

Devoicing of moraic nasals in Japanese by Icelandic learners of Japanese

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1 Introduction The Japanese Studies course at the University of Iceland was launched in September 2003 as the first non-European language course of the higher education level in the country. The history of Japanese language teaching in Iceland is not very long, and research in the area of L1 interference from Icelandic to Japanese is needed. Following are the major pronunciation problems unique to the Icelandic learners of Japanese based on the teacher's observation during the class activities.

1. Initial mora stressing: All Icelandic words have stress in the first syllable, and the learners tend to stress the initial mora in Japanese, which makes it sound longer and higher in pitch to the native speaker's ear.

2. Problem in perceiving the location of a long vowel within a word: Achieving a sufficient length in Japanese long vowels is one of the common difficulties for foreign learners of Japanese. However, Icelandic learners have a problem also in locating the lengthening within a word. For example, in words such as /rjo koo/ (=trip), they often fail to recognize the location of the long vowel in the word and even swap the long and short vowels within the same word, such as /rjoo ko/, in their production and this problem can even be seen in their writings.

3. Vowel quality of /u/: Icelandic speakers tend to replace Japanese /u/ (a high back unrounded vowel, said to be similar auditorily to [u] in IPA) with their front rounded vowel [y], rather than a high back rounded vowel, [u], that also exists in Icelandic.

4. Difficulties in distinguishing Japanese [s] and [ç] both in production and perception, as Icelandic has only one sibilant /s/. This confusion is frequently observed especially when the following vowel /u/ or /i/ is devoiced, as in copula '-desu' [desu], and its past tense counterpart '-deshita' [deçi tã]. Also, they tend to pronounce [ç] more as [s], thus /deshita/ [çi] may sound more like /desuta/ [su].

5. Sonorant devoicing: Icelandic sonorants are usually devoiced before voiceless consonants: although there are some dialectal differences, namely, /l, m, n/ are usually devoiced when followed by /p, t, k/ in the most common dialect (Thráinsson, 1994: 151.) This sonorant devoicing is one of the possible pronunciation problems found in English spoken by Icelandic speakers: As Knútsson points out, Icelandic speakers tend to have the unvoiced nasals before homorganic voiceless plosives, such as [stap̥] "stamp," [peɪ̯nt̥] "paint" and [θi̯ŋk̥] "think" (2002: 30) (The phonetic symbols here are written in such a way as Icelandic speakers would pronounce English.)

This sonorant devoicing is also observed among the Icelandic learners of Japanese.

The Japanese moraic nasal, /N/, has allophonic variations depending on the following sound. Among them, [m], [n] and [ŋ] occur before the homorganic stops. In Icelandic, a devoiced nasal occurs when [m], [n], or [ŋ] is followed by voiceless plosives, /p/, /t/ or /k/ respectively. Thus, devoicing of the nasals as L1 interference occurs when Japanese moraic nasal stops are followed by homorganic voiceless plosives, i.e., [m̥] followed by /p/, [n̥] followed by /t/, or [ŋ̥] followed by /k/. For example, /N/ in /se N too/ (=public bath) is pronounced with [n] devoiced, /ho N kan/ (=main building) is pronounced with [ŋ] devoiced, and /ka N poo/ (=Chinese medicine) is pronounced with [m] devoiced.

Devoicing of nasals is an extremely rare characteristic in the world's languages (Helgason: 1999) and little study has been conducted in the L1 transfer of devoiced

nasals. This paper has focused on the devoicing of moraic nasals as an L1 interference from Icelandic on Japanese. During the teaching of the language for a year, attempt has been made to correct the devoicing of the moraic nasals, and some students have shown a considerable improvement in perceiving the difference as well as correcting their own pronunciation. Yet the devoicing of moraic nasals is still heard occasionally during the class activities. Therefore, we have hypothesized the following two points:

1. Devoicing of a nasal before its homorganic voiceless plosive is commonly observed in Icelandic students' pronunciation of Japanese as an L1 interference.
2. In addition to the difficulty in production, the Icelandic learners have a difficulty in perceiving the difference between voiced and devoiced nasals.

In order to support our hypotheses, both perception and production tests were conducted, with Icelandic students as the subjects.

2 Perception and Production studies

2.1 Methodology

Production Test: The subjects of the production test were six Icelandic students of Japanese, aged 20 to 27. They had studied Japanese for one year at University of Iceland and were all at the latter half of the beginner's level when the test was conducted. The material used for the production test was a list of Japanese words, each of which contained a moraic nasal in the second mora and one of the three voiceless plosives (/p/, /t/ or /k/) in the third mora, such as /ka N po o/, /ka N to o/ and /a N ko o/. Twelve words were chosen, each of them repeated twice (thus 24 tokens in total). The tokens were ordered randomly in the list. The speakers were asked to say each of them embedded in an Icelandic sentence that went, 'Á japönsku er það ____.' (= In Japanese it is ____.) Recording was made, using WASP Version 1.3.

Perception Test: Fifteen students (aged 19 to 27) were asked to listen to the same 12 words, and mark whether the moraic nasal in the second mora in each word is voiced (+) or voiceless (-). Each word was read in isolation twice by a Japanese teacher, once with the second moraic nasal voiced and another time voiceless. In total, the 24 tokens were played in the same order as the material used in the production test.

2.2. Data analysis and results

Production test: Students' productions were analysed auditorily by the two authors who were both phonetically trained (Initially we wanted to evaluate the results by performing acoustic analysis as well, but because of the insufficient sound quality of many of the recordings we were restrained from using this method.) The productions were then marked with one of the following four categories:

Voicing of the nasal is fully maintained (+++), the nasal is voiced, but a trace of devoicing is detected shortly before the transition to the following plosive (++-), the nasal is partially devoiced (+- -) and the nasal is fully devoiced (- - -).

