

Can a Non-Native Speaker Train Students in English Phoneme Acquisition? A Classroom Study

Kayoko Kase and James C. Jensen

Abstract

This paper reports on an ongoing study investigating whether the techniques proven to be successful in previous studies conducted by native-English speakers can be replicated in a class conducted by a native Japanese-speaking teacher. Native Japanese-speaking students were trained on two English minimal pairs. Two research questions were asked: 1) To what extent can the success of perceptual training studies conducted by a native English speaker be replicated by a non-native teacher using an audio device? 2) How will students react to the training? The effectiveness of the training was measured by pre-training and post-training tests. The results of the testing showed that clear gains were made. The questionnaire showed that the learners believed instruction on phoneme perception to be valuable.

Keywords: phoneme acquisition, classroom study

The hypothesis that there is a critical period for first language acquisition has played an important role in second language teaching pedagogy for decades. Lennenberg (1964) asserted that the crucial period of language acquisition was completed around puberty. This notion, along with Krashen's (1982) position that the ability to perceive non-native phonemes will progress naturally, through exposure to the target language, contributed to a marginalizing of phoneme acquisition training. These necessary listening skills, it was believed, would be picked up implicitly and within a certain time frame.

Since the 1960s, several studies have shown that training adults can lead to improvement in the discrimination of nonnative phonemic contrasts (Strange & Dittmann, 1984; Bradlow, Akahane-Yamada, 1999; Zhang, Kuhl, Imada, Kotani & Tohkura, 2005). These training studies, among others, have provided important empirical data for reevaluating the "critical period" hypothesis. In conducting this training study, the authors consider this "reevaluated" critical period. The authors also argue that being explicit (Spada, 1977) and raising student awareness (Sharwood Smith, 1981), techniques which have proven successful in teaching other aspects of a second language, are equally important for acquiring the ability to perceive non-native phoneme contrasts. For such explicitness, moreover, an understanding of the first language (L1) phonology (which non-native English speaking teachers may share with their students) should be recognized as a strength to be built upon.

This paper is a preliminary report on an ongoing study investigating whether the techniques proven to be successful in previous studies can be replicated in a class conducted by a native Japanese-speaking teacher. Native Japanese-speaking students were tested and trained on two English minimal pairs that are non-existent in Japanese. Two research questions were asked:

- 1) To what extent can the success of perceptual training studies conducted by a native English speaker (NS) be replicated by a non-native (NNS) teacher using an audio device?
- 2) How will students react to the training?

The effectiveness of the training was measured by pre-training and post-training tests. The training was carried out over a 15-week semester and the students' reaction to the instruction was gauged by a questionnaire. The results of the testing showed that clear gains were made. The questionnaire showed that the learners believed instruction

on phoneme perception to be valuable.

Importantly, we are not interested in the specific details of what caused our success. We are interested on the big picture. To that end, we do not try to tease out to what degree the various elements of the training were effective. It could be the native speakers on the CD; it could be the pairwork activities. The fact that the teacher shares the students' L1, so could empathize with students' struggles and had "inside knowledge" of their problems, may play a role. We suppose it was a little of all these factors.

Our aim, however, was to show that a NNS can improve adult students' perception and there are elements of this study that are unique. There have been other studies, like the aforementioned ones, but most were conducted in labs with volunteer subjects and / or in a country where English is the common language. There have been a few classroom studies conducted by NS teachers in an English as a Foreign Language (EFL) setting. To our knowledge, however, we are one of the first to show that a NNS teacher can be successful with post-puberty students in a natural EFL class environment.

This article will briefly discuss why such training is important. The article will then discuss the best methods for improving student's perceptive abilities. Finally, it will describe the classroom study.

The Literature

Why Teach Segmentals?

There are a number of arguments supporting explicit phoneme acquisition training. One is the link between perception and production. A slightly dated review of the studies supporting the argument that the development of L2 perception precedes that of production can be found in Llisterri (1995). A more recent argument making the same claim is that of Escuerdo (2005). After considering studies that may contradict the fact that L2 perception develops before production, Escudero (2005) concludes that such studies had "experimental shortcomings," and that from the "weight of the evidence it can be concluded that perception develops first and needs to be in place before production development can occur" (p. 3).

