Cognitive Processes in Phrase Shadowing: Focusing on Articulation Rate and Shadowing Latency

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Abstract
Nowadays instruction using shadowing is conducted not only in schools of interpretation, but also in secondary educational institutions. The word “shadowing” has widely been recognized as far as appearing in a dictionary. However, one may still wonder how effective shadowing is in learning a foreign language. The aims of the present study are to investigate the cognitive processes in shadowing and to present possible implications to the question. By using the repeated phrase shadowing technique, shadowing duration and latency were measured. Listening comprehension tests were performed before and after the phrase shadowing to examine how shadowing had an effect on auditory processing in listening. Results revealed that repeated phrase shadowing training significantly increased articulation rate and had an impact on lower-level processing in EFL listening and that there was a moderate correlation between listening comprehension and shadowing latency. It is concluded that an increase in articulation rate is closely related to the development of retention capacity of the phonological loop and that better listeners tend to shadow with longer latencies.

Key Words: articulation rate, lower-level processing, internalization, shadowing latency

Introduction
Shadowing is a verbatim repetition task, which requires subjects to listen to a spoken message and to repeat it as soon as possible after hearing it. Shadowing has generally been used at schools of interpretation, where beginning interpreters first learn to listen and speak simultaneously before starting to interpret from one language to another (Lambert, 1988). In Japan, shadowing has been regarded as an effective learning method of developing ESL learners’ perceptual abilities. Today shadowing is widely used by many language teachers and instructors. Déjan Le Féal said, “shadowing is a good way to improve a foreign language precisely in that it draws attention to every single word of an utterance, especially structure words which normally do not even register when heard” (1997, 621).

Marslen-Wilson (1985) used speech shadowing as a means of studying the processes of language comprehension within the L1 context. Subsequent studies investigating the speech perception by collecting shadowing latency data were also performed in the L1 context (e.g., Vitevitch & Luce, 1999; Nye & Fowler, 2003).

Recently in Japan, several studies have been conducted mainly to measure the effectiveness of shadowing as a teaching method from a pedagogical point of view in the EFL
context (e.g. Kuramoto et al., 2007; Mochizuki, 2006). However, there has been little empirical study done exploring the cognitive processes in shadowing in the EFL learning context except for Tamai's (2005) study. Therefore, it is important that the cognitive mechanism of shadowing be explored and discussed from an EFL perspective. This study was done to investigate the cognitive processes in L2 shadowing and to provide practical implications for EFL learning.

**Shadowing and rehearsal in the phonological loop**

Baddeley and Hitch (1974) proposed a multi-component working memory system, which consists of the central executive and the two slave systems, that is, the visuo-spatial sketchpad and the articulatory (phonological) loop. In a subsequent study, it was assumed that the articulatory (phonological) loop was limited in capacity to approximately the amount of verbal material that can be articulated within about two seconds unless it was refreshed through covert verbal rehearsal. The rate of covert verbal rehearsal determined how many items could be kept active through rehearsal in the articulatory (phonological) loop. The rate at which an individual could recite the words aloud was taken as an estimate of the rate at which they could recite the words silently. (Baddeley et al., 1975). Hulme et al. (1984) suggested that the rate of subvocal rehearsal and overt articulation rate are thought to be highly correlated with one another.

Later, Baddeley (1986) proposed a revised articulatory (phonological) loop model, which comprises two components: a phonological short-term store that holds phonological representations of memory item that decay over time, and an articulatory rehearsal process that serves to refresh fading phonological representations in the phonological short-term store by re-activating them. The activated phonological representations of incoming speech correspond to the contents of the phonological store component of the articulatory (phonological) loop. Spoken speech information gains access to the phonological short-term store without articulatory rehearsal (Baddeley, 1986).

Performances of shadowing can be assumed to be mainly dependent on the operation of the articulatory (phonological) loop. Shadowers must retain sequences of verbal items over short periods of time before rehearsal and immediately articulate them overtly. This mechanism is identical with processes of overt articulatory rehearsal which Craik & Watkins (1973) referred to as maintenance rehearsal. Tamai (2005) suggested that shadowing is consistent with the articulatory rehearsal process of the phonological loop and it is also identical with maintenance rehearsal.

In addition, the phonological loop was regarded as an important system for vocabulary acquisition and language learning (Gathercole & Baddeley, 1993). Kadota (2007) maintained that shadowing is dependent on the phonological loop and is likely to affect the improvement L2 proficiency in that it exploits learners' potential to locate appropriate phonological representations in speech perception, and eventually, to develop lower-level processing ability in the bottom-up processing in L2 listening comprehension.

