Effect of Shadowing and Dictation on Listening Comprehension Ability of Japanese EFL Learners Based on the Theory of Working Memory

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INTRODUCTION

Developing phonological short-term memory (phonological memory, hereafter) may be one of the best ways to improve extensive listening ability; the phonological memory is the storage component in the phonological loop, which is one of the components in the working memory model. The phonological loop consists of the phonological memory and the subvocal rehearsal system. The phonological memory is assumed to hold limited verbal information, while the subvocal rehearsal system processes written information to be converted into phonological code and also rehearses information to prevent its decay. In experimental cognitive psychology, a number of studies have produced evidence that supports the relationship between the phonological memory and language learning (Baddeley et al., 1988; Adam & Gathercole, 1996; Ellis & Sinclair, 1996; Baddeley, 2000). In order to be a good listener, one has to hold auditory information effectively in the phonological memory until the information is processed. With the aim of developing the listening comprehension ability of Japanese college EFL learners, this paper focuses on how we can improve listening ability through activation and effective use of the phonological memory; more specifically, this paper proposes that both shadowing exercises using the materials contained in listening texts and dictation exercises promote activation and effective use of the phonological memory.

THEORETICAL BACKGROUND

For decades cognitive psychologists have conducted numerous experiments on how language is processed and stored in the human memory (Baddeley & Hitch, 1974; Baddeley, 1986; Anderson, 1995; Eysenck & Keane, 1995). A classic study, "The Magical Number Seven, Plus or Minus Two" (Miller, 1956), shows the limited storage capacity of the short-term memory (STM). Baddeley and Hitch, on the other hand, claim that the STM is capable of not only holding information transiently but also of cognitive activities such as "comprehension, learning and reasoning." This system has been called the "working memory" (Baddeley & Hitch, 1974; Baddeley, 1986). Logie (1996: 48) summarized Baddeley and Hitch's model as comprising "three components that respectively provide temporary verbal storage, temporary visuospatial storage, and a coordinating function." In 2000, Baddeley added a fourth component to the model "that is capable of drawing information both from the slave systems and from LTM, and holding it in some integrated form (p. 420)."

In their model, the working memory refers temporary verbal storage to the

phonological loop, which consists of "a passive phonological store and an articulatory rehearsal process." Baddeley (1986) claims that the phonological loop plays an important role in language storage and comprehension. According to the study, speech-based auditory information goes directly into the passive phonological store; however, written information has to be converted into a phonological code through articulatory rehearsal processing because all the language information is supposed to be stored in a phonological code in the phonological memory (Baddeley & Hitch, 1974; Baddeley, 1986; Anderson, 1995). In addition to the operation of articulatory rehearsal of written information, longer words that are presented auditorily may also require articulatory rehearsal in order for the words to be stored in the phonological memory (Baddeley, Lewis, & Vallar, 1984 cited in Logie, 1996). Therefore, phonological coding of input through articulatory rehearsal seems to be an important step for information to be stored in the phonological memory.

This claim has been supported by a neuropsychological experiment testing a patient whose short-term phonological store was impaired. Baddeley, Papagno, & Vallar (1988) investigated a patient called P.V., who suffered a left-hemisphere stroke. P.V. could not repeat sequences of longer than two or three digits or nonwords, and could not learn unfamiliar verbal material. This study suggests that the patient had a deficit in the phonological loop, which promotes articulatory rehearsal. That is, articulatory rehearsal in the phonological loop is a necessary operation for language learning.

There has been a considerable number of studies on first language vocabulary learning. A good deal of evidence supports the idea that the phonological memory plays a crucial role when children learn words in their first language (Baddeley, Papagno & Vallar, 1988; Gathercole, Willis, Emslie & Baddeley, 1992; Gathercole & Baddeley, 1993; Ellis & Sinclair, 1996). On the other hand, Service & Kohonen (1995) conducted experiments on whether there is a relationship between the phonological memory and foreign language learning. They investigated whether pseudoword[1] repetition ability, which seems to be related to the phonological memory capacity, can measure vocabulary knowledge as well as other kinds of foreign language knowledge. They found that there is a significant correlation between repetition ability and listening comprehension scores as well as English vocabulary scores. From their experiments, it is suggestive that pseudoword-repetition ability can also measure listening comprehension ability. In other words, if EFL learners perform well on word-repetition types of exercises, their listening skills are supposed to be good, which implies that word-repetition type exercises could promote listening comprehension ability as well as the effective use of the phonological memory.

Service & Kohonen recommend more attractive activities than the traditional repeating aloud in order to develop the phonological memory. Attractive activities are hard to find, but for mature foreign language learners like college students, activities such as shadowing and dictation may be tolerable exercises, and these exercises require heavy repetition. By practicing shadowing, students have to practice holding auditory information temporarily in the phonological memory of their working memory system. Dictation practice also requires keeping auditory information in the phonological memory until students transcribe the information from the tape. In Orita's study (2000), about

80% of his students at his *kosen* (a five-year educational institution for engineers) thought that shadowing and dictation exercises were either useful or very useful for the development of listening comprehension.

Study 1 attempts to explore further the speculation put forward by Onaha (1999) that intensive shadowing and dictation practice may develop listening comprehension ability, and that there may be a correlation between the phonological memory and listening comprehension ability.

The two research questions are as follows:

1. Do shadowing and dictation exercises develop listening comprehension ability?
2. Does an EFL learner who has a better phonological memory capacity have better listening ability?

