Phonetic Back Transfer

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As a result of minimal pair discrimination listening tests, the closing diphthong /ou/ proved one of the most difficult phonemes to learn for 153 Japanese college students learning English as a foreign language. The /ou/-/o:/ pair was rather more difficult than /r/-/l/, which has been recognized as being very difficult. In addition to the differences in phonological systems between English and Japanese, the great number of loanwords from English being introduced into Japanese can affect improvement in accent. For example, we can see many loanwords in computer-related documents. Japanese students may transfer such imprinted sounds through Katakana transcriptions into their English speech. EFL researchers should to investigate this to meet large needs of effective lessons on loanwords.

　日本人大学生153人に英語のミニマルペアの聞き分けテストを実施した結果、/r/-/l/など従来から難易度が高いといわれてきた音よりもむしろ二重母音/ou/の聞き取りが難しいことがわかった。英語と日本語の音韻構造の違いに加え、近年、コンピュータ関連などで増加している英語からの借用語の影響が考えられる。日本語のカナ書きで憶えた音のイメージを英語の発音に持ち込む可能性があり、英語教育者はもっとこの点に注目すべきである。

An increasing number of words originating from English enter the Japanese vocabulary (Asai, 2004; Hoffer, 1990; Junnouchi, 2003; Steinberg, 1996). We can easily identify these because loanwords in Japanese are transcribed with Katakana characters while native Japanese and Sino-Japanese words are written using Hiragana and Kanji characters. Katakana characters are phonemic scripts, and the users pronounce the words according to the Japanese phonemic interpretation. Loanwords are thus pronounced within the Japanese phonological framework in daily conversation. The frequent use of English loanwords can enhance phonetic fossilization (Ando, 1998; Blair, 1991; Han, 2004; Shimaoka, 1996).

This study discusses an aspect of phonetic interferences between Japanese (L1) and English (L2). Listening tests were carried out to find out what sounds would de difficult for young Japanese EFL learners and to explore the possible visio-aural influences of loanwords between Japanese and English.

Quantitative data were initially obtained about loanwords in Japanese in order to identify the influences. In typical daily conversation and document, loanwords are used at a ratio of about 3 to 5% of running words to all words (Hoffer, 1990; NIJL, 1962, 1964, 1995). In the wake of the information technology boom, there must now be a higher rate than those surveys indicate. In fact, loanwords occupy around 10% of IT documents such as users' guides of computers, cell phones, or digital home electronics, as well as in IT news articles (Asai, Ishikawa, & Se, forthcoming). Note

that most variations in the transcriptions with Katakana characters can be interpreted as variants under phonological constraints (Asai, 2004). It will be interesting to know the relationship between phonological cognition reflected in writing and aural skills. The following section analyses the performance of Japanese EFL learners when listening to English sounds.

Listening tests

Participants in this study were 153 students enrolled in one-semester English communication classes from 2002 to 2004. They answered questions requiring the discrimination of minimal pairs recorded in standard North American English. All were high-beginning to low-intermediate level first-year students who had studied English as a foreign language for at least six years.

College students were chosen for the following reasons. Young people use loanwords more frequently than any other generation. Young people are also more likely to build phonetic images by visual input, i.e., literal information, than by aural input (Akinaga, 2002). Furthermore, a uniform profile can be obtained from a sample of this age group compared with other generations. The final reason is to seek a projection towards the future use of the Japanese language and foreign language education.

The contrastive sounds in this study were /ou/-/o:/, /ae/-/a/, /r/-/l/, and /th/-/s/, all of which have been found to be difficult for Japanese EFL learners (Kakita & Oka, 1984; Miyawaki et al., 1975). For convenience this paper uses the Roman alphabet instead of the IPA fonts for describing

the sounds, for example /o:/, /ae/, and /a/ indicate the half-close-back vowel, the half-open-front vowel, and the open-back vowel, respectively. For the English consonant, /th/ indicates the voiceless dental fricative, and /l/ is light-l here. Each sound in question had four minimal pairs, as shown in Table 1. All the words are basic vocabulary items, and the participants can identify these words if they hear the sounds accurately.

Table 1. Minimal pairs in listening tests

/ou/ - /o:/	/ae/ - /a/	/r/ - /l/	/th/ - /s/
boat -bought	hat –hot	right – light	thing – sing
coast - cost	tap – top	wrong – long	mouth – mouse
hole - hall	map – mop	grass – glass	path - pass
flow - floor	black – block	pray – play	thick - sick

The participants listened to the minimal pairs, recorded by male and female native speakers of North American English, through a MiniDisc player and a public-address system preinstalled in the classroom, and then chose the word that contained the target sound in each pair. The sounds were presented to groups of participants as single words twice in a random sequence within a sound pair. The total of 16 test items was not large, but sufficient to discuss perceptive skills (Flege & MacKay, 2004). Note that the minimal pair test of /th/-/s/ had only 113 participants because of scheduling difficulties of one class in 2002.

