitch contour in the subjects' native language had a clear influence upon the identification of the word accent pattern in Japanese.

3.2 Vowel length

The error rate for long vowels vs. short vowels was much smaller than that of word accent pattern, or that of single consonant vs. geminate. Though the three subject languages, excluding Thai, do not have long vowels, the error rates of these three groups of subjects were as small as that of Thai subjects'. It cannot be discussed the differences made by the

subjects' native languages.

3.3 Consonant length

Thai and Indonesian have similar consonantal geminates to Japanese: [kk] and [ss]. But the error rates of the four groups of subjects were close to each other. It can be suggested that the acoustic cues for the identification of the voiceless geminate consonants in Thai and in Indonesian are different from those in Japanese.

Table 3-a. Error rate of Accent and Long-Short vowel

Native lang.	Word set	Error rate (%)		
		Accent	Both	L.-S.
Chinese	set 1	7	1	2
	set 2	8	2	4
Thai	set 1	16	4	4
	set 2	16	3	5
Indonesian	set 1	29	5	5
	set 2	29	6	5
Korean	set 1	39	5	8
	set 2	31	9	11

Table 3-b. Error rate of Accent and Long-Short consonant

Native lang.	Word set	Error rate (%)		
		Accent	Both	L.-S.
Chinese	set 3	3	1	22
	set 4	3	1	23
Thai	set 3	6	5	31
	set 4	5	4	26
Indonesian	set 3	24	11	15
	set 4	21	9	10
Korean	set 3	26	11	18
	set 4	23	14	19

3.4 Nasals and the nasalized vowel

Concerning the nasals and the nasalized vowel (sets 5-8), the error rate on the five distracters were counted for every stimulus. These error rates were classified into two types; confusions and omissions & additions. Confusions were errors among single nasals, geminate nasals and the nasalized vowel; (for example, [senno:] ↔ [seño:], [senno:] ↔ [se: no:], [senno:] ↔ [seno:], [seño:] ↔ [se: no:], [seño:] ↔ [seno:]), while omissions & additions were errors whose nasal consonant or the nasalized vowel was omitted (for example, [senno:] → [se: o:], [seño:] → [se: o:], [se: no:] → [se: o:], [seno:] → [se: o:]), or was added (for example, [se: o:] → [senno:], [se: o:] → [seño:], [se: o:] → [se: no:], [se: o:] → [seno:]). From the omissions & additions, the errors of long vowels with short vowels were excluded (for example, [se: o:] ↔ [seo:], [se: no:] ↔ [seno:]).

Error rates of each distracter were summed according to the two types of the errors, and the two types of error rates are shown in Table 4.

Compared to the error rate of the Indonesian subjects, the Thai subjects had the same rate of confusion errors, while they had a nearly double rate for omission & addition error. The Chinese subjects had somewhat a smaller rate for confusion errors than the Indonesian subjects, but nearly 2.4 times of omissions & additions. On the other hand, the Korean subjects had the larger rate both for confusions and omissions & additions.

These differences in error rates were examined in relation to the place of articulation. The two error rates were calculated according to the place of articulation (alveolar and velar) and are shown in Table 5.

For confusion errors in every group of subjects, velar nasals caused more than 4 times the number of errors as the alveolar nasals.

As for the omission & addition errors in the Chinese and the Thai subjects, velar nasals caused 2 times the number of errors as the alveolar nasals. On the other hand, the omission & addition errors for the Korean subjects were caused equally by the velar and the alveolar nasals. Errors in the Indonesian subjects were too small to examine the error patterns.

The differences in the error rates of omission & addition between the Indonesian subjects and the Thai subjects were due to the differences in the error rates for the velar nasals, and also those between the Indonesian subjects and Chinese subjects. On the other hand, the difference in the error rates of omission & addition between the Indonesian subjects and the Korean subjects were due to the difference in the error rates for both the velar nasal and the alveolar nasal.

Table 4. Error rate of Confusion, Omission & Addition Errors in Nasals

Native lang.	Chinese	Thai	Indonesian	Korean
Confusion	225	278	276	341
Omis. & Add. (Om./Ad.)	155 (105/50)	124 (67/57)	65 (37/28)	137 (87/50)

Table 5. Error rate of Confusion, Omission & Addition Errors of Alveolar nasals (set5+set6) and Velar nasals (set7+set8)

Native lang.	Chinese	Thai	Indonesian	Korean
Confusion				
Alveolar na.	39	55	50	60
Velar na.	186	223	226	281
Omis. & Add.				
Alveolar na.	51	43	39	69
Velar na.	104	81	26	68

In Thai, long vowels are unmarked and short vowels are marked, and a short vowel appears only in the closed syllable, but does not appear in the open syllable. For this reason, the error rates for single nasals in preceding short vowels, and in preceding long vowels are examined. With the preceding short vowels, Thai subjects had nearly 2.8 times their number in preceding long vowels in the confusion error. This ratio was far higher than the other groups of subjects. It may be the case that as the open syllable with a short vowel in Japanese does not exist in Thai, the Thai subjects take them for their familiar syllable with a short vowel. However, in the omission & addition errors, the error rates in preceding short vowels were not so high. It appears the judgment of the existence of the nasal consonant is not affected.

Chinese and Thai are monosyllabic languages, while Indonesian and Korean are polysyllabic languages. It is supposed that the monosyllable structure of Chinese and Thai have relation to the larger error rate in omission & addition with the Chinese and the Thai subjects.

Further studies will be conducted to investigate the correspondence between the phonetic pattern of a native language and error types in the perception of nasal sounds.

Reference

Fujisaki, H., Nakamura, K. and Imoto, T. : Auditory Perception of Duration of Speech and Non-Speech Stimuli. IEICE Technical Report, S73-12, 1973.