Another reason supporting explicit training in phonemic acquisition is that phoneme acquisition "bootstraps" and improves other language skills. A recent study suitably titled, "Phonetic Training Makes Word Learning Easier" (Perfors & Dunbar,

2010) indicates that training on novel phonetic contrasts improves word learning. Werker & Yeung (2005), in another poignantly titled article, “Infant Speech Perception Bootstraps Word Learning,” show that phoneme perception abilities are related to later word learning in young children.

To understand how the ability to distinguish phonemes aids in word learning, the authors refer to yet another relevantly titled article, “The Phonological Loop as a Language Learning Device” (Baddeley, Gathercole, & Papagno, 1998). In this article the phonological loop is understood to be an element of short-term memory’s executive control mechanism. It stores speech sounds in their temporal order. A detailed explanation of this mechanism is beyond the scope of this paper but a pertinent quote should be sufficient in pointing out its possible importance to learning a second language:

A review of studies of word learning ... provides evidence that the phonological loop plays a crucial role in learning the novel phonological forms of new words, suggesting that the phonological loop stores unfamiliar sound patterns while more permanent memory records are constructed. (p. 1)

Also, and perhaps the most compelling reason to teach phoneme acquisition is the work of Jennifer Jenkins (2000). Jenkins, who has compiled what is perhaps the largest body of data concerning communication between two NNSs, concluded that mistakes at the segmental level were the biggest source of communication problems. That is, errors on the segmental level cause more breakdowns in communication than errors on the supra-segmental level when both speakers are NNS. Given the status of English as a global language and the possibility that our students are as likely to be using English with other NNS as they are NS, some work of improving phoneme perception is more than reasonable.

Lastly, teaching pronunciation fits into what the students, particularly in Asia, may expect. In societies where teacher-centered classes are the norm, teacher-directed practice might be familiar, and well understood-in terms of goals.

How to Teach Segmentals

Second or foreign language learners cannot hear all the sounds of the language they are learning (Kuhl, 2000). Kuhl and her colleagues, in collaboration with NTT Labs in Tokyo, proved neural plasticity remains well past puberty, however, and improved the ability of Japanese university students to distinguish /r/ from /l/ (Zhang et al., 2005). The salient point they made is that the students had to be able to hear the sounds to learn them.

Signal Enhancement

The inability to hear non-native phonemes necessitates explicit training. Explicit teaching, or at least some type of signal enhancement, is the best if not the only way EFL students will ever learn to perceive difficult L2 phonemes. It is extremely doubtful they will pick these sounds up from natural communication. McCandliss et al. (2002) demonstrated the problem experimentally. They predicted that subjects who receive exposure to stimuli perceived as the same, that is contrastive phonemes they could not distinguish, would fail to benefit from training, even with hundreds of exposures. In accord with this prediction, subjects trained on stimuli that were difficult for them to discriminate showed no evidence of learning after three days of training. Subjects who received exposure to stimuli that they could discriminate, exaggerated stimuli, “showed considerable gains in both identification and discrimination” (p. 93). In short, the input had to be contrasted and enriched, that is exaggerated, so the learners could hear and distinguish them.

There are, as one might expect, exceptions. There are studies that seem to contradict McCandliss and the authors’ claim that explicit instruction is necessary. There are studies (Yamada & Tokura, 1991; Flege, Takagi & Mann, 1996; Flege bohn & Jang, 1997) that show, for example, that length of exposure to non-native contrasts can implicitly influence perception abilities. These studies, however, were conducted in ESL settings, in countries where English is widely spoken. The amount of input the subjects received is far greater than what most EFL students receive.