**Shadowing and articulation rate**

Articulation rate has been considered as a measure of how quickly words can be encoded
and rehearsed within the phonological loop which holds a sequence of spoken items (Baddeley & Hitch, 1974). In the past studies, articulation rate was generally examined from the perspective of the relation between rehearsal and memory span. Baddeley et al. (1975) suggested that there is a correlation between articulation rate and short-term memory capacity. It was also proposed that how quickly spoken words can be articulated is one of the major determinants of memory span (Roodenrys & Hulme, 1993). However, the relationship between shadowing and articulation rate has never been discussed in the context of foreign-language learning.

On the other hand, in Japan, several studies have focused on the link between shadowing and articulation rate in the EFL perspective to date (e.g. Tamai, 2005). Those research revealed that there is a close relation between the development in an articulation ability and shadowing training. In Tamai’s (2005) study, students’ articulation rates significantly increased after shadowing training for several months, and at the same time, listening comprehension scores also increased. He concluded that shadowing is an effective training method for the development of listening comprehension ability. Kadota (2007) insisted that the improvement of articulation rate expands shadowers’ capacity to articulate verbal items within about two seconds and consequently develops their EFL listening comprehension ability.

Shadowing latency

Shadowing latency has generally been used to examine the process of speech perception in previous studies. Marslen-Wilson’s (1985) research was among them. By measuring shadowing latency, Marslen-Wilson divided subjects into two types of shadowers, “close” and “distant” shadowers. Close shadowers started articulating at mean delays of 250 msec or less, while distant shadowers did at longer latencies, averaging over 500 msec. It was suggested that distant shadowers repeat back the input on the basis of a perceptually complete analysis of what they hear. And in the subsequent analysis, Marslen-Wilson found that close shadowers are sensitive to disruptions of the syntactic and semantic structure of the materials they are shadowing. He concluded that not only distant shadowers but also close shadowers gain access to the syntactic and semantic structure of the spoken items as well as the acoustic and phonetic properties.

In L2 shadowing, however, it is logical to presume that shadowing latency varies according to learners’ listening comprehension ability. Kadota (2007) argued that advanced listeners whose lower-level processing in speech perception is automatized are able to allocate their cognitive resources to syntactic and semantic properties in bottom-up processing. Thus, it is extremely likely that advanced L2 listeners can syntactically and semantically analyze verbal materials as they shadow them.

The present study

The present study was conducted to examine the following questions: (1) whether shadowing training increases articulation rate as previous studies showed, (2) whether the capacity to articulate verbal items within two seconds is related to the expansion of a chunk span in EFL listening, (3) whether an increase in articulation rate is associated with the
improvement of retention capacity of the phonological short-term store, (4) whether
shadowing latencies correlate with listening comprehension test scores.

To examine the relationship between the functions of the phonological loop and the
processes in EFL listening, we looked at increases in articulation rate and shadowing latency.
We used semantic chunks which could be pronounced within 2 seconds. That is because we
had an assumption that shadowing semantic chunks would activate the articulatory rehearsal
process, increase the capacity of the phonological store to hold phonological information and,
as a result, improve subjects' listening performance.

The hypotheses to be examined in the present study are: (1) that articulation rate
increases after repeated shadowing training, (2) that repeated shadowing training expands the
chunk span in listening, (3) that repeated shadowing training accelerates retention of auditory
items, and (4) that better listeners tend to shadow with longer latencies.

Methods

Participants
The participants were 30 Japanese undergraduate students. None of the participants had
any experience in living in English speaking countries. Only 5 of the participants had done
shadowing practices for very short periods of time at either high school or college.

Materials
1. Listening tests
All the sentences used in the listening comprehension pretest and posttest were chosen
from training materials for TOEFL listening comprehension test. All of them satisfied the
selection criteria that the words used in the sentences were of higher frequency than the
frequency level 5 in the JACET List of 8000 Basic Words4 (2005). The two variables we
investigated in the listening tests were speech duration and speech rate. Each of the listening
comprehension tests constructed for the current study comprised four components. The
breakdown by variable is shown in Table 1.

