



Effects of repeating after stimuli sounds during computer assisted HVPT on Japanese learners' perception and production of English fricatives

Atsushi Iino¹ and Brian Wistner²

Abstract. This study investigated the effects of using an online High Variability Phonetic Training (HVPT) program for university students whose first language is Japanese and who studied English as a foreign language. The target sounds were English fricatives, which many of the participants felt were challenging to distinguish and articulate. The training was conducted for five weeks; each week consisted of three HVPT sessions. The training process consisted of an initial explanation of how to articulate the sounds followed by a video that showed the physical articulative movements. The participants listened to stimuli sounds, produced the sounds after each stimulus, and completed an identification task. Based on pre and posttests, the perception performance of the participants improved significantly through the HVPT training. Regarding production, a positive effect was found for one phoneme, while no difference was found for the other. Questionnaire results were generally positive but indicated the need for explicit instruction for some of the fricatives that exhibited relatively lower successful production and perception rates.

Keywords: pronunciation, fricatives, HVPT, perception, production.

1. Introduction

Among the current practices applying HVPT in English as a Foreign Language (EFL) instructional environments, a mixture of computer assisted pronunciation training and HVPT has shown positive effects in learners' second language (L2) perception and production, particularly under the condition when learners are

1. Hosei University, Tokyo, Japan; iino@hosei.ac.jp; <https://orcid.org/0000-0002-6439-5529>

2. Hosei University, Tokyo, Japan; wistner@hosei.ac.jp; <https://orcid.org/0000-0003-2774-773X>

How to cite this article: Iino, A., & Wistner, B. (2021). Effects of repeating after stimuli sounds during computer assisted HVPT on Japanese learners' perception and production of English fricatives. In N. Zoghalmi, C. Bruderermann, C. Sarré, M. Grosbois, L. Bradley, & S. Thoušný (Eds), *CALL and professionalisation: short papers from EUROCALL 2021* (pp. 149-154). Research-publishing.net. <https://doi.org/10.14705/rpnet.2021.54.1324>

required to repeat after stimuli sounds (Iino, Yabuta, & Wistner, 2020). Following this finding, the present study investigated the effects of using the same online HVPT program, English Accent Coach (EAC; Thomson, 2017), on L2 learners' recognition and production of English fricatives, which are challenging consonants for many Japanese learners of English to recognize and/or articulate (Lambacher, Martens, Nelson, & Berman, 2001). The following research questions were examined in this study: (1) what are the effects of HVPT with explicit instruction and production practice after stimuli sounds on L2 learners' perception of /f/, /θ/, /s/, /h/, and /ʃ/?; (2) under the same conditions, what are the effects of HVPT on learners' production of /f/ and /θ/?; and (3) what is the relationship between the training outcomes and the learners' reaction to the training?

2. Method

The participants were 19 first-year students (six females and 13 males) enrolled in a university in Japan. Their English proficiency level was roughly at CEFR³ B1 based on the average score of their TOEIC⁴ reading and listening test: $M=581.1$, $SD=82.2$. They took a required English course focusing on reading in the fall semester of 2019. All of the participants accepted the research conditions and signed an agreement to participate in the research.

The training was conducted for five weeks in between the pretests and posttests; each week consisted of one in-class EAC session and two more individual sessions done outside of class (Table 1). The participants were engaged in perception training with EAC in word and word-like syllable environments – i.e. target consonant plus any vowel (CV) and other 'levels' provided in EAC. Before the training began, a video that demonstrated how to articulate the target sounds was shown by the instructor. It emphasized the acoustic features of fricatives. The participants were then strongly encouraged to repeat after the stimuli sounds during EAC before responding to its forced-choice identification task. As a pretest, the participants' perception performance was measured with Level 3 (CV) training; for production, the participants read aloud seven sentences presented on slides shown on a computer display – the production performances were recorded. Two fricatives, /f/ and /θ/, were included in the sentences, which were evaluated by two native speakers of English and one nonnative (Japanese) speaker of English.

3. Common European Framework of Reference for languages

4. Test of English for International Communication

Table 1. Research procedure

N=19	Target Sounds	Pretest	Week 1 Training	Week 2 Training	Week 3 Training	Week 4 Training	Week 5 Training	Posttest	
Perception	/f/, /θ/, /s/, /h/, /ʃ/	EAC Level 3 (C+V) Correct % of FCID with 200 stimuli	EAC Level 4: initial C + all V, single syllable words	EAC Level 5: final C + all vowels, single syllable words	EAC Level 6: initial C first syllable + all V	EAC Level 7: initial C, second syllable + all V	EAC Level 8: final C + all V, second syllable	Level 3 with the same conditions as the pretest	Questionnaire
Production	/f/, /θ/	Read aloud seven sentences with 18 target sounds	Repeat aloud HVPT stimuli three sessions in each week					The same as the pretest	

