

## 科学研究費助成事業 研究成果報告書

平成 30 年 6 月 26 日現在

機関番号：21602  
研究種目：若手研究(B)  
研究期間：2015～2017  
課題番号：15K16799  
研究課題名(和文) Improving English speaking with parsing training  
  
研究課題名(英文) Improving English speaking with parsing training  
  
研究代表者  
Heo Younghyon (Heo, Younghyon)  
  
会津大学・コンピュータ理工学部・准教授  
  
研究者番号：10631476  
交付決定額(研究期間全体)：(直接経費) 1,700,000円

研究成果の概要(和文)：この研究ではPIST(Pause, Intonation and Stress pattern Training)と呼ばれるシャドーイング練習法を開発した。これは、学習者の音声的および視覚、空間的作業記憶の両方を用いたシャドーイングを集中的に繰り返し行う訓練である。この練習により、生産におけるL2音声認知が発達し、最終的には学習者の英語の音声認知能力が高まることが予想される。PISTは、学習者がL2のモデルセンテンスを聞いた後にターゲットセンテンスを再生するという点で従来の英語のシャドーイングに似ているが、モデルセンテンスの音声的特徴が目立つように強調されて学習者に提示される。

研究成果の概要(英文)：In this research, we developed a particular type of shadowing technique what we call PIST (Pause, Intonation and Stress pattern Training). It is an intensive and repeated shadowing training using both learners' phonological and visuo-spatial working memory. It is designed to develop the L2 prosodic awareness in production and eventually help learners build up prosodic competence in English. It is similar to the traditional English shadowing in that learners orally reproduce target sentences after listening to model L2 sentence production but different in that prosodic components of target sentences are visibly marked/highlighted and presented to learners. The PIST training was experimented and implemented in English listening and speaking classes.

研究分野：Phonology

キーワード：Shadowing English Prosody

## 1. 研究開始当初の背景

It is typical for Japanese learners of English to have a hard time learning stress/intonation patterns of English and indicating phrase boundaries in speech since the Japanese language is not a stress-timed language like English and also the syntactic makeup (grammar) of it very different from English. As it is hard to master such aspect of English, Japanese learners of English are often told “monotonous” or “hard to understand.” People simply assume it is because of their pronunciation, which may be too late to master as adult learners of English. However, there are several aspects of what we call “pronunciation,” and pronunciation of individual segments or words can be very challenging for adult learners to learn while stress/intonation pattern or indicating phrasal boundaries in speech can be still learnable. Even with the “accent” in pronouncing individual words, meaning/idea can be effectively delivered by placing 1) pauses in phrase boundaries and 2) relatively higher pitch in words of significant importance (topic words). If Japanese learners of English learn to pay more attention to syntactic parsing and intonation pattern in speaking, their L2 English will become much more intelligible to English speakers.

Poor understanding of English prosody or phrase boundaries has a negative influence not only on their L2 speaking but also on all areas of English learning. In previous studies on L2 parsing skills and reading comprehension (Johnson & Moore 1997, Kim 2010), many researchers reported that L2 parsing skills and L2 reading accuracy are highly related, concluding that L2 parsing skills facilitate the achievement of L2 reading accuracy. With respect to listening, lack of intuition in identifying phrase boundaries or understanding the intonation/stress pattern results in poor comprehension because 1) listeners focus on individual words rather than processing phrase chunks, which is more helpful in figuring out the overall meaning of a sentence, and 2) listeners fail to understand the word with the highest pitch in a phrase as a head word.

In the literature of L1 and L2 acquisition, read aloud has been attested to facilitate the acquisition of the prosodic features of English (Gibson 2008) and the development of phonological awareness (Swanson et al. 2011). Among different

types of read aloud techniques, L2 shadowing has been widely popular in the Asian context including Japan. Shadowing is an oral reproduction of aurally modeled target sentences using short-term memory, and it is known to enhance the learning of L2 phonological patterns and also lexical chunks such as formulaic sequences (Kadota 2007). L2 shadowing has also been used for the instruction of L2 prosodic features (e.g., intonation, stress and pause). For example, Kusumoto (2015) argued in her study of shadowing instruction on Japanese university students that her PRAAT analysis of the recordings of student shadowing data showed some improvement of their pronunciation in terms of prosody. She reported that although students’ production was not perfectly identical to native patterns, still their prosody of target sentences patterned differently from their pretest (no shadowing instruction), resembling more closely the target language pattern.