<table>
<thead>
<tr>
<th>Table 1. Components of listening tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Components</td>
</tr>
<tr>
<td>SS</td>
</tr>
<tr>
<td>SF</td>
</tr>
<tr>
<td>LS</td>
</tr>
<tr>
<td>LF</td>
</tr>
</tbody>
</table>

Note: Shorter: the duration is approximately shorter than 2 seconds.
Longer: the duration is longer than 5 seconds. (Average duration: 5710msec)
Slower: the number of syllables per second (SPS) is less than 5.0.
Faster: SPS is more than 5.0.

Each test consisted of twelve questions, six of which were approximately up to two
seconds in speech duration (we call this type of question "shorter"), and the others were
longer than five seconds in speech duration ("longer"). Participants were asked to listen to a
short statement and choose the most appropriate Japanese translation from among the three
choices.
To prevent participants from using top-down processing strategy, short statements (one sentence or two sentences) were collected. The listening comprehension tests were designed to evaluate the bottom-up speech processing ability.

As for the speech rate, we selected sentences from TOEFL listening training books, measured duration and counted the number of syllables. The sentences uttered at the rate of more than 4 SPS (syllables per second) were collected and divided into two groups, the less-than-5-SPS group ("slower") and the more-than-5-SPS group ("faster").

2. Phrase shadowing training
Ten semantic chunks (See Appendix) used in the phrase shadowing section were selected from a TOEFL listening training book and recorded with a 2000ms interval. The duration of the chunks was all less than two seconds. The ten chunks were randomly arranged within each of the six sets, with the stipulation that no chunk could appear in succession at the turn of the sets. Presentation of chunks for shadowing practices was controlled by an experimental system (Super-Lab Experimental Laboratory Software). Shadowing voices of the participants were recorded with a microphone connected to another computer.

Procedure
Each participant was tested individually in a quiet room. A single session that contained a listening pre-test, a phrase shadowing training and a listening post-test lasted approximately 40 minutes. The following order of presentation was used for all participants: (1) listening comprehension pretest, (2) phrase shadowing training, and (3) listening comprehension posttest. All participants were paid for the participation.

1. Listening tests
Presentation of listening test items was controlled by an experimental system (Super-Lab Experimental Laboratory Software) that recorded the correctness of participants' responses. All the items were presented via loudspeakers. Participants started the listening test at any time they wanted to begin by pressing the start key. After the auditory presentation of each statement, three answer options appeared on the computer screen and participants then chose the most appropriate Japanese translation from among the choices by pressing the designated key on the keyboard. The feedback was given to them. Upon key press the second statement was presented. There were 12 questions (3questions×4components) in each of the listening pretest and posttest.

2. Phrase shadowing training
Auditory presentation of the semantic chunks was controlled by the experimental laboratory software. The chunks were presented over loudspeakers so that the stimulus items could be recorded and heard in the background of participant's voice in the subsequent measuring. This enabled identification of shadowing latencies. After a ten-minute instruction session, participants were introduced to the phrase shadowing task. Participants were told that they were going to shadow spoken materials presented via loudspeakers. Participants

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shadowed a set of ten chunks 6 times, taking a three minute break after the third set was shadowed. Responses were recorded through a microphone connected to a computer. If they made an error, such as omission, addition, substitution or hesitation, the chunk was excluded from analysis only for that certain participant. Chunks were assessed accurate if both the first and the third as a set were repeated correctly and both the fourth and the sixth as a set were articulated correctly. The duration measurements were made using a speech analyzer (SP4WIN Pro). Latencies were also measured with the assistance of a waveform display on the computer screen by indentifying the onset of the stimulus first and then the onset of the participants’ vocal response.

3. Cued recall

To examine how shadowing training is related to remembering auditorily presented materials, we asked them to say the chunks after the examiner’s cue and checked whether they could recall the chunks correctly. Ten participants were randomly selected and asked to recall the chunks with the examiner’s cue (the first word was auditorily given) after he or she finished shadowing task.

Results

Listening pretest

Table 2 presents average scores, SDs and mean correct answers of the listening pretest. The LF component, which consisted of longer and faster utterances, was the most difficult. The results showed that if the duration is within 2 seconds, speech rate may not affect listening comprehension much.

