NATIVE FRENCH SPEAKERS' PERCEPTION OF THE JAPANESE /h/: HA PIECE HOF CAKE?

Takeki KAMIYAMA[1,2], Yayoi NAKAMURA-DELLOYE[3]

[1]Linguistique Empirique: Cognition, Société et Langage (LECSeL), EA 1569, University of Paris 8
[2]Laboratoire de Phonétique et Phonologie (LPP) UMR 7018 CNRS / University of Sorbonne Nouvelle - Paris 3
[3]Centre d'études japonaises (CEJ) EA 1441, Institut national des langues et civilisations orientales (INALCO)
takeki.kamiyama@univ-paris8.fr, yayoi.nakamura@inalco.fr

ABSTRACT

It is commonly observed that native French speakers tend to drop nonnative /h/-like phonemes, or to insert them where unexpected, in the "/h/ languages" they learn (*e.g.* English). The perception of the Japanese /h/ by French listeners was tested by way of an AXB discrimination task on non-words and a word identification task on Japanese minimal pairs. For naïve listeners not learning Japanese (N=9), the error rate in the discrimination task ranged from 0% to 12.5%; for elementary level learners of Japanese (N=8) the error rate in the identification task ranged from 0% to 8%. 12 errors out of 17 in the latter task occurred when a less familiar word was identified as a more familiar one. These findings suggest that the French perception of the Japanese /h/ is not as difficult as other reported major difficulties in L2 acquisition, and that it interacts with lexical acquisition.

Keywords: Japanese /h/, French-speaking learners, perception, identification, discrimination.

1. INTRODUCTION

It has been observed and reported that native French speakers learning other languages as a foreign or second language tend to omit the English glottal fricative /h/ [23] [5] or similar phonemes in other languages ([11] for the Japanese /h/), or to insert a glottal fricative where it is unexpected [8]. However, the number of experimental studies on the perception and production of this type of phoneme seems to be quite limited, compared to some other widely reported difficulties in the perception and production of second language (L2) pronunciation, such as the English /r/-/l/ contrast by Japanese-speaking learners ([10], [12], *inter alii.*), or the Catalan /e/-/ɛ/ by Spanish-speaking learners ([4], [20], *inter alii.*).

A small number of empirical studies have been reported on the acquisition of the English /h/ by French-speaking learners. It has been suggested that when /h/ is omitted by these learners, the glottis tends to be closed, instead of being open for a fricative sound to be produced [14]. [8] illustrated French speakers' tendency to insert a [h] in the case of hiatus (*e.g.* 'to [h]eat'). [27] compared the results of an auditory discrimination task (AX) and three different production tasks (repetition; word naming; reading) and found that the least advanced group of learners dropped /h/ more frequently in the reading task, in which the orthography was presented, than in the word naming task (and still less often in the repetition task). This tendency was not observed in more advanced learners and those who were more accustomed to a writing system in which the letter h corresponds to a glottal fricative (German). These findings suggest that the writing system plays a non-negligible role in the acquisition of a /h/-like phoneme by French-speaking learners. What, then, happens when they acquire a language that has a similar phoneme but a writing system where the phoneme /h/ is not transparent, such as Japanese?

2. BACKGROUND

In traditional phonological accounts of Japanese, applied to Yamato (native) and sino-Japanese lexical items, the phoneme /h/ is commonly described to have 3 complementary allophones: bilabial [ɸ] before /u/ ([ɯ] in broad phonetic transcription), palatal [ç] before /i/ and /j/, glottal [h] in other contexts ([1], [25], [26], [17], *inter alii.*). Besides, it may be realized as voiced [ɦ] intervocalically ([1], [25], [26], *inter alii.*), and [x] ([1], [25]) or [χ] ([25]) may replace [h]. Certain speakers show neutralization with /s/ before /i/ and /j/, leading to the alveolo-palatal realization [ɕ] in eastern (Kantô) varieties (and [ç] in western (Kansai) varieties) [17]. However, no other regional variation in the phonetic realization of /h/ has been reported, to our knowledge. Note also that in present-day Japanese, the phone [ɸ] has undergone a "phonemic split" [26], or "phonemization" [17] in recent loan words, contrasting *fitto* [ɸitːo] (< fit) and *hitto* [çitːo] (< hit).

