

# Accuracy of Japanese pitch accent rises during and after shadowing training

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## Abstract

We conducted a longitudinal study on the effectiveness of shadowing training for Chinese and Mongolian learners of Japanese. The purpose of the present study was to clarify (1) the effect of longitudinal shadowing training for realization of pitch accent, and (2) to discuss if the difference of effectiveness depends on the learners' proficiency level as well as their first language. 15 Japanese as a foreign language (JFL) learners participated in this study. They are divided into two groups according to their level of Japanese proficiency. Each group was instructed to shadow a dialog ten times without seeing a script for three sessions over a seven week period. The results showed that speech rate and accuracy of pitch accent rose significantly after seven weeks in both groups, but each group was different in the ways of improvement.

**Index Terms:** shadowing, JFL learners, pitch accent, Chinese, Mongolian

## 1. Introduction

Japanese has lexical pitch accent. It changes from word to word and is very difficult for almost all learners of Japanese to distinguish and to realize the correct pitch pattern [1, 2]. Wrong pitch accent, however, causes misunderstanding of word meaning and unnaturalness of speech. The acquisition of pitch accent is considered to be important for foreign learners of Japanese (JFL learners) despite the existence of regional varieties of pitch accent [3, 4].

Recently, a great deal of studies on *shadowing* training on Japanese learners of English has been conducted [5, 6, 7]. Shadowing requires learners to listen to the model sentences while repeating almost simultaneously: The learners should repeat the sentences as exactly as possible while listening to the in-coming information [5]. Shadowing is said to improve prosodic features of learners' pronunciation [6]. There are also some studies of shadowing for JFL learners. The main results showed by these previous studies are that 1) shadowing training can improve listening skills [8], 2) shadowing provides effective practice for the enhancement of oral reading fluency [9] and furthermore, 3) misuse of word accent decreases during the shadowing training [10]. Also our previous study examined the effect of short-term shadowing and reading / repeating training on 40 JFL learners (23 Mongolian and 17 Chinese speakers) [11, 12], and showed that the accuracy of pitch accent pattern rose up to 90% during the shadowing but decreased after the training. So, whether the retrieval of pitch accent is a short term effect due to shadowing training remains unknown.

The aim of this paper is investigate the change of accuracy for realizing pitch accent in longitudinal shadowing training. Also, we examine if there is any difference in effectiveness of shadowing training as a function of the different levels of

proficiency. Finally, we discuss differences due to the learners' first language.

## 2. Method

### 2.1. Participants

15 JFL learners at a Japanese-language school in Kobe participated in this experiment. They were classified into two groups according to the result of proficiency tests. In the group of higher level (Group A), there were 6 Chinese and 3 Mongolian speakers. The group of lower level (Group B) included 5 Chinese speakers and one Mongolian speaker. The learning period and results of the proficiency test are shown as Table 1 below. The proficiency test was equivalent to the Japanese-Language Proficiency Test level N2.

Table 1: *Japanese Language Proficiency of Participants.*

	learning period	overall average score/ total score	average/ total score of listening
Group A	0.5 - 3.5 years	241.8 / 400	53.9 / 100
Group B	0.5 - 1 year	162.2 / 400	36.2 / 100

### 2.2. Procedure

The learners of both groups were instructed to shadow a dialog ten times without seeing the script. Before the shadowing, the experimenter checked the learners' comprehension of the dialog and explained about the contents of the dialog. Before and after shadowing, they were to read aloud once the text of the dialog while seeing the script ("Reading" in Table 2). This training was repeated two times, for a total of 3 days training: a week after the first training, and seven weeks later, as shown in Table 2.

Table 2: *Procedure of Shadowing Training.*

1 <sup>st</sup> session		2 <sup>nd</sup> session (1week after the 1 <sup>st</sup> session)		3 <sup>rd</sup> session (7weeks after the 1 <sup>st</sup> session)		
Reading1	shadowing (10 times)	shadowing (10 times)	Reading2	Reading3	shadowing (10 times)	Reading4

### 2.3. Material and recording equipment

A short dialogue text was used in the present study. The dialog consisted of 227 morae as shown in the Appendix, with the total duration of the model dialog for 39.9 seconds. This dialog was chosen through discussion with the teachers of the language school so that the difficulty of the dialog was adequate for both A and B groups.

The participants recorded their pronunciation by themselves. A microphone (SONY ECM-CS10) and an IC recorder (SONY ICD-SX 850 at 48 KHz/16 bit sampling) were used in the experiment.

### 2.4. Analysis

Participants' audio data were digitalized and acoustical analysis was done using a speech analyzer (Wavesurfer 1.8.8 [13]). The pattern of pitch accent was determined by the second author (a speaker of Tokyo Japanese) and evaluated if it was identical to the model recording the learners heard.

In this paper, we analyzed the recording of Reading 1 (before shadowing training on the 1<sup>st</sup> session), Reading 2 (after training on the 2<sup>nd</sup> session), Reading 3 (before training on the 3<sup>rd</sup> session) and Reading 4 (after training on the 3<sup>rd</sup> session).