<table>
<thead>
<tr>
<th>Chunk</th>
<th>shorter &amp; slower</th>
<th>longer &amp; slower</th>
<th>shorter &amp; faster</th>
<th>longer &amp; faster</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average score</td>
<td>1.87</td>
<td>1.93</td>
<td>1.77</td>
<td>1.20</td>
</tr>
<tr>
<td>SD</td>
<td>0.94</td>
<td>0.87</td>
<td>0.82</td>
<td>0.76</td>
</tr>
<tr>
<td>Mean correct answers (%)</td>
<td>62.22</td>
<td>64.44</td>
<td>58.89</td>
<td>40.00</td>
</tr>
</tbody>
</table>

The data were analyzed using a 2×2 repeated measures analysis of variance (ANOVA). The first factor was duration (shorter vs. longer) and the second factor was speech rate (slower vs. faster). There was a significant interaction between duration and speech rate, $F(1,29) = 4.48, p < .043$ (See Figure 1). The analysis indicated that both duration and speech rate have some effect on participants’ listening comprehension. The subsequent analyses revealed that there were significant main effects of speech rate (between LS and LF), $F(1,29) = 13.78, p < .001$ and duration (between SF and LF), $F(1,29) = 10.25, p < .003$. The results showed that participants may have difficulty in understanding the fast and long utterances (LFs). Since interaction is the expression of the association between two independent variables, the present linkage between the valuables obtained in the pretest was beyond what would be expected by chance. Therefore, it turned out that listening comprehension was influenced by both factors.
Listening Posttest

Average scores, SDs and mean correct answers of the listening posttest appear in Table 3.

Table 3. Listening posttest result (N=30)

<table>
<thead>
<tr>
<th>Chunk</th>
<th>shorter &amp; slower</th>
<th>longer &amp; slower</th>
<th>shorter &amp; faster</th>
<th>longer &amp; faster</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average score</td>
<td>1.43</td>
<td>1.57</td>
<td>1.13</td>
<td>1.07</td>
</tr>
<tr>
<td>SD</td>
<td>0.73</td>
<td>0.73</td>
<td>0.82</td>
<td>0.74</td>
</tr>
<tr>
<td>Mean correct answers (%)</td>
<td>47.77</td>
<td>52.22</td>
<td>37.78</td>
<td>35.56</td>
</tr>
</tbody>
</table>

The ANOVA obtained a significant main effect for speech rate, $F(1,29) = 7.43$, $p < .011$, but the interaction between duration and speech rate was not significant. However, the significant difference between SF and LF disappeared in the posttest (See Figure 2). In the pretest the difference between SF and LF was big, but in the posttest that was not the case, while the difference between SS and LS did not change much. There seems to be some reasons why the posttest average scores were lower than those of the pretest. One possible reason is that the translated choices in each question in the posttest were more misleading than in the pretest.
Phrase shadowing

Table 4 shows the result of phrase shadowing. Among the chunks, there were two chunks which almost no participants succeeded in meeting the evaluation criteria: the second chunk and the third chunk. They were omitted from the analysis. In the process of analyzing the sound data, the first and the sixth trials were compared to examine the durational differences.

Table 4. Phrase shadowing duration and latency & Mann-Whitney U-test result

<table>
<thead>
<tr>
<th>Chunk</th>
<th>1st</th>
<th>6th</th>
<th>p</th>
<th>1st</th>
<th>6th</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1406</td>
<td>1286</td>
<td>.047*</td>
<td>581</td>
<td>505</td>
<td>.142</td>
</tr>
<tr>
<td>2</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>3</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>4</td>
<td>1218</td>
<td>1124</td>
<td>.022*</td>
<td>653</td>
<td>604</td>
<td>.210</td>
</tr>
<tr>
<td>5</td>
<td>1583</td>
<td>1324</td>
<td>.262</td>
<td>549</td>
<td>581</td>
<td>.905</td>
</tr>
<tr>
<td>6</td>
<td>1759</td>
<td>1620</td>
<td>.015*</td>
<td>650</td>
<td>652</td>
<td>.520</td>
</tr>
<tr>
<td>7</td>
<td>1311</td>
<td>1159</td>
<td>.383</td>
<td>604</td>
<td>584</td>
<td>1.000</td>
</tr>
<tr>
<td>8</td>
<td>1597</td>
<td>1363</td>
<td>.006**</td>
<td>661</td>
<td>592</td>
<td>.441</td>
</tr>
<tr>
<td>9</td>
<td>1364</td>
<td>1383</td>
<td>1.000</td>
<td>708</td>
<td>501</td>
<td>.200</td>
</tr>
<tr>
<td>10</td>
<td>1283</td>
<td>1151</td>
<td>.055</td>
<td>732</td>
<td>563</td>
<td>.108</td>
</tr>
</tbody>
</table>

** p < .01  * p < .05

In the duration analysis the result of the Mann-Whitney U-test showed that statistically significant differences were found between the first trial and the sixth trial. There was a significant decrease in duration with chunk 1 (U = 24, p = .047), chunk 4 (U = 137, p = .022), chunk 6 (U = 59, p = .015) and chunk 8 (U = 17, p = .006). As for the chunk 10, the result of the Mann-Whitney U-test was marginally significant (U = 35, p = .055). On the other hand, as for the shadowing latency of the participants, any significant differences between the two trials were not observed. The descriptive statistics of shadowing latency means is presented in
Table 5.