By contrast, most present-day varieties of French do not have glottal phonemes any longer ([19], [9],

inter alii.), even though a glottal stop [ʔ] may be inserted to mark an initial boundary with an empty onset, as in the case of so-called "*h-aspiré*" (*e.g.* la hauteur [la ʔotœʁ] "the height", where [ʔ] is optional ([6], *inter alii.*) and tends to be inserted in the case of emphasis). The French uvular fricative /ʁ/ was shown to be categorized as Japanese /h/ by Japanese listeners in a perceptual assimilation task [28] [21], especially when its phonetic realization is voiceless [χ] [21].

The writing system of Japanese is comprised mainly of three scripts, namely, sinograms (*kanji*) and two syllabaries (*hiragana* and *katakana*). The characters of the syllabaries basically represent a combination of a consonant and a vowel (or only a vowel) and they are not decomposable phonemically. Roman transcription (*rômaji*) is also used in advertisements, street signs or when typing (sequences of roman characters are converted into syllabary characters). Some textbooks of Japanese for self study are provided with roman transcription, but in the great majority of L2 Japanese classrooms, only sinograms and syllabaries are taught. The use of the IPA is rare.

3. METHOD

3.1. Experiment 1: AXB discrimination

The goal of this experiment was to test French speakers' perception of the Japanese /h/ independently of the lexical knowledge of Japanese.

The profiles of the listeners were as follows:

1) 9 "naïve listeners" of French who had never learned Japanese (F-NAI), aged between 18 and 25; they all grew up in the northern half of France, and have never lived abroad.

2) 8 native listeners of French and learners of Japanese (F-LRN), aged between 17 and 23, all first-year students in Japanese at INALCO (National Institute of Oriental Languages and Civilizations) in Paris. They had all finished their first semester in Japanese studies (162.5 hours of language teaching) at the time of the experiment. Three of them had studied Japanese before the semester (4, 2, and 1 year(s) of learning experience at the time of the study). Their speaking proficiency level corresponds to A1-A2 in the Common European Framework of Reference (CEFR).

3) 8 native listeners of Japanese (J-NAT), aged between 27 and 44, originally from several different regions of Japan (let us remember that no regional variation in the phonetic realization of /h/ has been reported, to our knowledge).

Concerning the linguistic material, a total of 20 non-words were created (Tab. 1):

Word-initial /h/: /hV_1bjV_2/ vs. /V_1bjV_2/
Intervocalic /h/: /bjV_2hV_1/ vs. /bjV_2V_1/
(V_1: /i/ /e/ /a/ /o/ /u/; V_2 : /i/ /a/ /u/ (due to the phonotactic constraints), not identical to V_1)

These words were pronounced in the carrier sentence /sore o __ to iu/ 'I call that __' by a native speaker of Japanese born and raised in Tokyo, and recorded at 44100 Hz, 16 bits, and downsampled to 22050 Hz. Each carrier sentence containing a non-word was pronounced 3 times (but not consecutively), with 2 different pitch accent patterns each (low-high 'LH' and high-low 'HL'). The target non-words were extracted and 4 different combinations of triplets (two different tokens were selected for the same non-word in a triplet) were prepared for each of the 10 minimal pairs and the 2 pitch accent patterns. Thus, a total of 80 triplets were created along with 20 distracters. These triplets were arranged in a semi-random order. In the first half of the list, non-words pronounced with HL pattern were placed, and LH in the latter half.

The experimental interface used was "ExperimentMFC" (Praat [3]). The participants were asked to listen to the triplets through a headphone, to decide if the first or the last (non-)word was identical to the second, and then to choose from the two boxes presented on the screen the one that corresponded to their decision. The experiment was preceded by a training session.

3.2. Experiment 2: word identification

Experiment 2 consisted of a word identification task administered to the 8 F-LRNs and the 8 J-NATs who participated in Experiment 1. The goal of this experiment was to test the identification of Japanese minimal-pair words containing or not /h/ by learners who are more less familiar with them.

