論文

# The Effect of Contents Shadowing on English Sound Perception for Japanese English Learners

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## 1. Introduction

English shadowing training requires students to repeat auditory input speech immediately after listening to the speech. This training has gotten more attention in the field of English education as an effective method to improve the English listening ability of Japanese EFL (English as a Foreign Language) learners (Tamai, 2005). The listening comprehension process consists of phonological, lexical, syntactic, semantic, and pragmatic processing; the shadowing training improves sound processing skills. Kadota (2007) argued that shadowing training facilitates automatic perception of input speech because the repeating process helps update their speech database in their long-term memory. Their Japanese-like English sounds can be converted into more native-like English sounds. In addition, shadowing training enables learners to perceive not only individual English sounds level but also the prosody level (i.e. rhythm). In fact, Hori (2008) and Miyake (2009) revealed that repeated shadowing improved their originally narrow pitch range to the pitch range of native English speakers. Furthermore, their research showed that shadowing training increases rehearsal efficiency in the phonological working memory. Tamai (2005) and Hori (2008) indicated that shadowing training could accelerate the articulation rate measured by how many words or syllables could be read aloud within a limited amount of time. This effectiveness of rehearsal efficiency by shadowing training was also supported by the neuroimaging study using near-infrared spectroscopy(NIRS) (Kadota et al, 2015). These studies showed that shadowing training is a significantly more cerebral activity than listening training in regions, such as the Broca's area. There is also a significant increase in reading speed after shadowing training compared to after listening training (Kadota et al, 2016). In this way, previous studies have demonstrated that shadowing training improves English sound processing abilities.

However, these previous studies did not demonstrate clearly how to employ shadowing, including to which aspects (i.e., phonological, lexical, semantic, syntactic, or pragmatic aspect) English learners should pay attention during shadowing training. Shadowing is often classified into two types: prosody shadowing and contents shadowing. Prosody shadowing requires learners to pay attention to input sounds; they should heed English individual sounds and to the language melody aspects, such as pitch, intensity, and pause to improve their English perception skills. Contents

shadowing requires the learners to attend to the meanings of the input in order to improve their English comprehension skills and internalize words, phrases, and structures of the passage they hear. The shadowing adopted in most of the previous studies was prosody shadowing. The previous studies have yielded useful data that help specify the way the prosody shadowing improves phonological processing skills, which is significant for Japanese EFL learners who have exhausted their cognitive resources, leaving few resources for comprehension, whereas this study focuses on the effect of contents shadowing on Japanese EFL learners' phonological processing skills, on which previous studies have not been focused. The main purpose of the contents shadowing training is to improve comprehension skills; however, contents shadowing also requires the learners to repeat the model sounds. Therefore, contents shadowing is expected to improve English sound perception skills, as well as the prosody shadowing does.

There are also no studies exploring whether the type of contents shadowing, which direct Japanese English EFL learners' attention to a specific aspect (i.e., semantic, syntactic, or pragmatic aspect), influences the improvement of learners' phonological processing skills. As a previous step, the present study examines whether the performances of the learners' English sound perception depend on types of contents shadowing.

## 2. Literature Review

Few attempts have been made to explain the effects of contents shadowing. Hamada (2014) was one study that examined the effectiveness of contents shadowing training for listening comprehension skills. The prosody shadowing group (called the "pre-shadowing group" in his paper) began shadowing training before the text comprehension, while the contents shadowing group (called the "post-shadowing group" in his paper) engaged in shadowing after they learned new vocabulary and comprehended the content of the passages. The shadowing training was conducted in eight English classes for one month. Before and after training, the TOEIC listening tests were conducted. The results showed that the contents shadowing group significantly improved their listening comprehension compared to the prosody shadowing group. His pioneering study demonstrated the effect of contents shadowing on listening comprehension ability; however, it is not clear whether the contents shadowing also improves phonological processing ability and which aspect of the contents (i.e., syntactic, semantic, or pragmatic) the learners' attention should be directed toward while engaged in the contents shadowing.