Pearson correlations were performed to investigate the association between the total score of the listening comprehension tests and the shadowing latencies. A significant moderate correlation was observed \((r = .386^*, p = .035)\). Moreover, the whole group was divided into two groups by the total score of the listening tests. There was a significant positive correlation between the listening test scores and shadowing latencies in the upper half of the whole group \((r = .524^*, p = .045, N=15)\), while in the lower half, there was no significant correlation between them \((r = .196, p = .483, N=15)\).

In addition, we performed a correlation analysis between listening comprehension test scores and the five chunks with longer latencies (chunk 2, 4, 6, 8, 10), and a significant correlation was also observed \((r = .482^*, p = .007)\).

Table 5. Descriptive statistics of mean shadowing latency \((N=30)\)

<table>
<thead>
<tr>
<th>latency mean</th>
<th>max.</th>
<th>min.</th>
<th>mean</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1027</td>
<td>392</td>
<td>628</td>
</tr>
</tbody>
</table>

There were 3 participants whose mean latencies were below 500msec.

**Cued recall**

The result of the cued recall of the shadowing chunks is presented in Table 6. The chunks that were articulated at a significantly faster rate in the phrase shadowing training were well recalled.

Table 6. Cued recall result

<table>
<thead>
<tr>
<th>chunk</th>
<th>1</th>
<th>4</th>
<th>6</th>
<th>8</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>recall ratio (%)</td>
<td>60.00</td>
<td>80.00</td>
<td>60.00</td>
<td>60.00</td>
<td>20.00</td>
</tr>
</tbody>
</table>

**DISCUSSION**

**Shadowing and internalization of learning items**

Shadowing is no simple task in that learners are required to follow and articulate every single word while trying to keep up with an utterance. It is natural to assume that through shadowing practice, learners improve their ability to articulate faster as well as pay close attention to a sound sequence between stressed words to repeat back. This assumption is compatible with the previous findings reported by Tamai (2005). The result of the phrase shadowing task in the present experiment showed that there were significant durational differences between the first and sixth trial. Hence, there is no question that the repeated shadowing training increases articulation rate.

The improvement of rehearsal ability may contribute to the development of the phonological short-term store capacity to retain verbal materials. This view is compatible with the result of Baddeley et al. (1975). Futatsuya (1999) suggested that the rehearsal capacity of the phonological loop improves, that is, the amount of verbal items that can be articulated
within two seconds increases as the rehearsal capacity develops and that the increase in articulation rate may influence the amount of phonological information for listening comprehension that can be held temporarily in the phonological short-term store. We have obtained the result in the listening posttest that in the faster utterances (SF and LF), the durational significant differences in the pretest almost disappeared after the repeated phrase shadowing training. Though this outcome may lead to an interpretation that phrase shadowing influenced listening comprehension, it is impossible to conclude from the result that increase in articulation rate is highly related to listening comprehension, because the scores of the posttest were lower than those of the pretest.

The result of the cued recall indicates that there is a close relationship between an increase in articulation rate and retention of rehearsed phonological information in the phonological store. The chunks articulated significantly faster were better retained. We can assume that the phonological items were internalized with the materials repeatedly shadowed at a faster rate. Kadota (2007) suggested that shadowing training leads to an increase in articulation rate and the internalization of learning items in L2 acquisition processes. From the perspective of human memory, too, articulation rate has been regarded as an important factor for remembering. Gathercole et al. (1994) concluded that there is a significant correlation between articulation rate and memory span.

The shadowing task in the current study may correspond to the overt articulatory rehearsal as Tama (2005) mentioned in his study. While shadowing, a participant keeps verbal materials in the phonological store for a short period of time, then articulates them through the articulatory control process. It is possible to presume from this view, too, that there is a link between the increase in articulation rate and internalization of phonological sequences.