3. Results and discussion

3.1. Perception

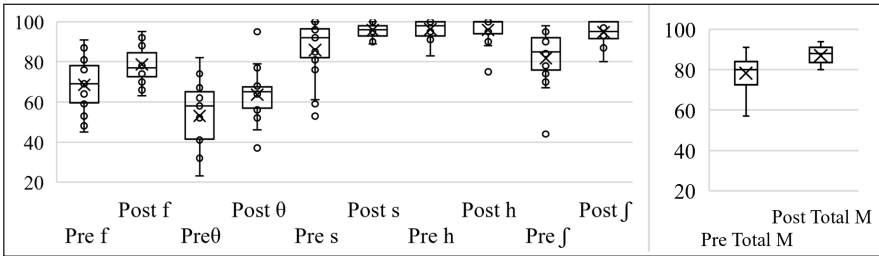
The overall results confirmed that the perception performance of the participants improved after the HVPT training with EAC (see [Table 2](#); [Figure 1](#)). Statistical significance was observed for all the sounds except for /h/, which was already 96% correct in the pretest. The progress made was about 10%, which exhibited large effect sizes. After the HVPT training, the sounds /s/, /h/, and /ʃ/ seemed easier to perceive than /f/ and /θ/. The percentage correct for those two sounds was relatively lower even on the posttest, which indicates that those sounds were difficult for Japanese EFL learners to perceive. Even with these differences in difficulty, the participants' reactions indicated that over 60% thought that the use of EAC was effective for perception, and that their listening skills improved ([Figure 3](#), Q1 and Q2). However, the amount of progress in total was smaller than that reported in [Iino et al. \(2020\)](#), in which /l/, /r/, and /w/ were examined. This result could be due to the shorter length of training (five weeks versus ten weeks) and the inclusion of five sounds instead of three.

Table 2. Descriptive statistics and analyses for /f/, /θ/, /s/, /h/, /ʃ/ perception (N=19)

	Pretest		Posttest		Post-Pre				
	M (%)	SD	M (%)	SD	M (%)	SD	Cohen's d	t-value	
f	68.53	12.6	78.63	9.5	10.11	12.7	.93	3.48	**
θ	53.00	3.8	63.58	3.0	10.58	15.7	.73	2.94	**
s	85.84	14.5	95.74	3.6	9.89	12.1	.96	3.55	**
h	96.21	4.6	95.89	6.3	0.32	6.8	.06	.20	n.s.
ʃ	81.74	12.9	94.79	5.7	13.05	2.3	1.34	4.63	**
Total	78.32	8.6	87.00	4.7	8.68	6.4	1.29	5.94	**

* p < .05; ** p < .01

Figure 1. Left: boxplots of perception rates in /f/, /θ/, /s/, /h/, /ʃ/ between pre and posttests (%; N=19); right: overall change of perception (%)



3.2. Production

The results for production of the two fricatives with lower perception rates are shown in Table 3 and Figure 2. For /f/, statistically significant progress was observed with a small effect size ($t=2.44$, $df=18$, $p<.01$, $d=.34$), while no significant progress was made for /θ/. This finding supports the relationship between perception and production – progress in production might be based on increases in perception.

Based on the questionnaire results, 38% of the participants perceived the employed explicit instruction as helpful, but 48% were not sure (Figure 3, Q5: 24%+14% agreed). Although 48% of the participants perceived the benefits of EAC on producing the segmental sounds, 29% did not (Q3). Additionally, regarding the effect on overall pronunciation (Q4), 43% expressed their uncertainty by choosing *not sure*, while a similar number found it effective (Q4, 24+19% agreed). For /f/ and /θ/, more intensive instruction and articulatory practice may be necessary. During the assessment process, it was noted among the raters that some participants replaced the Japanese voiceless bilabial /ϕ/ for /f/ and /s/ for /θ/.

Table 3. Descriptive statistics and statistical analyses for /f/ and /θ/ production (N=19)

No. of items	Pretest			Posttest			Post-Pre			Cohen's d	t-value
	M	(%)	SD	M	(%)	SD	M	(%)	SD		
/f/	9	4.45 (49.4)	3.3	5.50 (61.1)	3.0	1.05 (11.7)	1.9	.34	2.44	*	
/θ/	9	3.13 (34.8)	3.6	3.82 (42.4)	3.5	0.68 (7.6)	1.7	.20	1.79	n.s.	
Total	18	7.58 (42.1)	6.7	9.32 (51.8)	6.2	1.74 (9.6)	2.9	.28	2.63	*	

* p < .05; ** p < .01

Figure 2. Left: pre-post production for /f/ and /θ/ (raw score /9 words); right: overall pre-post production (/18)