Results

Figure 1 shows the results of the listening test. About half of the participants perfectly discriminated /th/ from /s/. On the other hand, they showed lower performance on the identification of /r/ in the /r/-/l/ pair. Moreover, only 16% of the participants distinguished /ou/ from /o:/ perfectly. Remarkably 24% answered one question correctly, and 18% did not answer any question correctly. In short, the /ou/-/o:/ minimal pair was the most difficult among the four studied.
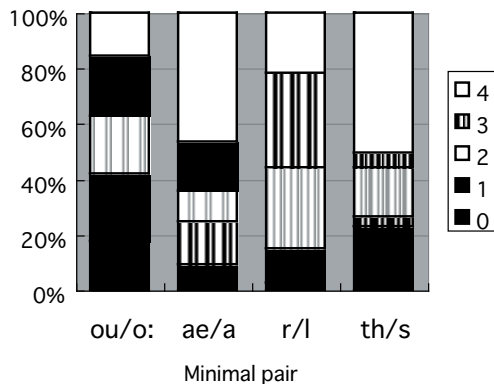

Figure 1. Listening test results

When the results were scored on the number of correct answers in each minimal pair, the mean (SDs) was 2.04 (1.26) for /ou/-/o:/, 2.85 (1.35) for /ae/-/a/, 2.70 (1.00) for /r/-/l/, and 2.57 (1.65) for /th/-/s/. The scores for the /ou/-/o:/ pair show a dispersed distribution, while those in the /r/-/l/ had a relatively high stability.

Discussion

This section discusses factors responsible for the difficulty in discrimination of the sounds presented above. The first factor is that /ou/ has the closest acoustic properties between its onset and coda. Figure 2 shows the transitions in the gliding on the first and second formant frequencies, which are determinant to the vowel qualities (Delattre et al., 1952; Takebayashi, 1996). The diphthong /ou/ has little transition in the second formant frequencies. Such acoustic similarity evidently results in difficulty in aural discrimination. The low performance on the /ou/-/o:/ pair by the Japanese EFL learners can, to a large extent, be explained for this property.
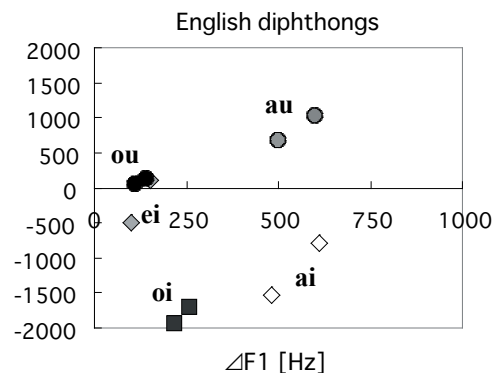

Figure 2. Formant frequency transitions
(Data from Delattre et al. (1952) and Takebayashi (1996)).

Another phonetic factor is differences in the articulatory postures between English and Japanese vowel productions.

The English /u/ is a rounded vowel so that it's likely perceived as /o/ by Japanese speakers (Oguri, 1969, p.52). In Standard Japanese, /u/ is not a rounded vowel, but /o/ is a rounded vowel.

The second factor is the small changes in sonority. Sonority scales are largely related to cognitive salience (Flemming, 2002; Prince & Smolensky, 2004). For example, when sonority in consecutive phonemes curves upward or downward shapely, the prominence of the phonemic string will be large. In other words, psychoacoustically large contrastive distinctiveness results in easy aural perception (Gussenhoven & Jacobs, 1998; Venneman, 1972). Many onomatopoeic expressions for emphasizing strength and size, for instance, have a phonemic structure whose sonority change at onset is large (Asai, 2003). The sonority values in English phonemes are 10 for the open vowel /a/, 9 for the mid vowels /e/ and /o/, 8 for the close vowels /i/ and /u/, 7 for the flap /r/, 5 for the lateral /l/, 3 for the voiceless fricatives /th/ and /s/, and 2 for the voiced plosive /b/ (Hogg & McCully, 1987; Selkirk, 1984). The sonority values in /th/ and /s/ are the same. However, they are comparatively distinguishable because of sound differences from the different articulation manners.

Thus, sonority curves consisting of fricatives and preceding or following vowels in minimal pairs can help the listeners distinguish the consonants. On the other hand, nuclei vowels play a phonetically central part in the word, and a similarity in the vowel quality could result in low discrimination in listening. The diphthong /ou/ has an inner structure of acoustical uniformity as shown in Figure 2. For example, /ou/ in "hole" has a sonority value change of 1

when /o/ and /u/ are treated as independent components, and /o:/ in "hall" has virtually no change. The awareness of these properties is key in foreign language learning (Takahashi, 1987).