## 3. Results

### 3.1. Speech rate

The speech rates of Readings 1 to 4 were measured. The speech rate of the model dialog was 5.69 morae per second. The speech rate of Readings 1, 2, 3 and 4 of the two groups are summarized in Figure 1. As the figures show, the speech rate had a big improvement from Reading 1 to Reading 2. In other words, it means the learners' articulation in both groups got faster after 20 times shadowing. Two-factor repeated measure ANOVA revealed a significant main effect on the task (Reading 1 to 4) [ $F(3, 39) = 55.0, p < 0.001$ ], but no main effect of group (Group A, B) [ $F(1, 13) = 0.03, p = 0.86$ ].

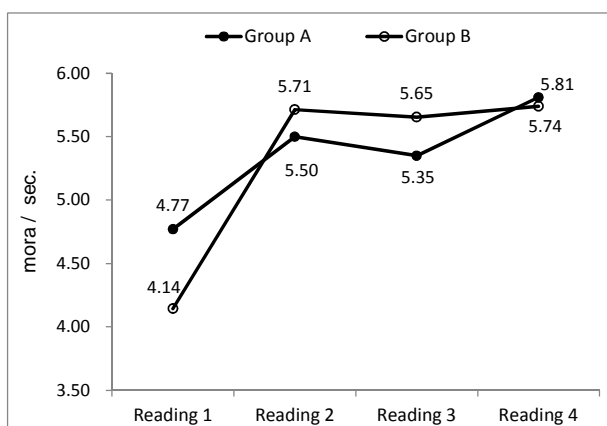


Figure 1: Mean Speech Rate.

### 3.2. Accuracy of word accent

The pitch accent pattern of 23 nouns was evaluated. Mean accuracy of Reading 1, 2 and 4 in each group are shown Figure 2. The difference among the mean accuracy of Reading 1, 2 and 4 of each group was compared. The accuracy of word accent among the tasks showed a significant main effect [two-factor repeated measure ANOVA,  $F(2, 26) = 45.0, p < 0.001$ ]. However, there was no significant difference between Group A and B [ $F(1, 13) = 4.21, p = 0.06$ ].

The accuracy of pitch accent pattern rose drastically after 2 trainings, more than 20 %, and remained at around 74.6% to 85.6 % for each group. Bonferroni-corrected post hoc comparisons revealed a significant difference between Reading 1 and 2 ( $p < 0.05$ ), and Reading 1 and 4 ( $p < 0.05$ ). This result shows that the correction of pitch accent through shadowing training remains due to repeated training.

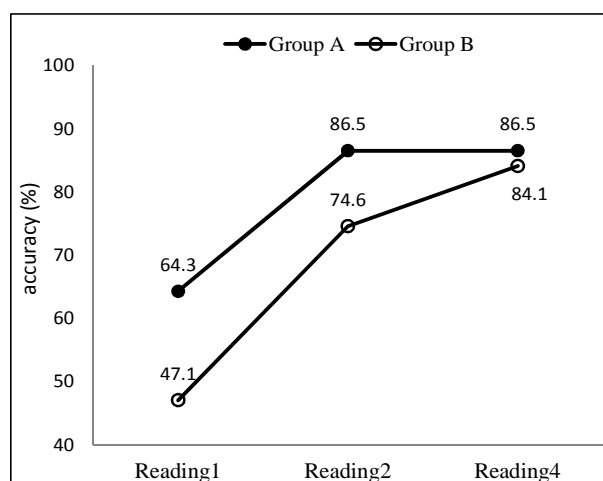


Figure 2: Accuracy of Word Accent.

### 3.3. Accuracy of different accent pattern

We also analyzed the accuracy of individual pitch accent patterns. Figure 3 shows the results for accuracy of type 0 (flat accent without accent nuclear) and type 1 (accent nuclear on the first mora) which were often found in the dialog for Chinese and Mongolian learners.

There were 16 words (nouns) of type 0 accent and 4 words of type 1 accent. For type 0 accent, both groups of Chinese and Mongolian speakers had a higher accuracy of pitch accent after overall training (Reading 4) than before (Reading 1). Two-factor repeated measure ANOVA (task  $\times$  language) showed a significant main effect on tasks [ $F(2, 26) = 10.1, p < 0.001$ ], but not on languages [ $F(1, 13) = 2.7, p = 0.1$ ].

On the other hand, for type 1 accent pattern, Mongolian speakers showed a tendency to have higher accuracy than Chinese speakers [ $F(1, 13) = 3.17, p = 0.098$ ]. After the second session (after shadowing training of 20 times), Mongolian speakers showed 100% accuracy. But Chinese speakers had no such prominent effect for realizing type 1 accent. All four groups (Chinese and Mongolian learners of Group A and B) demonstrated higher accuracy of pitch accent at Reading 2 and 4 than Reading 1. Two-factor repeated measure ANOVA (task

× language) showed a significant main effect on tasks [ $F(2, 26) = 15.2, p < 0.001$ ]. This result shows that pitch accent pattern is corrected through longitudinal shadowing training, but the effects vary as a function of the learners' native tongue and proficiency, as well as the pitch accent pattern (accent type).