In this research, a new type of shadowing was adopted; shadowing in this study incorporates the visual marking of prosodic features of English. Developing an intuition on phrase boundaries and the intonation/stress pattern in English through shadowing practice with visually marked prosody can lead to the improvement in English speaking, listening and reading by gradually promoting their awareness of bigger chunks (phrase and clause) in grammar and high-pitched head words.

## 2. 研究の目的

In this research, we developed a particular type of shadowing technique what we call PIST (Pause, Intonation and Stress pattern Training). It is an intensive and repeated shadowing training using both learners’ phonological and visuo-spatial working memory. It is designed to develop the L2 prosodic awareness in production and eventually help learners build up prosodic competence in English. It is similar to the traditional English shadowing in that learners orally reproduce target sentences after listening to model L2 sentence production but different in that prosodic components of target sentences are visibly marked/highlighted and presented to learners. The PIST training was experimented and implemented in English listening and speaking classes taught by PI.

### 3. 研究の方法

In 2015, data were collected during the class in two sections of English Listening and Speaking to test the knowledge of English prosody by Japanese learners of English. Reading passages were selected to test their parsing in careful speech. After recording, participants were asked to identify the boundaries of chunks that are bigger than “word” in the texts that they recorded. The recorded data were analyzed for boundary marking (parsing) and intonation using Praat. Then, marking results in the test were compared with their pause insertion in speech to examine whether their marking pattern is reflected in their speech, if so, to what extent they mark bigger chunks in their speech. Data on different parsing units in English (e.g., different types of prepositional phrases and clauses) were collected.

In 2016, shadowing materials with visually marked intonation and pause pattern were created using sentences in the textbook. Based on the results of the experiment in 2015, sentences containing commonly found error patterns by Japanese learners were selected for training. For each training set, PPT slides containing 10 sentences with embedded audio and visual prosody marking were created. Students enrolled in the two sections of English Listening and Speaking class participated in the PIST training, taking the pre-test and post-test at the beginning and end of the training, respectively. Students participated in the total of 17 training sessions.

In 2017, a new set of PIST was created to include both the sentence-level and the paragraph-level shadowing. Students were asked to 1) read, 2) listen to, and 3) read-aloud the whole paragraph (10 English sentences; an excerpt from the class listening) with visual marking of prosody first. Then they moved on to the same tasks for 10 individual sentences (one-by-one), which were used in the paragraph. The length of each paragraph used for training was limited to 10 sentences so that students can still recall the native reading (audio) of those sentences. Student recordings (mp3 file recordings with Audacity) were uploaded on Schoology (LMS) for the total of 17 training sessions for each speaking class. Trainings consisted of in-class (10-15 min) sessions and home assignments.

### 4. 研究成果

#### (1) *Pause marking and pitch change in L2*

For the analysis of pause insertion and pitch change, recordings of readings by 15 students were selected. Recordings were acoustically analyzed for their “intentional pauses” (not the pauses produced due to their lack of fluency). So only those pauses accompanied by pitch reset were ultimately selected. Analyzed data were compared with the correct pause patterns with each pause syntactically classified into different categories (9 syntactic categories). Table 1 below shows the results for the number of correct pauses, categorized by phrase type.

Table 1. Pauses by phrase boundary type

Phrase Type	Total Number of Contexts	Correct Pauses (Count followed by rate)
Prepositional	105	33 31.4%
Long NP (object)	45	5 11.1%
Embedded CP	15	11 73.3%
Parenthetical	45	32 71.1%
Post-modifier	15	7 46.7%
Verb phrase	60	14 23.3%
Conjunction	60	24 40.0%
Conjunctive adverb	15	13 86.7%
All phrases	360	139 38.6%

Correct pauses were produced at all of the clause-level phrase boundaries. On the other hand, a very low pause rate was found in phrase boundaries involving long object NP's, and to a lesser extent, VP boundaries. More than half of the incorrect pauses in the participants' speech involved pauses directly before or after prepositions. Post-copula pause insertion (31.82%) was also commonly found in L2 English produced by Japanese learners (e.g. *Only 2.5 percent is/water.*), which is due to the interference from L1 (subject marking). These findings can be explained by considering differences between Japanese and English syntax. While clause-level phrase boundaries have similar characteristics, they differ in the relative order of the verb and object NP. It is likely that this syntactic difference may underlie a difference in phonological phrasing between the two languages as well.