A total of 25 minimal pairs (50 words) were chosen for this experiment (Tab. 3). It should be noted that words with a word-medial, intervocalic /h/ are much smaller in number than those with an initial /h/, partly due to the phonetic changes that occurred in the language (p > h word-initially, but p > w or disappearance word-medially: [17], *inter alii.*). These words were pronounced by the same native speaker in the same manner as for the non-words used in Experiment 1. The target words, along with 10 distracter words, were arranged in 2 different semi-random orders.

The participants were asked to listen to a word and to choose the corresponding one from the two forms presented in *hiragana* syllabary on the screen. The list of words was presented in one of the two

orders in the first half of the test, and in the other in the second half, with another token of each word. The other procedures were identical to those of Experiment 1.

When the identification task was completed, the F-LRNs were asked to fill in a vocabulary questionnaire, in which they reported their familiarity with the test words (a French translation was provided).

4. RESULTS

4.1. Experiment 1: AXB discrimination

The overall error rate, shown in Fig. 1, was as follows: for F-NAI 4.31% (mean), ranging from 0% (2 listeners our of 9) to 12.5%; for F-LRN 2.50% (mean), ranging from 0% (3 listeners out of 8) to 11.3%; for J-NAT 0.16% (only 1 error out of the 80 non-distracter trials, made by only 1 listener out of 8). A Kruskal-Wallis test shows a significant effect of group on the mean error rates ($H_{(2)} = 7.45$, $p < .05$). The difference between F-NAI and J-NAT is also significant (Mann-Whitney's $U = 9.5$, $p < .05$).

Figure 1: Error rate in AXB discrimination: F-NAI (N=9), F-LRN (N=8), J-NAT (N=8); 80 trials.
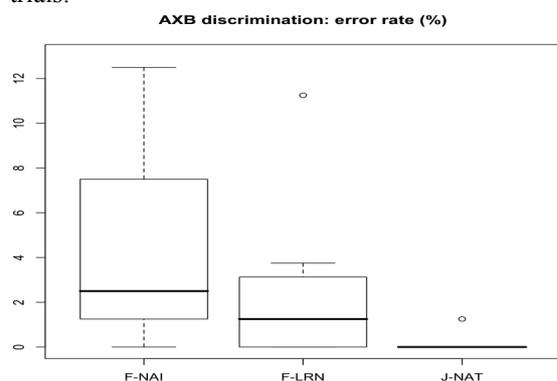

Table 1: Non-words used in the AXB discrimination task and the mean error rates.

| Initial /h/	Initial /Ø/	Medial /h/	Medial /Ø/	Error F-NAI	Error F-LRN
/hibja/	/ibja/	/bjohi/	/bjoi/	2.08%	0
/hebjo/	/ebjo/	/bjohe/	/bjoe/	2.78%	3.13%
/habju/	/abju/	/bjuha/	/bjua/	5.56%	1.56%
/hobja/	/obja/	/bjaho/	/bjao/	2.08%	4.69%
/hubja/	/ubja/	/bjahu/	/bjau/	9.03%	3.13%
F-NAI: 3.06% F-LRN: 2.5%		F-NAI: 5.56% F-LRN: 2.5%			

Mean error rates were then calculated for each position (word-initial or word-medial) and for each vowel following /h/. For F-NAI, the error rate was higher for word-medial position (5.56%) than for word-initial position (3.06%), whereas no difference was found for F-LRN (2.5% for both conditions). Concerning the following vowel, for F-NAIs, the error rate was the highest for /u/ (9.03%), followed by /a/ (5.56%), /e/ (2.78%), /o/ and /i/ (2.08% for both) (Friedman test F_r corrected for the existence of ties 12.76, $p < .05$); for F-LRNs, it was the highest for /o/ (4.69%), followed by /u/ and /e/ (3.13% for both), /a/ (1.56), and /i/ (no error).

4.2. Experiment 2: word identification

The overall error rate (Fig. 2) was as follows: for F-LRN 2.13% (mean), ranging from 0% (4 listeners out of 8) to 8%; for J-NAT 0% (no error made by any of the 8 listeners).