**Shadowing latency and processing levels in shadowing**

In comparison to a L1 shadowing study, listening comprehension ability must be taken into account in a L2 shadowing study, because EFL learners face difficulties specifically in the bottom-up processing stage. Rost (2002) suggested that even if the listener may know all the words being used, phonetic qualities (e.g. assimilation) or prosodic patterns (e.g. varying speed of input) are still the factors that influence comprehensibility of speech input in L2 listening. Poor listeners often fail to decode incoming speech and therefore do not reach the next processing stage. While shadowing, poor listeners are likely to pay more attention to a sound sequence than to the syntactic or semantic features of the shadowing material. On the other hand, better listeners don't have to pay as much attention to the lower-level processing properties. It is likely that they shadow paying more attention to the different properties from poor listeners, though individual differences exist. Hence, it was predicted that shadowing latencies would differ according to the listening proficiency level.

The analysis of correlation between shadowing latency and listening comprehension score showed that many of the participants whose shadowing latencies were longer were in the upper half of the whole group in the listening comprehension test result. A possible explanation is that listening comprehension ability can be partially explained in terms of storage capacity of the phonological short-term store. In other words, even before
performing articulatory rehearsal, shadowers who have no difficulty recognizing a word sequence in the semantic chunks for shadowing can hold phonological representations longer in the phonological short-term store, because they have achieved automaticity in lower-level processing and have enough resources to do syntactic and semantic analyses. However, for shadowers who have limited storage capacity, the longer they spend time to listen, the more difficult it becomes to keep phonological information in the short-term store. Hence, they may tend to articulate with shorter latencies so that they can listen to and hold verbal items coming soon.

From the psychophysiological standpoint, too, the result is supported. Kojima (2006) proposed a multiple-repetition route model (Figure 3) in his study of word sound deafness. In Kojima’s model, it is hypothesized that there should be several routes for repetition of auditorily presented materials. In the acoustic level, incoming signals are repeated like parroting. In the phonological level, incoming signals are repeated with the phonological processing. In the lexical level, incoming signals are repeated in the lexical processing with recognition of words. In the semantic level, repetition is done along with understanding the meaning of materials. Shadowing is likely to have compatible characteristics with the processing routes in this repetition model.

In L1 shadowing, the probable processing routes are lexical and semantic levels. However, in L2 shadowing, it is possible that different routes are taken. Some “distant” shadowers are likely to take the lexical or the semantic route, whereas “close” shadowers may take acoustic or phonological route. Finally, it seems natural to maintain that shadowing latency probably shows how verbal items have been processed and therefore better listeners, whose lower-level processings are automatized, tend to shadow with longer latencies.

![Figure 3 Model of repetition](image_url)

Based on Kojima (2006:37)

**Figure. 3 Model of repetition**

*MIYAKE, S.*
Conclusion

The present study examined the relationship between shadowing and the function of the phonological loop by looking especially at the influence of phrase shadowing on the processes of EFL listening. The result of the present study indicates that repeated phrase shadowing leads to an increase in articulation rate and an expansion of the chunk span in listening. In other words, articulation rate can be an important factor in the development of bottom-up processing ability in EFL listening. At the same time, the present study suggests that repeated phrase shadowing is likely to develop the phonological storage capacity and consequently to reduce the cognitive load in the lower-level processing, such as phoneme detection and phonological analysis. Thus, it is natural to infer that continual shadowing practice for a certain period of time can lead to automatization of the lower-level processing in speech perception. In addition, shadowing latency may show that there are some possible processing routes in shadowing and that better listeners take different processing routes from poor listeners.

To understand better the cognitive processes in shadowing, a further study should be conducted from the perspective of other properties, such as suprasegmentals or language production. Then, broader pedagogical implications will be acquired.

Notes
1. “Phrase shadowing” is an experimental method devised by the author to measure shadowing speed and latency. Semantic chunks within 2000 msec duration are shadowed by subjects.
2. “Lower-level processing” means processing in a perceptual stage

Acknowledgement

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References


Rost, M. (2002). Teaching and researching listening. Essex: Pearson Education.


Appendix: Semantic chunks for phrase shadowing

1. a book about cooking  
2. the room above the kitchen  
3. carry out his assignment  
4. the day after tomorrow  
5. a walk along the river  
6. the restaurant around the corner  
7. cut out for teaching  
8. believe in Santa Claus  
9. agree to a suggestion  
10. answer your mother back