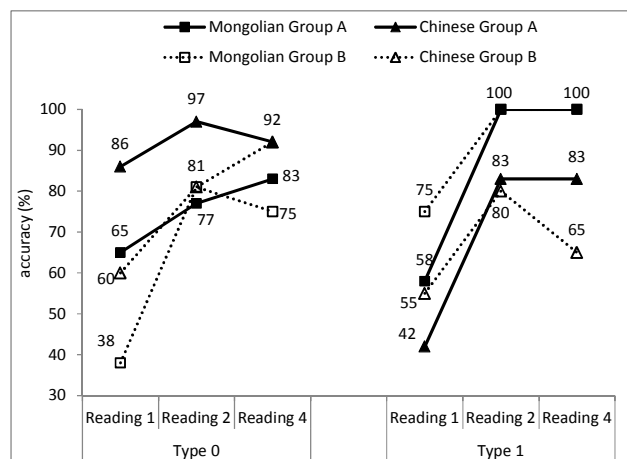


Figure 3: Accuracy of Pitch Accent Pattern for Type 0 and Type 1 accent.

#### 4. Discussion

The present study examines the previous findings of a clear effect of shadowing training on the accuracy of pitch accent. Specifically, previous studies [11, 12] showed that the accuracy of word accent rose during shadowing training, but fell in the reading task soon after the shadowing. It was hypothesized that it was difficult to maintain the effect of correction on pitch accent pattern through short-term shadowing, because the pitch accent is often easy to imitate, but difficult to realize consciously [14]. During shadowing, it is not necessary to access the learners' mental lexicon and the learners only need to imitate what is heard. But in the reading task knowledge of pitch accent or phonetic interference from the learners' mother tongue could occur by accessing their mental lexicon. The current study indicates that longitudinal (repeated over 3 sessions) shadowing training helps learners of Japanese to successfully realize pitch accents.

Moreover, in our previous study of short-term shadowing training [11, 12], there were no significant differences between before and after shadowing training. However, in this paper, it was shown that results from before and after a longitudinal training of shadowing are significantly different, showing a clear improvement.

Furthermore, which particular accents were corrected by the learners of Japanese varied according to their (1) proficiency level and (2) first language. Chinese learners tended to show a higher accuracy for realizing pitch accents than Mongolians, as previously reported [11], specifically, the flat accent pattern (accent type 0) [15, 16]. Mongolian speakers had a tendency to pronounce unknown words with a middle high pitch pattern (accent nuclear is placed on the penultimate mora) [17], similar to the pitch accent in their

native language. This phonetic interference from Mongolian could affect the realization and correctness of Japanese pitch accent.

Both groups (A and B) showed a higher accuracy of word accent at post-reading (Reading 4) than pre-reading (Reading 1). Shadowing is considered to be a more difficult training method for JFL learners than other trainings such as reading aloud and repeating. That may be why many teachers hesitate to introduce shadowing to the learners with lower level proficiency. But it was shown in this study that the effect of shadowing helps also learners with lower proficiency.

In this study, participants were instructed to not look at the script during shadowing. Participants could concentrate on listening to the audio input and thus overcome the phonetic interference from their mother tongues.

It was also confirmed that shadowing made a large contribution to speed up the speech rate, regardless of the learners' proficiency. That is, no significant difference was found between Group A and B for speakers of both Chinese and Mongolian.

#### 5. Conclusions

The present study attempted to examine the effects of longitudinal shadowing training for acquisition of word accent. Several important conclusions are derived from the findings in this study. First, the shadowing training speeds up the learners' speech rate irrespective of their proficiency. Second, it is important to take a longitudinal shadowing training to acquire more accurate word accent. Third, the pitch accent will be corrected through shadowing but depending on the learners' first language and their proficiency, different pitch accents will be corrected more easily.

A draw-back of this study is that the experimental design did not allow us to make a comparison between the experimental group and the control group. In the future, an additional experiment with a control group will be done; also it will be necessary to check the learners' knowledge of pitch accent [18].

Nevertheless, this study suggests longitudinal shadowing training substantially helps JFL learners to acquire natural-sounding Japanese speech.

#### 6. Acknowledgements

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## 8. Appendix

The script of the dialog

(M for a male and F for a female speaker)

- M: Konomae, Nihon-no tomodachi-to shokuji-ni ittan-desuga, kaikei-no-toki, hanbun-zutsu okane-o harattan-desu. “Watashi-ga harau-yo”-tte ittan-desuga . . . Sō-iu-no-tte “warikan”-tte iun-desu-yone?
- F: Sōsō, warikan.
- M: Nihon-no kata-wa yoku warikan-surun-desuka?
- F: Ūn, sō-desu-ne. Tomodachidōshi-dewa yoku-shimasu-ne. Jōshi-to issho-no toki-wa, jōshi-ga haratte kureru baai-ga ôi-desuga.
- M: Hê, sō-nan-desu-ne. Koibitodōshi-no baai-wa dô-desuka?
- F: Saikin-wa kareshi-to kanojo-demo, warikan-suru-koto, ôi-mitai-desu-yo.
- M: Hê.