Language comprehension involves phonological, lexical, syntactic, semantic, and pragmatic processing. Each process takes place on Working Memory (WM) by retrieving appropriate information from the knowledge in the long-term memory (i.e., lexical, syntactic, semantic, and pragmatic knowledge); each process consumes

WM resources. The capacity of the WM is strictly limited (Just & Carpenter, 1992). The learners' consumption of many resources in certain aspects of the processing results in negative consequences, such as failing to comprehend the passage or forgetting information they already processed. Therefore, efficient processing is key in accomplishing language comprehension. Prosody shadowing is expected to improve phonological processing skill, while contents shadowing is expected to enhance lexical, syntactic, semantic, and pragmatic processing skills.

Nakanishi and Yokokawa (2011) attempted to specify the type of second language (L2) processing—semantic, syntactic, or pragmatic—that consumes the maximum resources among Japanese EFL learners. With this aim, four different types of sentences under different cognitive load manipulations on processing (i.e., semantic, syntactic, or pragmatic) were created. The participants were asked to read aloud a series of sentences, remembering the sentence-final words, and to perform tasks. The sentences used in the experiments were a sentence with no task, a sentence with a Japanese-translation verification task, a sentence with a grammatical judgment task, and a sentence with a pragmatic judgment task. The result showed that performances of a sentence with a grammatical judgment task were significantly lower than the other sentences, suggesting that syntactic processing places a heavy cognitive load on WM resources; this leaves few resources for storage functions.

This study investigated whether the different kind of contents shadowing (i.e., semantic, syntactic, or pragmatic) influences the performances of English learners' sound perception. By following the framework of Nakanishi and Yokokawa (2011), four types of sentences for shadowing were created: a sentence with no task, a sentence with a Japanese-translation verification task, a sentence with a grammatical judgment task, and a sentence with a pragmatic judgment task. The first shadowing task was set as prosody shadowing, whereas the second, third, and forth shadowing tasks were set as contents shadowing that directed participants' attention to a specific aspect (i.e., semantic, syntactic, or pragmatic) of sentence processing. In this paper, we explore whether the aspects of contents shadowing influenced how successfully learners reproduced syllables.

## 3. Purpose

This study examined whether directing participants' attention to different aspect of contents (i.e., semantic, syntactic, or pragmatic) during contents shadowing influences the performance of their sound perception. To that end, three research questions (RQs) were posed:

RQ1: Do the reproduction rates differ according to the types of contents shadowing (i.e., semantic, syntactic, or pragmatic)?

RQ2: Do the processing accuracy scores differ according to the types of contents shadowing (i.e., semantic, syntactic, or pragmatic)?

RQ3: Do the effects of contents shadowing on shadowing performances (i.e., reproduction rates and processing accuracy scores) differ according to English proficiency?

## 4. Method

### 4.1 Participants

The participants consisted of 35 Japanese EFL undergraduate or graduate students (10 males and 25 females) of various majors at private and public universities in Japan, ranging in age from 19 to 25 years ($M$ = 20.86). Their proficiencies were either lower intermediate or advanced according to their Oxford Online Placement Test (henceforth, OOPT), with scores ranging from 19 to 103 ($M$ = 59.23). Converted to CEFR scores, there were two Beginners (A1), three Pre-Intermediate (A2), 16 Intermediate (B1), eight Upper-Intermediate (B2), five Advanced (C1), and one Proficiency (C2) out of 35 participants.

### 4.2 Procedure

All participants were required to shadow four types of orally presented sentences: a sentence with no task, a sentence with a Japanese-translation verification task, a sentence with a grammatical judgment task, and a sentence with a pragmatic judgment task. They also completed the OOPT, an English proficiency test. All tests were administered individually using a computer. The OOPT took place following the shadowing tasks, and the order in which the four versions of the shadowing tasks were administered was counterbalanced. The entire experiment took approximately two hours.