Figure 2: Error rate in word identification: F-LRN (N=8), J-NAT (N=8); 100 trials.
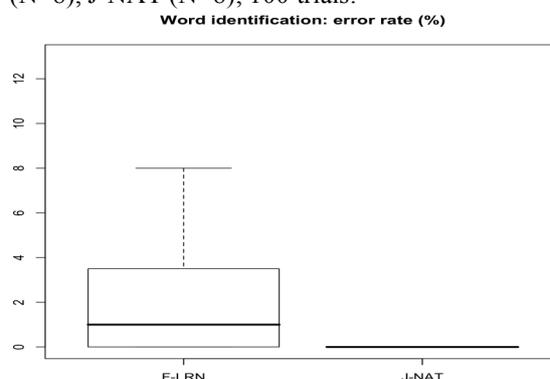
Out of the 17 incorrect answers (out of 800 answers given by the 8 F-LRNs), 11 stimulus words had /h/ but the participant chose a word without /h/, and 6 others did not have /h/ but the one containing /h/ was selected. Two errors were observed for words with or without intervocalic /h/ (Tab. 3).

Table 2: Number of responses in identification and familiarity gap: i) 'positive': the target word was more familiar to the learner than the other word of the minimal pair; ii) 'equal': familiarity was equal for both words of the minimal pair; iii) 'negative': the target word was less familiar than the other word of the minimal pair. The data of the 3 F-LRNs who obtained a 0% error rate both in discrimination and identification were excluded.

N = 500 (5 learners)	Familiarity gap		
	Positive	Equal	Negative
Incorrect	2	3	12
Correct	138	217	128

For each incorrect answer, the lexical familiarity of the participant was checked, except for the 3 F-LRNs who made no errors in the discrimination task (they made no errors in word identification either). For 12 out of the 17 Ωincorrect answers, the

participants chose a word more familiar to them when they heard a less familiar word (Tab. 2). When the categories "positive" and "equal" are merged into one single category, the correctness and the familiarity gap show a phi value of 0.18 (Phi coefficient of association: p < 0.001).

Table 3: 50 words used in the identification task. /H/, /N/, and /Q/ represent respectively the second half of a long vowel, mora nasal, the first half of a geminate. Note that (lexically) unaccented verbs were pronounced with a fall after the final mora of the word in the carrier sentence /sore o ___ to iu/ 'I call that ___'. * shows an incorrect answer in identification.

With /h/		Without /h/	
/hiˈru/	'daytime'	/iru/	'(to) stay'
/hiku/	'(to) pull'	/iku/	'(to) go'
/ˈheN/	'strange'	/ˈeN/	'circle, yen'
/ˈhai/	'yes'	/ˈai/	'love'
/haˈna/	'flower'	/aˈna/	'hole'
*/haˈsi/	'bridge'	*/aˈsi/	'foot, leg'
*/ˈharu/	'spring' (season)	*/ˈaru/	'be, exist'
**/hoˈsoi/	'thin'	/oˈsoi/	'late'
/ˈhiNdo/	'frequency'	/ˈiNdo/	'India'
**/ˈheH/	'soldier'	/ˈeH/	'yes'
*/ˈhau/	'crawl'	/ˈau/	'(to) meet'
/hane/	'feather, wing'	/ane/	'elder sister'
/ˈhoN/	'book'	**/ˈoN/	'obligation'
/hoQto/	feeling relieved	*/oQto/	'husband'
/hoˈsii/	'desired'	*/oˈsii/	'regrettable'
/ˈhumi/	'letter'	/ˈumi/	'sea'
/ˈhutjuH/	'(city of) Fuchû'	/ˈutjuH/	'universe'
/ˈhuzi/	'(Mt) Fuji'	/ˈuzi/	'(city of) Uji'
/ˈhema/	'blunder'	/ˈema/	'votive picture'
*/hizjoH/	'emergency'	/izjoH/	'unusual'
/ˈhaha/	'mother'	/ˈhaH/ [haː]	'yes'
*/taiheN/	'serious, awful'	/taieN/	'leaving a park'
*/koHheN/	'second and last part'	/koHeN/	'park'
/ˈgohaN/	'cooked rice, meal'	/ˈgoaN/	(place name)
*/suiheH/	'horizontal'	/suieH/	'swimming'

5. DISCUSSION AND CONCLUSION

In the discrimination task, stimuli with /i/ produced a relatively low error rate, possibly because French listeners are familiar with the allophone [ç] (close to the German [ç], even though this latter is usually replaced by [ʃ] in loans and proper nouns in French).

