Effects of web-based HVPT on EFL learners' recognition and production of L2 sounds

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Abstract. In English as a Foreign Language (EFL) situations, it is important for educators to improve learners' sound recognition skill due to the variation of English found in the world. Furthermore, perceptual skill is a foundation leading to intelligibility in production. This study examined the effects of using High Variability Phonetic Training (HVPT) in computer assisted pronunciation training on the recognition and production of English phonemes, which are challenging for Japanese learners of English. Between pre-, mid-, and post-tests, the learners completed training sessions three times a week in two sound environments. The results demonstrated improvement in recognition skill with larger effects immediately after training. For production skill, however, the effects were not large, with a mixed outcome against the improvement in perception. Further research is suggested under a condition in which articulation practice immediately follows identification of individual training items.

Keywords: pronunciation, HVPT (high variability phonetic training), computer assisted pronunciation training.

1.   Introduction

HVPT is a training method for learners to perceive L2 sounds produced by multiple talkers in multiple phonetic contexts, which has been applied to language programs for a variety of L1 due to its effectiveness and generalizability (Thomson, 2018). HVPT has been proven effective in helping learners to distinguish L2 sounds that are confusing due to their similarity to L1 sounds (Munro & Derwing, 2006). This perceptual training approach has also led to improvement in learner production by

way of better intelligibility scores (Bradlow, Akahane-Yamada, Pisoni, & Tohkura, 1999).

While numerous studies have examined the efficacy of HVPT for training Japanese listeners to perceive English /l/ and /r/ contrasts (Bradlow et al., 1999; Logan, Lively, & Pisoni, 1991, among many others), we are only aware of such studies being conducted in highly controlled phonetic laboratories. Further, with few exceptions, most studies have not examined whether this training transfers to production (Thomson, 2018). Finally, previous /l/-/r/ studies for Japanese learners focus on a binary distinction, which fails to recognize that English /r/-/w/ are also known to be confusable (Guion, Flege, Akahane-Yamada, & Pruitt, 2000).

In this study, Thomson's (2017) *English Accent Coach* is used because it comprises thirty distinct talkers for each sound in each phonetic context and has been gamified to make it more interesting to learners. The research questions are:

- What are the effects of HVPT on **perception of English /l/-/r/-/w/ contrasts** over time in different phonetic environments?

- What are the effects of HVPT on **production** of the same sounds over time in different phonetic environments?

- What is the relationship between perception and production?

2.   Method

2.1.   Participants

The learners who agreed to participate in this research were freshman non-English majors in a university in Tokyo. They were enrolled in compulsory English courses consisting of two classes: Class A and Class B. By eliminating those who scored 100% on the pre-test and those who could not take all the tests, 30 students were eligible for data analysis: Class A (*n*=13; four males and nine females) and Class B (*n*=17; 11 males and six females). According to their TOEIC[3] listening scores (Class A, *M*=363.5, *SD*=48.5; Class B, *M*=277.2, *SD*=56.6), their English proficiency

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could be categorized as B1 in CEFR[4] levels based on the score bands provided by the test provider, the Institute for International Business Communication.

2.2. Treatment

A pre-test and post-test design was adopted for a ten-week treatment period during the fall semester in 2017. During training, the target sounds were presented either in Consonant + Vowel (CV) environments or Consonant + Vowel + Consonant (CVC) environments, while the test stimuli utilized 100 CV items consisting of the three target consonants randomly followed by a vowel, such as /li/, /ru/ or /wa/. The sound combinations were also randomized as were the thirty talkers' stimuli. Mid-tests were conducted after five weeks only for perception. In the first and the tenth week, the participants' production was recorded by having them produce target items in the carrier phrase: "Now I say _____ ." (Thomson, 2012).