### 4.3 Materials

#### 4.3.1 Shadowing task

Four types of shadowing tasks were implemented on a Windows computer using the psychological experiment software SuperLab Pro5. The instructions were given and a practice session was conducted with two trials prior to each of the shadowing tasks. There are four shadowing tasks, each including 16 sentences. All the words used in the experimental sentences had a familiarity rating of at least 5.0 on a 7-point scale (7=high familiar; Yokokawa et al., 2006). The average familiarity of sentences was statistically equal among tasks 1–4, $F(3,63) = 2.318$, ns. In addition, the average number of syllables in sentences was set to be statistically equal among tasks 1–4, $F(3,63) = .31$, ns.

The speed of model sound was 135 words per minute recorded by an American native speaker of English and the participants' shadowing voices were collected by digital sound recorders to be analyzed for their performance.

(1) Standard version of the shadowing task (See Appendix A)

This shadowing task required participants to just repeat the oral input soon after listening to the model sounds. The shadowing procedure is as follows. The model sound was relayed to the participants through a headset after the fixation marker was presented for one second on a computer monitor. The participants were required to shadow the oral input as soon as they heard it and then immediately press the spacebar key, followed by the next sentence heard through the headset following the fixation mark. The participants were asked to shadow the model sounds again. This procedure was repeated until they saw an instruction indicating the end of the session.

(2) A sentence with a Japanese translation–verification task (See Appendix B)

This shadowing task aimed to direct participants' attention mainly to the semantic aspect. The Japanese translation-verification task was incorporated into the standard version of the shadowing task. The shadowing procedure was as follows. After the participants shadowed the experimental sentence, the Japanese equivalent of the previous English sentence appeared on the monitor. The participants were required to press the B key if the translation was correct and press the N key if it was incorrect. Half of the translations were correct and half were not, with the condition that nine English sentences appeared in their correct Japanese translation and nine with their incorrect version across the entire test set.

(3) A sentence with a grammatical judgment task (See Appendix C)

This shadowing task aims to direct participants' attention mainly to the syntactic aspect. The grammatical judgment task was incorporated into the standard version of the shadowing task. The shadowing procedure was as follows. The participants were required to shadow the model speech and press the B key if the sentence was grammatical and press the N key if it was ungrammatical. Half of the sentences were grammatical and half were ungrammatical, with the condition that nine sentences appeared in their grammatical forms and nine in their ungrammatical forms across the entire test set.

(4) A sentence with a pragmatic judgment task (See Appendix D)

This shadowing task aims to direct participants' attention mainly to the pragmatic aspect. The pragmatic judgement task was incorporated into the standard version of the shadowing task. The shadowing procedure was as follows. The participants were required to shadow the model sound and press the B key if the sentence was pragmatically plausible and press the N key if it was implausible. Half of the sentences were pragmatically plausible and half were implausible, with the condition that nine sentences appeared in their pragmatically plausible forms and nine in their pragmatically implausible forms across the entire test set.

#### 4.3.2 English proficiency test

The OOPT was implemented and conducted on the Internet. This test was

used to measure the participants' English fluency in reading and listening. The test consisted of reading and listening sections. Each question was accompanied by three or four possible answers, only one of which was correct. There was a time limit of 50 minutes.

Table 1 *Average scores of OOPT*

| | Total (n = 35) | | | High (n = 18) | | | Low (n = 17) | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total | R | L | Total | R | L | Total | R | L |
| **Ave** | 59.23 | 66.51 | 51.74 | 74.44 | 82.11 | 66.56 | 43.12 | 50.00 | 36.06 |
| **Min** | 19.00 | 16.00 | 10.00 | 58.00 | 55.00 | 38.00 | 19.00 | 16.00 | 10.00 |
| **Max** | 103.00 | 112.00 | 93.00 | 103.00 | 112.00 | 93.00 | 56.00 | 73.00 | 48.00 |
| **S.D.** | 20.20 | 23.23 | 20.94 | 13.16 | 16.74 | 16.43 | 12.13 | 16.89 | 11.71 |

The participants were divided into two groups according to their OOPT total scores (reading score plus listening score), such that the scores were significantly different between the group with higher levels of English proficiency (M = 74.44, range: 58–103, S.D. = 13.156) and lower levels of proficiency (M = 43.12, range: 19–56, S.D. = 12.129) ($t(33) = 7.312$, $p < .01$). The upper group, with 18 participants, was defined as having a higher proficiency, whereas the lower group, with 17 participants, was defined as having a lower proficiency. The average scores of OOPT are shown in Table 1.