High Variability

Another point confirmed by previous studies (for a review see Lively & Pisoni, 1995) is that exposure to multiple speakers, “high variability,” as it is called, seems to be

an effective way to increase perceptual learning and to ensure that the learning generalizes to novel (never before heard) listeners (Zhang, et al., 2005). The CDs used in the training described in this study employed the above mentioned techniques: contrast, emphasis and high variability.

The Study

Participants

The participants of this study were 103 Japanese speaking first-year students in a Japanese university. They were members of four intact university English classes. The classes had been streamed so the students were judged to be at the same overall level of proficiency. The levels ranged from low to lower-intermediate. Three of the classes were trained on the phonemic contrasts while one group of 24 students did not receive any training. The group of 24 is the control group.

Pre-training Test

Two contrasts were tested, a vowel contrast and a consonant contrast: /a - ʌ/ and /b - v/. The pre-test and post-test were recorded by a native speaker of American English. The test was given on the first day of class; all students were present. The students were told they were participating in a study and that the test would have no effect on their grade for the class. The test sheet can be found in the Appendix.

Training

As previously noted, a number of studies have shown the positive effects training has on the perception of individual phonemes. The aim of this study, however, was to find evidence for the effectiveness of classroom instruction by a NNS teacher. Our beliefs setting out were that because knowledge of the phonologies and phonetics of both languages is helpful, NNS teachers might have certain strengths when it comes to training L2 perception. Also, a NNS teacher who struggled with the sounds of English might be better able to help learners with their own struggles. A NNS teacher, moreover, has had first hand experience with what is or is not intelligible so may be better able to judge what constitutes acceptable performance from his or her learners. Informed by these ideas, the teacher explained the articulation of the sounds and contrasted them with Japanese.

The teacher met with the students twice a week, on Mondays and Thursdays over the course of a 15-week semester. On Mondays the students heard a CD with the same phonemic contrasts as on the test but using different words and sentences. The pairs of contrasts were recorded with emphasis to make them salient and a number of different voices were used to achieve high variability. Listening to the CD took five to ten minutes. After listening and repeating, the students would work in pairs, one student saying the words and the other guessing whether it was A or B. They then changed roles.

Post-training Test

The post-training test was exactly like the pre-training test. Again, it was anonymous and all students were present.

Results

Substantial improvement in phoneme discrimination was made in all contrasts. The total number of correct responses increased 23.5% from the pre-test to the post-test. By way of comparison, the control group, who did not receive the training, achieved negligible gains of 2.4%. The results of ANOVA tests run on the pre-tests / post-test scores of both groups confirm the statistical significance of the improvement. The gains in the subject groups were statistically significant allowing us to reject the null hypothesis ($df=23$; $p=.00024$; $\alpha=0.05$; $F=19.11$, $F_{crit}=4.30$). The ANOVA results on the control group, however, showed no statistically significant changes in the pre-test / post-test scores ($df=23$; $p=0.532$; $\alpha=0.05$; $F=0.40$, $F_{crit}=4.30$). We cannot reject the null hypothesis with the control group.

This suggests that appropriately focused instruction by a non-native teacher can lead to changes in learners' phonological architecture. The results are recorded in Table 1.

Table 1. The Number of Correct Responses for the Subject Group (n=79)

Correct/ Contrasts	Pre-test # correct	Post-test # correct	Increase in correct responses
1. Drug/Drag	49	66	+ 17 = 21.5%
2. Much/Match	36	72	+ 36 = 45.5%
3. Butter/Batter	44	72	+ 28 = 35.4%
4. Base/Vase	58	77	+ 19 = 24%
5. A bit/Avid	68	79	+ 11 = 13.9%
6. Our staff/stuff is there.	57	64	+ 7 = 8.8%
7. We cut those vines/bines.	55	68	+ 13 = 16.4%
8. I run/ran in the park.	63	67	+ 4 = 5%
9. Hat/Hut	63	66	+ 3 = 3.7%
10. It's my best/vest.	38	72	+ 34 = 43%
11. Look out for the curb/curve.	22	61	+ 39 = 49%
12. That is a big cat/cut.	55	67	+ 12 = 15.1%
Totals	608	831	+ 223 = 23.5%
Mean	50.6	69.25	+ 18.6 = 23.5%

The results for the control group are recorded in Table 2.