By contrast, [ɸ] in /hu/, which produced the highest error rate for F-NAIs, may be less familiar, even if it is used as a non-linguistic sound (when blowing out a candle or as a sigh of relief). Also, it is acoustically weak (low intensity). The higher error rate in the word-medial position for F-NAI may be due to the voicing of /h/ in the stimuli, but the same does not hold for F-LRN, suggesting that learners get accustomed to this phone rather quickly.

It is worth noting that in the discrimination task, the error rate was not high even for naïve listeners (F-NAIs' mean: 4.31%). This is fairly low, compared to other major difficulties in cross-language perception reported in the literature, and close to the case of the French contrast /ʁ/-/l/ [22] [28]. Let us remember that this French contrast, not very difficult in perception, is known to be a major difficulty in production, and is reported as general observation [13] [18]. It could thus be argued that the case of French speaker's /h/ presents a similar difficulty. Indeed, F-LRNs in the present study showed a low error rates in both tasks (2.50% in discrimination, 2.13% in identification), but French-speaking learners in general have been reported to show h-omission or insertion even in the written language [15].

The difficulty in production, however, needs to be investigated further. It may be due to articulatory reasons, as for the fully back French [u] by Japanese-speaking learners who are not used to articulating high back rounded vowels [16]; but since French speakers are known to insert [h], this may not be the case. Is it related to other linguistic levels, such as vocabulary and semantic acquisition? The error patterns in word identification observed in the present study suggest that lexical acquisition may interact with phonological acquisition of second or foreign languages [2] [24]. The writing system may also exert a non-negligible influence [7] [27]. In [27], French-speaking learners' error rates in an AX discrimination task on English short, basic words containing /h/ were much higher (11% - 39% depending on the group of listeners) than those of the present study. It could be argued that once a word is recognized, linguistic processes could exert an influence on the task. It could also be that Japanese words, mainly written in sinograms or syllabaries, are treated differently from English words, written in roman alphabet as in French, and many of which are similar to French words, inciting learners to proceed in a similar decoding mode.

In order to approach these issues, it will be necessary to conduct production studies requiring different processes (repetition, naming, map task, reading, *etc.*), as well as further perceptual discrimination and identification experiments in more difficult conditions (with noise, or with stimuli produced by multiple talkers), with learners of different proficiency levels.

6. ACKNOWLEDGEMENTS

7. REFERENCES

[1] Amanuma, Y., Ôtsubo, K., Mizutani, O. 1978. *Nihongo Onseigaku* [Japanese phonetics]. Tokyo: Kuroshio.

[2] Best, C., Tyler, M. 2007. Nonnative and second-language speech perception: Commonalities and complementarities. In: Bohn, O.-S., Munro, M. (eds), *Language Experience in Second Language Speech Learning. In honor of James Emil Flege*. Amsterdam: John Benjamins, 13-34.

[3] Boersma, P., Weenink, D. 2014. *Praat: doing phonetics by computer* [Computer program]. Version 5.3.45, retrieved in 2014 from http://www.praat.org/

[4] Bosch, L., Costa A., Sebastian-Galles N. 2000. First and second language vowel perception in early bilinguals. *Journal European Journal of Cognitive Psychology* 12, 189-221.

[5] Capliez, M. 2011. Typologie des erreurs de production d'anglais des francophones : segments vs. suprasegments. *Recherche et pratiques pédagogiques en langues de spécialité*, 30(3), 44-60.

[6] Dell, F. 1973. *Les règles et les sons*. Paris: Hermann.

[7] Detey, S. 2005. *Interphonologie et représentations orthographiques. Du rôle de l'écrit dans l'enseignement/apprentissage du français oral chez des apprenants japonais*. Unpublished doctoral dissertation, Université de Toulouse II.

[8] Exare, C. 2010. *Étude Phonétique de la résolution du hiatus en anglais langue maternelle et dans l'anglais des francophones*. Unpublished Master's thesis. Université Paris 3 – Sorbonne Nouvelle.

[9] Fougeron, C., Smith, C. L. 1999. Illustrations of the IPA: French". In: International Phonetic Association (ed), *Handbook of the International Phonetic Association: A Guide to the Use of the International Phonetic Alphabet*. Cambridge: Cambridge University Press, 78–81.