## 5. Results

### 5.1 Descriptive statistics for shadowing tasks

For the analysis, the following shadowing data were computed: 1) the rates of successfully shadowed syllables (henceforth, reproduction rates), which were based on the number of syllables produced correctly by the participants in all types of shadowing tasks; and 2) processing accuracy scores (henceforth, accuracy scores), or the number of sentences correctly processed by the participants in the shadowing tasks accompanied by translation verification, grammatical judgement, and pragmatic judgment tasks (SH2-4).

Table 2 shows the rates for successfully shadowed syllables. The total number of syllables used in the shadowing tasks are different among the tasks (SH1=182, SH2=185, SH3=187, SH4=192) and for the sake of easy comparison, each reproduction rate will be graded based on a score of 100. The result of a one-way analysis of variance (ANOVA) indicated that the differences among the tests were not found to be significant: $F(3,139) = 2.443$, ns.

Table 3 shows the number of sentences processed accurately. The analysis of the one-way ANOVA disclosed that there was a significant difference among the tests: $F(2, 104) = 106.602$ ($p < .01$). Multiple comparisons showed that the accuracy score was significantly lower in SH3 than in SH2 and SH4 ($p < .01$) and that the accuracy rate was significantly lower in the SH4 than in SH2 ($p < .05$).

Concerning the rate of successfully shadowed syllables, the shadowing type does not significantly affect the participants' performances, which is the answer to research question 1.

On the other hand, regarding the accuracy score, SH3 was significantly lowest, which is consistent with Nakanishi and Yokokawa's (2011) reading study. The contents shadowing type significantly influences processing accuracy, which is the answer to research question 2.

Table 2 *Reproduction rates of shadowing tasks*

| | SH1 | SH2 | SH3 | SH4 |
|---|---|---|---|---|
| Average | 93.77 | 92.77 | 90.85 | 90.00 |
| Minimum | 82.42 | 67.57 | 66.31 | 63.02 |
| Maximum | 99.45 | 98.92 | 98.93 | 100.00 |
| S.D. | 4.14 | 6.25 | 7.30 | 7.84 |

*Note*. n = 35; Mark range: 0–100.

Table 3 *Accuracy scores of shadowing tasks*

| | SH2 | SH3 | SH4 |
|---|---|---|---|
| Average | 14.74 | 8.97 | 12.37 |
| Minimum | 11.00 | 6.00 | 8.00 |
| Maximum | 16.00 | 15.00 | 16.00 |
| S.D. | 1.12 | 1.81 | 1.94 |

*Note*. n = 35; Mark range: 0–16.

### 5.2 Shadowing performances by English proficiency

Table 4 illustrates the reproduction rates by participants' proficiency. A 2 (proficiency) ×4 (SH type) ANOVA revealed significant main effects of proficiency, $F(1,139) = 14.818$, $p < .01$, and SH type, $F(3, 139) = 2.718$, $p < .05$. However, there was no significant interaction between proficiency and SH type ($F(3,139) = .425$, ns.).

Table 5 provides the mean accuracy scores for high and low proficiency. A 2(proficiency) × 3(SH type) ANOVA revealed significant main effects of proficiency, $F(1,104) = 7.290$, $p < .01$, and SH type, $F(2, 104) = 111.878$, $p < .01$. However, there was no significant interaction between proficiency and SH type ($F(2,104) = .281$, ns.).