Table 2. Number of Correct Responses for the Control Group (n=24)

Correct/ Contrasts	Pre-test # correct	Post-test # correct	Increase in correct responses
1. Drug/Drag	16	18	+ 2
2. Much/Match	14	14	0
3. Butter/Batter	16	14	- 2
4. Base/Vase	20	20	0
5. A bit/Avid	18	22	+ 4
6. Our staff/stuff is there.	18	18	0
7. We cut those vines/bines.	16	14	- 2

8. I run/ran in the park.	18	18	0
9. Hat/Hut	14	16	+ 2
10. It's my best/vest.	14	16	+ 2
11. Look out for the curb/curve.	17	16	- 1
12. That is a big cat/cut.	14	16	+ 2
Totals	195	202	+ 7= + 2.4%
Mean	16.2	16.8	+ .6=.025%

The second part of this study was a survey of the students' opinions regarding the training. A four-part question was added to a class questionnaire. It was given apart from any specific activities and covered other aspects of the class. The question took the following form:

Minimal Pair Exercises

Useful

Enjoyable

Helpful

Important

The results were overwhelmingly positive. The students were asked to rank different elements of the training from 1 to 5 with 5 being the highest. If 4 and 5 are considered positive reactions, 74% of all responses were positive. If 1 and 2 can be considered negative responses, there were only 17 in total; that is 5.3%. Table 3 shows the numbers.

Table 3. How the Students Ranked Each Category (n=24)

Rank (1-5) / Category	1	2	3	4	5
Useful	0	0	17	32	29
Helpful	0	3	11	22	43
Enjoyable	2	9	29	28	11
Important	1	2	6	16	54

Note. 5 is the highest

Discussion

From the data it can be stated that the success of other phoneme acquisition training studies was replicated in an EFL class conducted by a native Japanese teacher. It can also be stated that the students found the instruction valuable.

One limitation of this study is the number of tokens. A larger set of minimal pairs needs to be incorporated; a set that uses 12 pairs for two contrasts is too limiting. More pairs that place the contrasting phonemes into more phonetic contexts would be informative and might enhance the possibility of teasing more nuances from the data. This is an ongoing study, however, and the authors will incorporate more sounds in the future. The aforementioned limitation aside, this study has shown that the success of native speakers in training Japanese students to perceive English phonemes can be achieved by a native speaking Japanese teacher as well.

The second research question dealt with the students' attitudes toward exercises that focus on phoneme acquisition. The results were positive but one may suspect some element of subject expectancy in the overwhelmingly positive result. That may be the case, although every effort was made to control such a variable. The questionnaire included questions about other aspects of the class and it was given on the day of the final test. There were no listening activities that day so there was no temporal connection between the questionnaire and the exercises it inquired about.

Concluding Remarks

Clearly, caution must be exercised when drawing conclusion about a study the size of this one. Nonetheless, this study is noteworthy because it was conducted by a NNS teacher. That phoneme perception can be improved in an EFL classroom had been previously demonstrated, but the fact that a NNS teacher can be successful is of particular interest. In the studies conducted by native speakers one cannot be sure that the phoneme acquisition did not occur implicitly, by exposure to the native speaker's normal classroom language. In this study, because the teacher was a non-native speaker, we show that the improved acquisition is more than likely due to the explicit training.

It is often assumed that native speakers are better suited to teach certain aspects of English just by being native speakers. Inversely, NNS are sometimes considered naturally poorer instructors in certain areas of instruction. This study shows that with the help of audio devices, NNS teachers can use their knowledge of both languages and

their understanding of the problems the students are facing to their advantage and be successful at training students in phoneme acquisition.