Training comprised three 200-item perceptual training sessions per week. Over the ten weeks, Class A learners were trained to perceive the English consonants in syllable-onset position in CV frames for the first five weeks, up to mid-test, followed by CVC frames for another five weeks and post-test. Class B was trained in the opposite order. In each of the classes they practiced first round of training in a week and assigned to do the rest during the week. They submitted three PDF feedback forms through Sakai, a course management system, every week. The researcher asked them to complete only one training session on a given day (i.e. they could not do multiple sessions back-to-back).

3. Results and discussion

3.1. RQ1: effects of HVPT on recognition over time

The means of the tests for the two classes exhibited medium and large effect sizes between pre- and post-tests (CV : Cohen's d=.78; CVC d=.58, Table 1). In both of the phonetic environments, HVPT training showed immediate positive effects and persistence (CV: pre- to mid-test in Class A, d=.46 ; mid- to post-test in Class B, d=.74). These results seem to be in accordance with the results of Logan et al. (1991) in that the linguistic environments for HVPT training makes a difference. In

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addition, the CVC environment showed higher average scores than CV. The CVC stimuli, even non-words, may have sounded more word-like than the CVs.

Table 1. Mean of correct percentages (SD) in perception tests of CV and CVC environments

	CV tests %			CVC tests %	
	Pre	**Mid**	**Post**	**Mid**	**Post**
Class A	73.2 (17.5)	83.2(12.6)	83.7 (10.9)	87.3 (7.3)	96.9 (2.5)
Class B	68.6 (10.7)	73.4 (11.4)	84.5 (9.7)	94.6 (3.2)	94.1 (2.9)
Total	70.6 (14.1)	77.8 (12.7)	84.1 (10.1)	91.3 (6.1)	95.3 (3.2)

Among the three target phonemes, identification of /r/ was the lowest (50%), followed by /l/ (64%) and /w/ (90%) in the CV pre-test. However, the largest progress was made immediately after the training (30% in both environments). In comparison, /l/ made a maximum progress of 19% in CV and 12% in CVC. The sound of /w/ had high scores in the beginning (90%) and reached the ceiling (99%) over a short period.

3.2. RQ2: effects of HVPT on production over time

Approximately 13% increase was observed in CV and CVC production tests between pre- and post-tests (d=.44). Particularly, Class B showed larger progress both in CV and CVC environments with more than a 20% increase (Table 2). This positive transfer follows the findings of Bradlow et al. (1999) that perception-only training improves production. HVPT may have exerted more influence on learners at an intermediate level of L2 English rather than those at a higher level.

It was also found that the order of sound difficulty was the same as for perception. In addition, larger progress was observed in /l/ and /r/ in CVC than in CV. These similarities to perception may represent the distance between their L1 and L2 (Munro & Derwing, 2006).

Table 2. Mean of correct percentages (SD) in production tests of CV and CVC environments

	CV test %		CVC test %	
	T1	**T3**	**T1**	**T3**
Class A	59.8 (15.4)	62.4 (22.3)	65.4 (13.1)	65.0 (22.6)
Class B	53.5 (35.6)	74.3 (23.2)	54.5 (22.1)	78.1 (17.5)
Total	56.3 (33.7)	69.0 (24.1)	59.4 (20.0)	72.2 (22.6)

3.3.   RQ3: relationship between perception and production

Pearson's correlation coefficients between the recognition test gain and the production test gain were r=-.20 in CV, and r=-.43 in CVC. The results indicate the progress in production is not necessarily made by the participants who made progress in recognition. This gap may come from the EFL situation where the learners had limited opportunities of oral communication outside the classroom, yet perceptual foundation prepares learners for production.

4.   Conclusion

This study found positive effects of HVPT in computer assisted pronunciation training on perception to a large degree, but a small degree on production. Despite the gap, it is significant for EFL learners to develop a robust acoustic image to be drawn on for production. In this sense, HVPT realized by *English Accent Coach* has a strong potential to change the paradigm of pronunciation learning and teaching in EFL environments.

5.   Acknowledgements

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