Table 4 *Reproduction rates of shadowing tasks by proficiency*

| | SH1 | | SH2 | | SH3 | | SH4 | |
|---|---|---|---|---|---|---|---|---|
| | High | Low | High | Low | High | Low | High | Low |
| Average | 95.27 | 92.18 | 94.68 | 90.75 | 93.73 | 87.94 | 93.52 | 86.27 |
| Minimum | 85.71 | 82.42 | 83.24 | 67.57 | 86.63 | 66.31 | 80.21 | 63.02 |
| Maximum | 95.45 | 97.25 | 98.92 | 98.38 | 98.93 | 98.40 | 100.00 | 96.86 |
| S.D. | 3.64 | 4.13 | 4.26 | 7.43 | 3.35 | 9.07 | 4.51 | 8.97 |

*Note*. High n = 18, Low n = 17; Mark range: 0–100.

Table 5 *Accuracy scores of shadowing tasks by proficiency*

| | SH2 | | SH3 | | SH4 | |
|---|---|---|---|---|---|---|
| | High | Low | High | Low | High | Low |
| Average | 15.00 | 14.47 | 9.44 | 8.47 | 13.00 | 11.71 |
| Minimum | 14.00 | 11.00 | 7.00 | 6.00 | 9.00 | 8.00 |
| Maximum | 16.00 | 16.00 | 15.00 | 11.00 | 15.00 | 16.00 |
| S.D. | 0.77 | 1.37 | 1.98 | 1.50 | 1.61 | 2.08 |

*Note*. High n = 18, Low n = 17; Mark range: 0–16.

Regarding the effects of proficiency on the performances of English sound perception, participants with a high proficiency reproduced significantly more syllables and obtained significantly better accuracy scores than those with a low proficiency. However, proficiency did not yield a significant interaction with shadowing type, which is the answer to research question 3.

### 5.3. Correlation analysis among the task performances

Table 6 presents the correlations between OOPT scores (i.e., total score, reading section score, and listening section score) and shadowing performances (i.e., reproduction rates and accuracy scores). English proficiency scores produced significant correlations with shadowing performances, irrespective of modality difference (i.e., reading and listening). This significant correlation suggested that the more proficient the participants, the better performances they showed in shadowing, which is consistent with the results of section 5.2.

Table 6 *Correlation among the OOPT and shadowing performances*

| | | Total | Reading | Listening |
|---|---|---|---|---|
| Reproduction rates | SH1 | **0.56 | **0.44 | **0.59 |
| | SH2 | **0.55 | *0.42 | **0.59 |
| | SH3 | **0.55 | **0.46 | **0.56 |
| | SH4 | **0.65 | **0.58 | **0.61 |
| Accuracy scores | SH2 | *0.41 | *0.37 | *0.38 |
| | SH3 | *0.39 | *0.36 | *0.34 |
| | SH4 | †0.33 | *0.34 | †0.25 |

** $p < .01$, * $p < .05$, † $.05 < p < .01$

## 6. Discussion

The first purpose of the present study was to explore the effects of cognitive load through different aspects of processing (i.e., semantic, syntactic, or pragmatic) on the performances of shadowing (i.e., the rates of successfully reproduced syllables) using various types of SH tasks. Table 7 below summarizes the SH data obtained from the present study. The results show that the successful reproduction rates of speech input

during shadowing are not significantly different according to the contents shadowing types. This result suggests that which aspect of contents (i.e., semantic, syntactic, or pragmatic) participants pay attention to during shadowing might not interfere with or compensate for their sound perception performances.Clahsen and Felser (2006) have insisted that second-langauge learners generally make good use of non-syntactic information (i.e., semantic and pragmatic information) for sentence interpretation because they cannot construct a complete syntactic analysis, which is fundamentally different from what native speakers do. Considering these non-syntactic-dependent processing characteristics of second-langauge learners, the present study's non-significant difference in speech perception among the shadowing tasks suggests that even semantic and pragmatic information, which can be relatively accessible for second-language learners' knowledge, do not play a role in boosting the performance of their sound perception. However, we must consider that the average reproduction rates are over 90 percent in all of the shadowing tasks, which reached the ceiling point. This is partly because the words used in this experiment may be very familiar or the speed of the model sound may be very slow for the participants in this study. Generally speaking, a lack of English sound perception skills is a barrier to developing effective listening skills for Japanese EFL learners, who exhaust many cognitive resources. If lower-familiarity words were used or the model sound speed was faster in this experiment, semantic and pragmatic information (SH2 and SH4) might be used to compensate for their lack of English sound perception skills.