The third factor is the phonological framework of Japanese, which integrates loanwords from English. Diphthongs do not fit into the Japanese phonology. Many English diphthongs are decomposed to consecutive monophthongs, or receive vowel or semi-vowel insertions. Some English sounds can hardly be recognized by Japanese speakers. A typical phenomenon is pre-nasal shortening. Japanese is a mora-timed language that does not prefer superheavy syllables. English phonemes in extrametrical positions may be dropped in Japanese transcriptions (Kubozono, 1995). Thus pre-nasal shortening likely occurs after diphthongs that have small formant frequency transitions. The most frequent occurrence is observed after /ei/ at a percentage of 37%, for instance "entertainment" /eNta:teimeNto/, and the second most frequent is after /ou/ at 33% (Otaka, 2004). On the other hand, pre-nasal shortening never occurs after /ai/, /oi/, /ia/, /ea/, /oa/, /ua/ and /u:/, and rarely occurs in /au/ and /i:/. Japanese transcriptions with monophthongs plus the prolongation for English diphthongs are still often observed in /ou/ and /ei/, such as in the case of "homepage" /ho:mupe:ji/, but scarcely in other diphthongs. As of December 2003, catalogues of 15 computer venders and 4 cell-phone carriers had 54 Katakana words whose English origins include /ou/, and the monophthongization plus prolongation /o:/ was observed in 181 expressions out of 184 cases (Asai, 2004). This percentage, 97.8%, decreased in /ei/ to 81.0%, 375 out of 463. In contrast,

monophthongization plus prolongation was never observed in the transcriptions for /ai/, /au/, and /oi/. These observations reflect how difficult the recognition of /ou/ is for native speakers of Japanese. On the other hand, young people have a different preference for transcriptions of loanwords. They prefer faithful transcriptions that describe the English /ei/ as /e/ plus /i/ in Katakana expressions, but this trend does not reach /ou/ (Asai, Ishikawa, & Se, forthcoming). This supports the considerable difficulty in accurate identification of the English diphthong /ou/ for Japanese speakers.

As discussed above, almost all English-to-Japanese transcriptions decompose the diphthong /ou/ to /o/ plus its prolongation. These days, written texts and daily conversations in Japanese contain many loanwords from English. This visual and oral input can reinforce the perceptual cognition built under the phonological framework of L1 (Inoue, 2002). Phonological systems are thought to be the most stable linguistic feature, and phonetic transfers from L1 and L2 are typical (Odlin, 1989). Even though modern teaching and learning materials are common in today's EFL classroom, the listening and speaking performance of the learners has not been significantly improved (e.g., Ministry of Education, Culture, Sports, Science and Technology, 2002). One factor for this is the increasing influence of loanwords. English diphthongs will be transcribed as the corresponding monophthongs that have the closest phonetic properties to the onset of the target English diphthongs plus prolongation in Japanese. Modern learners likely bring the internalized sounds back to their English speech (Saito, 2000; Spada & Lightbown, 2002). This tendency is observed in ESP classes featuring information technology, where most of the vocabulary is comprised of loanwords. This perspective, however, has not been fully analyzed. EFL teachers in Japan should lead their students to awareness of this.

Conclusions

The closing diphthong /ou/ is one of the most difficult phonemes to learn for Japanese EFL learners. Their ability to pronounce it correctly has not improved despite the development of methodologies in phonetics. In addition to the differences in phonological systems between English and Japanese, the increasing number of loanwords from English into Japanese affects improvement in accent. Today, we can see many loanwords written with phonetic Katakana scripts in computer-related documents. Japanese students may transfer such imprinted sounds into their English speech: a monophthong plus its prolongation instead of the diphthong. EFL researchers should to investigate this to meet large needs of effective lessons on loanwords.

References

Akinaga, K. (2002). *Tokyo-go no hatsuon to yure*. (In Japanese) Tokyo: Meiji Shoin.

Ando, K. (1998). Katakana English and English education (2). (In Japanese) *Journal of Science of Culture and Humanities, Nagoya Economics University and Ichimura Gakuen Junior College*, *61*, 1-23.

Asai, A. (2003). Aural perception and descriptive production by L1: Methodological application. *Proceedings of JALT 2003*, pp. 489-495.

Asai, A. (2004). Influences of recent loanwords. Paper presented at PAC5 (Proceedings in printing), Far Eastern State University, Vladivostok.

Asai, A., Ishikawa, Y., & Se, M. (forthcoming). A study on loanwords in IT contexts. (In Japanese) *Proceedings of the 15th Conference of the Japan Association of Sociolinguistic Sciences*, March 2005, Tokyo.