References

- Baddeley, A., Gathercole, S., Papagno, C. (1998). The phonological loop as a language learning device. *Psychological Review*, 105.
- Bradlow, A. R., Akahane-Yamada, R., Pisoni, D. B., & Tohkura, Y. (1999). Training Japanese listeners to identify English /r/ and /l/: Long-term retention of learning in perception and production. *Perception & Psychophysics*, 61 (5). Retrieved Nov. 2008. from <http://babel.ling.northwestern.edu/~abradlow/bradlow-etal-rl5-p&p99.pdf>
- Escudero, P. (2005). *Linguistic perception and second language acquisition*. Retrieved. 2010. from: http://www.fon.hum.uva.nl/paola/escudero_PhDmanuscript_final.pdf
- Flege, J. E., Bohn, O.-S., & Jang, S. (1997). Effects of experience on non-native speakers' production and perception of English vowels. *Journal of Phonetics*, 25, 437-470.
- Fledge, J. E., Takagi, N., & Mann, V. (1995). Japanese adults can learn to produce English /r/ and /l/ accurately. *Language and Speech*, 38, 25-55.
- Jenkins, J. (2000). *The Phonology of English as an International Language*. Oxford University Press, Oxford.
- Kuhl, P. K. (2000). A new view of language acquisition. *Proceedings of the National Academy of Science*, 24, 11850-11857.
- Llisterri, J. (1995). *Relationships between speech production and speech perception in a second language*. Retrieved Dec. 20, 2008. from http://liceu.uab.es/~joaquim/publicacions/Prod_Percep.html
- Lively, S., & Pisoni, D. (1995). Variability and invariance in speech perception: A new look at some old problems in perceptual learning. In W. Strange (Ed.), *Speech perception and linguistic experience; Issues in cross-language research*, 433-459, Baltimore: York Press.
- McCandliss, B. D., Fiez, J. A., Protopapas, A., Conway, M., & McClelland, J. A. (2002). Success and failure in teaching the [r]-[l] contrast to Japanese adults:

- Tests of a Hebbian model of plasticity and stabilization in spoken language perception. *Cognitive, Affective, & Behavioral Neuroscience*, 2 (2), 89-108. Retrieved June 10, 2008. from <http://www.cnbc.cmu.edu/~jlm/papers/McCandlissETAL02.pdf>
- Sharwood Smith, M. (1981). Consciousness-raising and the second language learner. *Applied Linguistics*, 2, 159-169.
- Spada, N. (1997). Form-focused instruction and second language acquisition: A review of classroom and laboratory research. *Language Teaching*, 30, 73-85.
- Strange, W., & Dittmann, S. (1984). Effects of discrimination training on the perception of r / l/ by Japanese adults learning English. *Perception and Psychophysics*, 36, 131-145.
- Perfors, A., & Dunbar, D. (2010). Phonetic training makes work learning easier. *Proceedings of the 32nd Annual Conference of the Cognitive Science Society*.
- Werker J. F. & Yeung, H. H. (2005). Infant speech perception bootstraps word learning. *Trends in Cognitive Science*. 9 (11).
- Yamada, R. A., & Tohkura, Y. (1991). Perception of American English /r/ and /l/ by native speakers of Japanese. In Y. Tohkura, E. Vatikiotis-Bateson, & Y. Sagisaka (Eds.), *Speech perception, production and linguistic structure* (pp. 155-174). Tokyo: Ohmsha.
- Zhang, Y., Kuhl, P., Imada, T., Kotani, M., & Tohkura, Y. (2005). Effects of language experience: Neural commitment to language-specific auditory patterns. *NeuroImage*, 26, 703-720.

Appendix

Day: _____ Time: _____	
Check the letter of the word or words you hear.	
(1) a. drug b. drag	(2) a. much b. match
(3) a. butter b. batter	(4) a. base b. vase
(5) a. a bit b. avid	(6) a. Our staff is there. b. Our stuff is there.
(7) a. We cut those vines. b. We cut those bines.	(8) a. I run in the park. b. I ran in the park.
(9) a. hat b. hut	(10) a. It's my best. b. It's my vest.
(11) a. Look out for the curb. b. Look out for the curve.	(12) a. That is a big cat. b. That is a big cut.