The second purpose of this study was to examine whether processing accuracy depends on the types of contents shadowing (i.e., semantic, syntactic, or pragmatic). Table 7 below shows that the accuracy score in SH3 is the lowest. SH3 places the cognitive load on processes that are primarily syntactic by directing participants' attention to a grammatical judgment task. It can be said that syntactic processing consumes a large portion of WM resources in Japanese EFL learners. In addition, processing accuracy in SH4 was significantly lower than in SH2. One of the possible reasons is that SH4, which directs participants' attention to pragmatic processing, requires participants to integrate their world knowledge into their sentence comprehension process. This online integration of extra-sentential world knowledge during internal-sentential comprehension increases cognitive demands (Sorace, 2005). On the other hand, SH2 focuses participants' attention on semantic processing and only requires them to map English sentences onto Japanese sentences. Therefore, the cognitive demand of SH2 is much less than that of SH4.

The third purpose of this study was to explore whether shadowing performances (i.e., reproduction rates and accuracy scores) differ according to English proficiency. The result indicated that the higher proficiency group performed significantly better than the lower proficiency group in terms of reproduction rate and accuracy score, and that there were also significant correlations between proficiency test scores and shadowing performances. This implies that the EFL learners with high proficiency

could employ sound perception and each type of processing (i.e., semantic, syntactic, or pragmatic processing) to a fairly high degree of competence.

Table 7 *Performances on the shadowing tasks (Summary of Tables 2 and 3)*

| SH type | Task | Main processing aspect | Reproduction rates | Accuracy scores |
|---|---|---|---|---|
| SH 1 | — | — | 93.77 | — |
| SH 2 | Translation verification | Semantic | 92.77 | 92.13 |
| SH 3 | Grammatical judgment | Syntactic | 90.85 | 56.06 |
| SH 4 | Pragmatic judgment | Pragmatic | 90.00 | 77.31 |

*Notes.* Mark range: 0–100. *The maximum processing accuracy score for SH 2, 3, and 4 is 16. However, for ease of comparison with the reproduction rate, the processing accuracy score is graded based on a score of 100.

## 7. Conclusion

Contents shadowing is often conducted in class to promote students' understanding and internalization of the material they have learned. Shadowing, which requires students to immediately repeat the model sound, is also expected to improve their phonological processing skills. This study explores the performances of shadowing, especially sound perception, depending upon types of contents shadowing by directing the participants' attention to various aspects of processing (i.e., semantic, syntactic, or pragmatic). The main outcome demonstrated that the reproduction rates during contents shadowing do not differ according to the types of contents shadowing. In addition, the reproduction rates during contents shadowing is almost the same as the standard version of SH (SH1), which direct learners' attention solely to phonological processing. This means that even if teachers direct students' attention to the syntactic aspects of shadowing training–which is the most cognitively demanding process for Japanese EFL learners–their performance of English sound perception will not decline.

For further study, we should explore whether the characteristics of English prosody (i.e., realization of pitch, intensity, pause) differ according to the type of contents shadowing and whether repeated contents shadowing training improves students' phonological processing skills (i.e., sound perception, realization of English prosody) and processing efficiency (i.e., processing accuracy, processing speed), which would benefit further investigations of cognitive processes in contents shadowing.

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**Appendix A. Sample sentences in the SH1**

The new black dress made her look pretty.

The boy liked his new school and friends soon.

**Appendix B. Sample sentences in the SH2**

Her first job with the company was driver. 彼女の最初の仕事は、運転手であった。

The truth was very different from his story. その真実は、彼の話とは大違いであった。

**Appendix C. Sample sentences in the SH3**

The doctor gave glasses him to help his condition.

Her new dress was made from red paper.

**Appendix D. Sample sentences in the SH4**

Traveling at the speed of light is impossible.

Learning to read and write is important.