Blair, R. (1991). Innovative approaches. In Celce-Murcia, M. (ed). *Teaching English as a second or foreign language*, p. 29. Boston, MA: Heinle & Heinle.

Delattre, P., Liberman, A. M., Cooper, F. S., & Gerstman, L. J. (1952). An experimental study of the acoustic determination of vowel color, *Word*, *8* (3), 195-210. Flege, J. E., & MacKay, I, R. (2004). Perceiving vowels in a second language. *SSLA*, *26*, 1-34.

Flemming, E. (2002). *Auditory representations in phonology*. NY: Routledge.

Gussenhoven, C., & Jacobs, H. (1998). *Understanding phonology*. London: Arnold.

Han, Z. H. (2004). *Fossilization in Adult Second Language Acquisition*. Clevedon, UK: Multilingual Matters.

Hoffer, B. (1990). English loanwords in Japanese: Some Cultural Implications. *Language Sciences, 12* (1), 1-21. Hogg, R., & McCully, C. B. (1987). *Metrical phonology*. Cambridge: Cambridge University Press.

Inoue, F. (2002). *Seiyo-go no hatsuon no eikyo*. (In Japanese) Tokyo: Meiji Shoin.

Ito, M., Tsuchida, J., & Yano, M. (2001). On the effectiveness of whole spectral shape for vowel perception. *J. Acoust. Soc. of Am*, *110* (2), 1141-49.

Jinnouchi, M. (2003). Gairaigo no kadai to shoraizo. (In Japanese) *Nihongogaku*, *22* (8), 12-18.

Kakita, N., & Oka, H. (1984). *Eigo no speaking*. (In Japanese) Tokyo: Taishukan.

Kubozono, H. (1995) *Gokeisei to on-in kozo*. (In Japanese) Tokyo: Kurosio.

Ministry of Education, Culture, Sports, Science and Technology. (2002). Developing a strategic plan to cultivate "Japanese With English Abilities." Press release, July 12. Tokyo: Ministry of Education, Culture, Sports, Science and Technology of Japan.

Miyawaki, K., Strange, W., Verbrugge, R., Liberman, A. M., & Jenkins, J. J. (1975). An effect of linguistic experience: the discrimination of [r] and [l] by native speakers of Japanese and English. *Perception and Psychophysics*, *18*, 331-340.

NIJL. (1962). *Gendai zasshi 90 shu no yoji yogo I*. (In Japanese) Tokyo: National Institute for Japanese Language, Shuei Shuppan.

NIJL. (1964). *Gendai zasshi 90 shu no yoji yogo III*. (In Japanese) Tokyo: National Institute for Japanese Language, Shuei Shuppan.

NIJL. (1995). *Terebi hoso no goi chosa I*. (In Japanese) Tokyo: National Institute for Japanese Language, Shuei Shuppan.

Odlin, T. (1989). *Language transfer*. Cambridge: Cambridge University Press. Oguri, K. (1969). *Eigo onseigaku*. In Japanese [English phonetics]. Tokyo: Shinozaki Shorin.

Otaka, H. (2004). Negative effects of pre-nasal shortening on listening to English. *Proceedings of the 9th Annual Conference of the English Phonetic Society of Japan*, pp. 37-44, Kwansei Gakuin Univ.

Prince, A., & Smolensky, P. (2004). *Optimality theory*. Malden, MA: Blackwell.

Saito, A. (2000). *Eigo hatsuon ha nihongo de dekiru*. (In Japanese) Tokyo: Chikuma Shobo.

Selkirk, E. O. (1984). On the major class features and syllable theory. In Aronoff, E., & Oehrle, R.T. (eds). *Language Sound Structure*, pp. 107-136. Cambridge, MA: MIT Press.

Shimaoka, T. (1996). "Kikitori noryoku" wo dou tsuke saseru ka. (In Japanese) *Eigo kyoiku. 7*, 8-10.

Spada, N. & Lightbown, P. M. (2002). Second language acquisition. In Schmitt, N. (ed) *An introduction to applied linguistics*, pp.124-126. London: Arnold.

Steinberg, J. D. (1996). Lexical Borrowing and Modernization in China and Japan. Ph.D. dissertation, UCLA.
Takahashi, Y. (1987). Language Universals and Transfer Effects: Acquisition of English Vowel Durations by Japanese Learners. Ph.D. dissertation, Stanford University.
Takebayashi, S. (1996). *Eigo onsei-gaku*. In Japanese [English phonetics]. Tokyo: Kenkyusha.

Venneman, T. (1972). On the theory of syllable phonology. *Linguistische Berichte*, *18*, 1-18.

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