[10] Goto, H. 1971. Auditory perception by normal Japanese adults of the sounds "l" and "r". *Neuropsychologia* 9(3), 317–323.

[11] Isomura, K. (Kokusai Kouryû Kikin [Japan Foundation]) (1990). Onsei o oshieru [Teaching pronunciation]. Kokusai kouryû kikin nihongo kyoujuhou shirîzu 2 [Japan Foundation series in Japanese teaching methodology 2]. Tokyo: Hituji Syobô Publishing.

[12] Hattori, K., Iverson, P. 2010. Examination of the relationship between L2 perception and production: an investigation of English /r/-/l/ perception and production by adult Japanese speakers. *Proc. INTERSPEECH 2010 Satellite Workshop on "Second Language Studies: Acquisition, Learning, Education and Technology"* Tokyo.

[13] Kamiyama, T., Detey, S., Kawaguchi, Y. To appear. Les japonophones. In: S. Detey, I. Racine, Y. Kawaguchi, J. Eychenne (ed.), *La prononciation du français dans le monde : du natif à l'apprenant*, Paris: CLE International.

[14] Kamiyama, T., Kühnert, B., Vaissière, J. 2011. Do French-speaking learners simply omit the English /h/? *Proc. 17th ICPhS* Hong Kong, 1010–1013.

[15] Kamiyama, T., Nakamura-Delloye, Y. 2014. L'omission et l'insertion du /h/ dans des expressions verbales écrites par des apprenants de japonais langue étrangère en France. *Workshop in Japanese linguistics "Analyse des erreurs commises par les étudiants français"* Paris, oral presentation.

[16] Kamiyama, T., Vaissière, J. 2009. Perception and production of French close and close-mid rounded vowels by Japanese-speaking learners. *Acquisition et interaction en langue étrangère Aile... Lia* 2, 9-41.

[17] Labrune, L. 2012. *The phonology of Japanese*. Oxford: Oxford University Press.

[18] Lauret, B. 2007. *Enseigner la prononciation du français : questions et outils*. Paris: Hachette.

[19] Léon, P. R. 2000. *Phonétisme et prononciations du français* (4th edition). Paris: Nathan.

[20] Mora, J. C., Keidel, J. L., Flege, J. E. 2011. Why are the Catalan contrasts between /e/-/ɛ/ and /o/-/ɔ/ so difficult for even early Spanish-Catalan bilinguals to perceive? In: Wrembel, M., Kul, M., Dziubalska-Kołaczyk, K. (eds), *Achievements and perspectives in the acquisition of second language speech: New Sounds 2010*, Vol. 2, Bern: Peter Lang, 183-193.

[21] Ooigawa, T. 2009. Individual differences in production of voicing of French /R/ sounds and the perception by Japanese adult listeners. *Proc. CIL (International Congress of Linguists) 18*, 1094-1111.

[22] Ooigawa, T. 2013. Perception of /l/ and /r/ in English, French and Spanish by Japanese Listeners. *Sophia Linguistica* 61, 49-68.

[23] Ostiguy, L., Sarrasin, R., Irons, G. 1996. *Introduction à la phonétique comparée: les sons: le français et l'anglais nord-américains*. Sainte-Foy: Les Presses de l'Université Laval.

[24] Ota, M., Hartsuiker, R. J., Haywood, S. L. 2009. The KEY to the ROCK: Near-homophony in nonnative visual word recognition. *Cognition* 111, 263–269.

[25] Saito, Y. 1997. *Nihongo onseigaku nyûmon* [Introduction to Japanese phonetics]. Tokyo: Sanseido.

[26] Vance, T. J. 2008. *The sounds of Japanese*. Cambridge: Cambridge University Press.

[27] Watelle-Campbell, N. 2014. *Perception et production du phonème /h/ par des apprenants francophones de l'anglais*. Unpublished master's thesis, Université Paris 8 Vincennes - Saint-Denis.

[28] Yamasaki, H., Hallé, P. A. 1999. How do native speakers of Japanese discriminate and categorize French /r/ and /l/? *Proc. 15th ICPhS* San Francisco, 909-912.