The table below shows the individual result from the test. A-F correspond to the 6 speakers, and the values in the table are number of tokens that fell into each category.

	A	B	C	D	E	F
+++	4	19	19	11	18	19
++-	4	3	1	3	2	2
+--	1	1	1	3	1	2
---	15	1	3	7	3	1

Table 1: Individual result from the production test.

Since the recording was made after one year of teaching, there are considerable differences between each speaker's performances. In many cases the devoicing was successfully corrected (the average value of categories + - - and - - - across the speakers is 6.5 tokens out of 24) (Having been corrected the devoicing in many instances, the students were conscious of the sound in question and made effort to correct them during the production test.) However, on some occasions, although the speakers seem to succeed in NOT devoicing the nasal, the trace of devoicing shortly before the transition to the following plosive can still be detected in their speech.

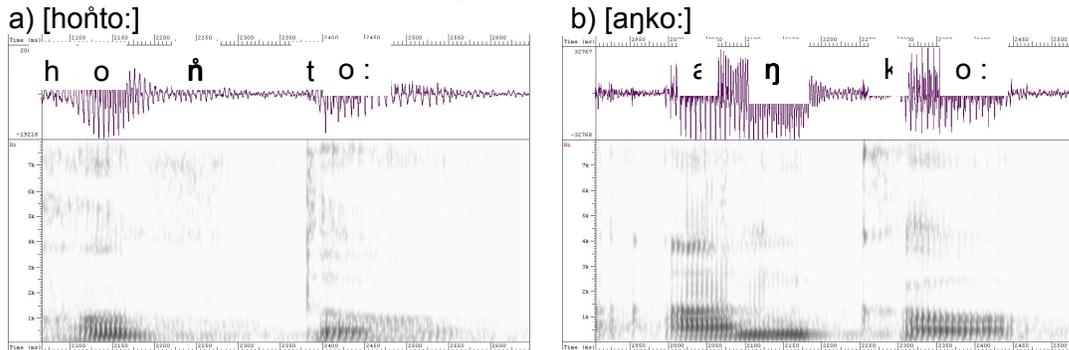


Figure 1: examples of Sp waveform and spectrogram of a devoiced nasal (a) and those of a voiced nasal (b) produced by Speaker D.

Figure 1-a is a representative Sp waveform and spectrogram of devoiced nasal taken from the Japanese word /hoNtoo/ "truth" produced by Speaker D. We can notice that the vocal fold vibration (which is presented by the periodicity of the waveform and also the presence of the voicing bar, a low-frequency energy observed near the bottom of the spectrogram, (Kawahara, 2005:90) stops shortly after the transition to the alveolar nasal stop, as opposed to the case where the speaker successfully maintained the voicing during the nasal stop as in Figure 1-b.

Perception test: The result from the perception test was analysed in order to see if the Icelandic learners can successfully distinguish between voiced and devoiced nasals in their perception. Considering the nature of task (binary forced choice between voiced and voiceless nasals) we calculated the binomial probabilities, and based on the calculation, we can say that the listener can correctly distinguish between voiced and voiceless nasals, above the chance ($p < 0.05$), if the total number of the correct answers is 17 or more. The average number of correct answers across all the 15 listeners was 18.6 out of 24, which was above the chance (≥ 17) performance of the distinguishing between voiced and devoiced nasals. When looking at individual results, 11 out of 15 listeners got more than 16 answers correct, in other words, 11 listeners appeared to be able to perceive the difference between voiced and devoiced nasals. This indicates that the subjects of the test were able to distinguish the voiced and devoiced nasals rather well, but there were considerable differences in the performance among the individuals.

3 Discussion and conclusion Icelandic speakers have a considerable amount of exposure to English since their puberty¹ and yet devoicing of nasals has been reported as one of the characteristics of their English pronunciation. Similarly, both auditory and acoustic analyses of the production test indicate that L1 interference of nasal devoicing

¹ English is currently taught from the 5th grade (10 years old), and Danish, from the 7th grade (12 years old). (Ministry of Education, Science and Culture 2004: 32)

is still observed across the speakers in their Japanese, even though students had been trained for one year.

Although the number of occurrence of the devoicing is relatively few, the result implies that L1 interference of nasal devoicing is a very common phenomenon for Icelandic speakers. For the auditory analysis of the production test, binary choice, + or -, was initially intended to be used. However, it was discovered that there were many occasions where the devoicing was partially recognisable even if the subject has succeeded in voicing the nasal. This implies the correction of the devoiced nasal can be achieved in different degrees, rather than just voiced or devoiced. It is also reported that voicing alteration in Icelandic sonorants was found to be not at all limited to a voiced-voiceless contrast (Bonbien 2006:19), which can be one of the possible explanations for the partial devoicing of the nasals found in our production test. Correction of the nasal devoicing and perceiving the difference was relatively easy to some learners but not for others. One interesting finding is that the place of articulation seems to have some effect in vulnerability of nasals to the devoicing. The result indicates that alveolar nasal tend to be more susceptible to L1 transfer of nasal devoicing. The reason for this is not known, and further study is required. Due to the overall quality of the recording, the main analysis was made auditorily, instead of acoustically. However, some of the acoustic data has provided the evidence of the devoicing of nasals as L1 interference, as well as supporting the auditory analysis. Both auditory and acoustic data confirms that devoicing of nasals is commonly transferable to the learner's L2 (Japanese).

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