More than half of the incorrect pauses in the participants' speech involved prepositions (18 of 34 incorrect pauses). This may indicate the tendency for Japanese speakers to place pauses following prepositions in their L1, a tendency that carries over to their L2, lowering fluency. Based on the results of the above experiment, sentences for the PIST training were selected from the textbook. We balanced the text so that the training sets can include grammatical

structures that Japanese learners of English show robust pause insertion errors: copula (*be* verb), different types of prepositions and long noun phrases.

## (2) PIST Training in 2016

In 2016, a complete set of PIST (Pause, Intonation and Stress pattern Training) with visual marking (intonation/pause), audio (native reading) and text (written sentence) focusing on a sentence level shadowing was prepared and implemented in two English classes. For each training set, students were asked to record themselves reading 10 English sentences, for each of which, they had to read the sentence immediately after they listened to a native speaker reading the target sentence. While students were primed with native production of it, they were presented with visibly marked intonation and pause patterns. Students were asked to download a PowerPoint file, which include 10 written sentences; each slide contained one written target sentence with pitch/pause marking and embedded audio (native production). Pitch contour drawn based on PRAAT analysis was used for intonation, and pause patterns in the most careful reading were visually presented by listing phrase chunks in different lines (Figure 1).

Figure 1. Sentences with visually marked pauses and intonation pattern



For each training set, the number of pauses were up to 4, and 10 sentences were balanced in terms of the number of pauses (two or three sentences per each pause number). Students participated in total of 17 training sessions, each of which was recording of their shadowing practice using 10 selected sentences. Approximately two-third of training sessions took place during the class at the classroom equipped with computers whereas the location of the other training sessions was not designated (classrooms, computer exercise rooms, home, etc.) as students were asked to do them as their homework. PIST materials (PPT slides with embedded audio) were uploaded on our LMS (Learning Management Site) for students to

download, and they recorded their production using Audacity and uploaded their recordings on the site.

For the comparison of their pre- and post-test performance, students recorded their reading of 20 sentences before and after the 2-month training. In the total of 20 sentences, 10 phrases were selected for analysis. Considering the fact that intonation pattern varies even among native speakers of English due to different interpretation/nuance/style, only a subset of the entire data could be used for analysis. As a result, 10 phrases invariably with rising pitch were selected for analysis. We used PRAAT for the analysis of their intonation patterns. The pitch range was between 50 and 500 Hz, and 20 Hz shift at the very least was required for rising pitch in the identification of pitch rising for student data. Recorded data of 25 male students were chosen for analyzed. Some of the reasons for excluding data include 1) very small number of female students, causing the imbalance between genders, 2) poor recording quality, and 3) no production of target phrases. Logistic regression analysis (analyzing the binary choice of whether the student improved the intonation pattern in the desired direction) was used, and there was a significant improvement in the post-treatment intonation patterns ( $\beta = 3.14$ ,  $SE = 0.31$ ,  $p < 0.01$ ) as shown in Figure 2.

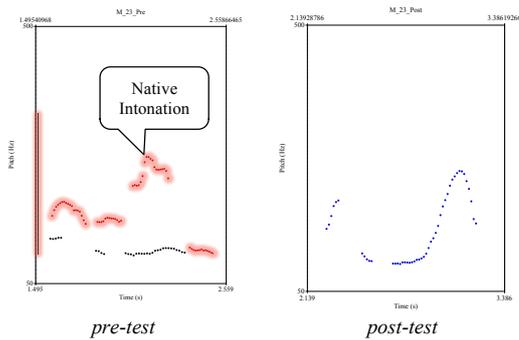
Figure 2. Overall pretest vs. post-test performance