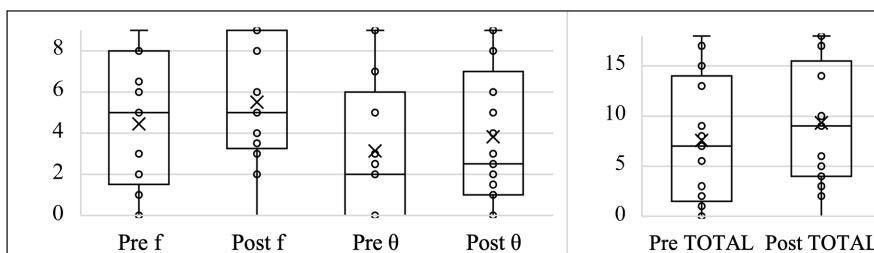
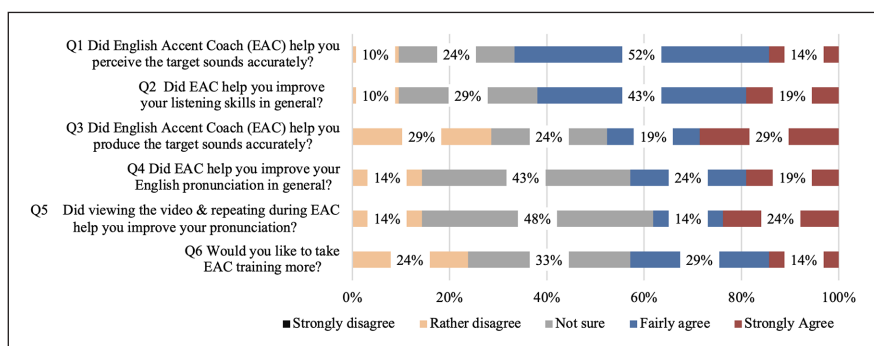


Figure 3. Results of the questionnaire on the use of EAC for perception and production (N=19)



4. Conclusion

The overall results of the training indicated positive effects of HVPT on L2 learners' perception of the target fricatives. This finding supports the idea that incorporating such training inside and outside of the L2 classroom could be beneficial for

improving L2 phonemic perception skills. To further investigate the effectiveness on production, focus-on-form pronunciation instruction could be utilized in class, through which learners pay attention to target sounds after engaging in meaning-focused communicative activities.

5. Acknowledgments

This work was supported by JSPS KAKEN Grant No. 20K00785 (Principal Investigator: Atsushi Iino; Co-Investigator: Brian Wistner).

References

- Iino, A., Yabuta, Y., & Wistner, B. (2020). Effects and users' reactions to the use of CAPT and HVPT on Japanese EFL learners' segmental perception and production. In K.-M. Frederiksen, S. Larsen, L. Bradley & S. Thoušny (Eds), *CALL for widening participation: short papers from EUROCALL 2020* (pp. 107-113). Research-publishing.net. <https://doi.org/10.14705/rpnet.2020.48.1173>
- Lambacher, S., Martens, W., Nelson, B., & Berman, J. (2001). Identification of English voiceless fricatives by Japanese listeners: the influence of vowel context on sensitivity and response bias. *Acoustical Science and Technology*, 22(5), 334-343. <https://doi.org/10.1250/ast.22.334>
- Thomson, R. (2017). *English accent coach* [Computer software]. Version 2.3. www.englishaccentcoach.com

Published by Research-publishing.net, a not-for-profit association
Contact: info@research-publishing.net

© 2021 by Editors (collective work)
© 2021 by Authors (individual work)

CALL and professionalisation: short papers from EUROCALL 2021

Edited by Naouel Zoghلامي, Cédric Brudermand, Cedric Sarré, Muriel Grosbois, Linda Bradley, and Sylvie Thouéšny

Publication date: 2021/12/13

Rights: the whole volume is published under the Attribution-NonCommercial-NoDerivatives International (CC BY-NC-ND) licence; **individual articles may have a different licence.** Under the CC BY-NC-ND licence, the volume is freely available online (<https://doi.org/10.14705/rpnet.2021.54.9782490057979>) for anybody to read, download, copy, and redistribute provided that the author(s), editorial team, and publisher are properly cited. Commercial use and derivative works are, however, not permitted.

Disclaimer: Research-publishing.net does not take any responsibility for the content of the pages written by the authors of this book. The authors have recognised that the work described was not published before, or that it was not under consideration for publication elsewhere. While the information in this book is believed to be true and accurate on the date of its going to press, neither the editorial team nor the publisher can accept any legal responsibility for any errors or omissions. The publisher makes no warranty, expressed or implied, with respect to the material contained herein. While Research-publishing.net is committed to publishing works of integrity, the words are the authors' alone.

Trademark notice: product or corporate names may be trademarks or registered trademarks, and are used only for identification and explanation without intent to infringe.

Copyrighted material: every effort has been made by the editorial team to trace copyright holders and to obtain their permission for the use of copyrighted material in this book. In the event of errors or omissions, please notify the publisher of any corrections that will need to be incorporated in future editions of this book.

Typeset by Research-publishing.net

Cover Theme by © 2021 DIRCOM CNAM; Graphiste : Thomas Veniant
Cover Photo by © 2021 Léo Andres, Sorbonne Université
Cover Photo by © 2021 Sandrine Villain, Le Cnam
Cover Layout by © 2021 Raphaël Savina (raphael@savina.net)

Fonts used are licensed under a SIL Open Font License

ISBN13: 978-2-490057-97-9 (PDF, colour)

British Library Cataloguing-in-Publication Data.
A cataloguing record for this book is available from the British Library.

Legal deposit, France: Bibliothèque Nationale de France - Dépôt légal: décembre 2021.