Scaled residuals:					
	Min	10	Median	30	Max
	-5.2291	-0.4413	-0.1611	0.4482	10.5171
Random effects:					
Groups Name	Variance	Std.Dev.			
Subject (Intercept)	1.797	1.341			
Number of obs: 586, groups: Subject, 25					
Fixed effects:					
	Estimate	Std. Error	z value	Pr(> z )	
(Intercept)	-1.1323	0.4827	-2.346	0.018973 *	
Pre.PostPost	3.1355	0.3149	9.956	< 2e-16 ***	
-----					
Sentence5	-1.6819	0.5552	-2.885	0.003914 **	
Sentence6	-1.6819	0.5552	-2.885	0.003912 **	
Sentence8	-1.4588	0.5513	-2.631	0.008594 **	
Sentence9	-1.0884	0.5427	-1.858	0.063148 .	
Sentence11	-1.7556	0.5597	-3.137	0.001709 **	
Sentence15	-2.0732	0.5708	-3.632	0.000281 ***	
Sentence16	0.7484	0.5474	1.353	0.176185	
Sentence17	-2.9727	0.6382	-4.660	1.52e-08 ***	
-----					
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1					

The result above indicates that students' target phrases in the post-test after the 2-month shadowing training elicited more rising pitch compared to their flat pitch patterns prevailed in the pre-test. For some phrases, their pre- and post-test performance was different to a greater extent than in other phrases. One of them is the sentence "That is amazing." and below (Figure 3) is the pitch contour for the pre-test and post-test performance of one subject with the native intonation pattern

also given for comparison.

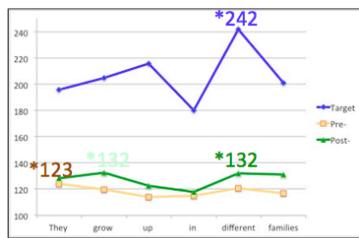
Figure 3. Subject 23: Pre-test vs. post-test performance



The dramatic change between pre- and post-test performance for this participant in Figure 4 shows how hard this student is trying to reflect his knowledge in target language intonation in his production.

We also compared students' performance with prosodic focus marking in four selected sentences to check their performance on a sentence level. (The location of highest pitch is associated with the semantic focus in a sentence.) Students' pre-test performance shows the pattern of locating the highest pitch sentence-initially with gradually falling intonation, as reported in the literature (Mori 2005). In their post-test results, more variation in pitch is observed, resembling the target pattern of marking the semantically most important word in a sentence with the highest pitch as shown in the two examples in Figure 4.

Figure 4. Change in the prosodic focus marking at a sentence level



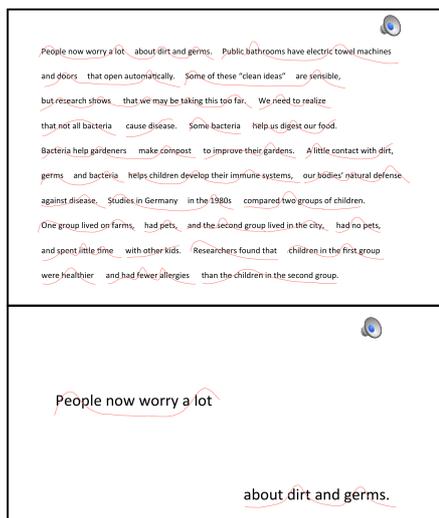
Based on the results, we could confirm that the repeated shadowing with visually marked intonation/pause patterns can help L2 learners improve their performance in terms of prosody. One can argue that comparing pre- and post-test performance using sentences drawn from the training does not show anything about their prosodic competence, pointing out that it does not mean learners built the prosodic competence in their production but simply

reproduced what they have memorized. It may be true that it is very difficult for adult L2ers of English to build up prosodic competence in English speaking, and their improved performance across the board may not tell anything about the implication in their competence. However, considering the goal of this study—developing L2 prosodic awareness—what is more noteworthy is the result shown in three phrases with students' exceptionally good performance in the post-test. Years of English learning must have led to the construction of some knowledge (although not complete) in L2 prosody, and the participants in our study must be able to show it in their production even without training. However, their pre-test performance does not show that it is necessarily the case. With two months of training raising their awareness in L2 prosody in speaking, they could finally learn to apply their knowledge in L2 prosody in their production. The goal of the shadowing training with prosodic features highlighted is to re-familiarize themselves with prosodic patterns that they are already aware of and encourage them to reflect them in their production rather than hoping them to learn novel prosodic patterns. If they begin to gradually incorporate more and more target-like prosodic patterns in their production, they may eventually be able to do something similar outside the training with phrases/sentences, the prosodic patterns of which were already familiar to them, simply not applied during production. In sum, shadowing with marked prosodic features can raise the prosodic awareness in L2 production.

### (3) PIST Training in 2017

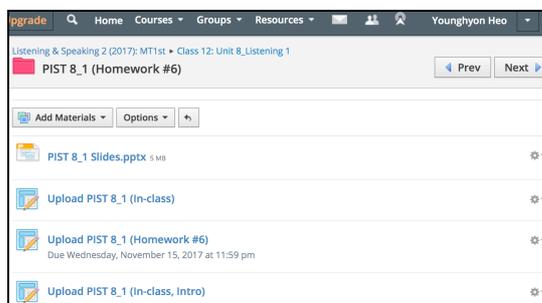
In 2017, a new set of English PIST set was created using all three components (audio, visual and text) and implemented in two English Listening and Speaking classes. In 2016, PIST training was implemented only at the sentence level, but for this set, paragraph reading was added to improve their understanding/reading of English prosody not only at the sentence level but also at the paragraph level (Figure 5).

Figure 5. Paragraph vs. Sentence-level PIST slides



So students were asked to read/listen to/read-aloud the whole paragraph (10 English sentences; an excerpt from the class listening) with visual marking of prosody first. Then they moved on to the read/listen to/read-aloud of 10 individual sentences (one-by-one), which were used in the paragraph. The length of each paragraph used for training was limited to 10 sentences so that students can still recall the native reading (audio) of those sentences. Student recordings (mp3 file recordings with Audacity) were uploaded on LMS (Figure 6).

Figure 6. Screenshot of one PIST set in LMS



The total of 17 training sessions were administered in two classes. Trainings consisted of in-class (10-15 min) sessions and home assignments.

## 5. 主な発表論文等

(研究代表者、研究分担者及び連携研究者には下線)

[雑誌論文] (計 1 件)

Heo, Younghyon. 2017. "Developing L2 Prosodic Awareness: Shadowing with Visuals by Japanese Learners of English," Proceedings of the 2017 Winter Conference of the Korean Association of Language Sciences, Busan, Korea (pp. 271-278).

[学会発表] (計 4 件)

Heo, Younghyon, Jeremy Perkins, Emiko Kaneko, Naomi Ogasawara & Ahrong Lee. 2015. "Syntactic boundary marking in L2 speech: Pause and pitch reset by Japanese learners of English," 13th annual conference of the French Phonology Network, Bordeaux, France.

Heo, Younghyon. 2016. "Can your brain adjust to the L2 rhythmic structure?," 10th International NeuroELT Conference, University of Macau.

Heo, Younghyon. 2017. "Developing L2 Prosodic Awareness: Shadowing with Visuals by Japanese Learners of English," Winter Conference of the Korean Association of Language Sciences, Busan, Korea.

Heo, Younghyon, Emiko Kaneko & Ahrong Lee. 2017. "Reintroducing the English prosody to Japanese EFL Learners through Shadowing" 2017 Second Language Research Forum (SLRF), Ohio State University, USA.

[図書] (計 件)

[産業財産権]

○出願状況 (計 件)

名称:

発明者:

権利者:

種類:

番号:

出願年月日:

国内外の別:

○取得状況 (計 件)

名称:

発明者:

権利者:

種類:

番号:

取得年月日:

国内外の別:

[その他]

ホームページ等

## 6. 研究組織

### (1)研究代表者

ホウ ヨンヒョン (HEO, Younghyon)

会津大学・コンピュータ理工学部・准教授

研究者番号: 1 0 6 3 1 4 7 6

### (2)研究分担者

研究者番号:

### (3)連携研究者

研究者番号:

### (4)研究協力者