In addition, another study was conducted to follow up on the question of whether shadowing and dictation exercises expand the capacity of the phonological memory. Since Study 1 did not answer the question of whether such expansion takes place over time, Study 2 was designed to answer that question.

STUDY 1

Method

Participants

Forty-three Japanese college freshmen (33 females and 10 males) majoring in English participated in Study 1 in 2001.

Materials

The materials for the shadowing and dictation exercises were interviews from radio programs contained in the intermediate textbook, *On the Air* (Sadow & Sather, 1998), and news stories recorded from CNN News on TV.

Procedure

Students met one class period (90 minutes) per week for the first semester. All the materials in each lesson were recorded on students' own cassette tapes in class so that they could take them home to practice.

In class, the students first listened to the text and then listened to an explanation of the content of the text by the instructor. The instructor tried to familiarize the students with the content of the text by asking questions in English or giving the meaning of unfamiliar vocabulary. The students then practiced shadowing, concentrating not only on correct reproduction of the words but also on the stress and intonation patterns in the sentences. The instructor paused the tape for about two seconds whenever the speakers on the tape made a pause. By doing so, the shadowing exercise was made easier for all the students to follow. The students took their tapes home for additional practice. In class, the instructor selected a couple of paragraphs (about one minute long) from the interviews from the radio program for shadowing, which the students recorded for grading. The students were told to imitate the speakers on the tape as closely as possible, especially their stress and intonation patterns. The grading was based not only on their reproduction of the individual words, but also on the stress and intonation of their sentences. Five tape

recordings were graded for the semester.

Dictation exercises were given as homework, in which students answered questions by citing the content of the text. The students had to answer the questions in detail so that they could practice transcribing most of the text. Since the students did not have a script of the text, they had to practice by only listening to the tape. After handing in their homework, they got the script of the text in order to check their transcription.

Data

1. Listening Comprehension Pre- and Post-Tests

The students took a listening pre-test at the beginning of April and a listening post-test at the beginning of August in 2001. The NHK Intermediate I Listening Test that was broadcast in 1999 was used to assess their listening comprehension ability[2]. The same test was used for both pre- and post-tests.

2. Grading of Shadowing

The instructor graded the students' reproduction ability and their stress and intonation on the shadowing they recorded on their tapes. Five tapes for each student were graded. The scale for grading was A (95%), A^- (90), B^+ (85), B (80), B^- (75), C^+ (70), C (65) and C^- (60). When the instructor graded each tape, individual names were covered so that she could grade as objectively as possible[3].

3. Dictation Test

At the end of the semester, the students took a dictation test. Materials for the dictation test were selected from interviews in the textbook *On the Air* by Sadow & Sather (1998). The materials were recorded on the students' tapes on the day of the test and the students were permitted to listen to the tapes as many times as they wanted.

4. Measurement of Phonological Memory Using Unfamiliar Words

Gathercole and Baddeley (1993: 48) recommend using nonwords in a "repetition test as a measure of phonological short-term memory in children" because nonwords do not exist whatsoever in long-term memory and therefore do not support the phonological memory. However, Baddeley et al. (1998) further claim that even the use of nonwords cannot rule out long-term memory contribution to short-term phonological memory. They argue that wordlike nonwords can get more support from long-term memory than nonwords with unusual sound patterns. That is, it seems to be hard to rule out support from long-term memory completely. Therefore, in this study, unfamiliar words for immediate free recall performance were used for measuring the phonological memory in EFL learners because there was not much difference between nonwords and unfamiliar words for the participants of this study, and this task is easier to handle during a class session.

The students took a test of immediate free recall of auditorily presented words. Seven unfamiliar one-syllable words[4] recorded by a native speaker of English were presented. The seven words were read out in a span of ten seconds. The students were instructed to listen to the words, trying to memorize them. Immediately after the seven words were presented, the students were required to write as many words as they remembered. Another set of seven unfamiliar words was used for practice using the same procedure before the main test took place.

If students remembered and wrote down all seven words correctly, they got seven points, and if three words were correct, they got three points. If students misspelled one letter, such as "lurch" for "larch," they still got one point. No distinction was made for "l" and "r." If students wrote "root" or "rute" for "lute," or "rarch" for "larch," they got one point. Most of the words were either correctly spelled or not recalled at all.

Statistical Analysis

A two-tailed t-test (repeated-measures) and correlation analysis using the SAS program was used to provide quantitative analysis. The t-test analyzed whether there were significant differences between the listening pre- and post-tests. The Spearman correlation analyzed whether there were correlations between the scores of the listening post-test, shadowing, dictation, and memory tests. Since the data of this study were not normally distributed, the Spearman correlation coefficents were used. There are four variables in the correlation analysis: the scores of the listening post-test, shadowing, dictation, and memory tests.

Results

This section presents the scores on the listening pre- and post-tests, shadowing, dictation, and memory tests. The statistics in Table 1 describe the mean scores and standard deviations (SD) of each test. The minimum and maximum scores of each test are also shown in Table 1.

Table 1 Descriptive Statistics for All Tests in Study 1 (N=43)

Measure	(Total possible)	Mean	SD	Minimum	Maximum
Listening pre-test	(40)	32.09	4.68	19.0	40.0
Listening post-test	(40)	34.63	3.64	25.0	40.0
Shadowing	(100)	83.93	6.65	69.0	95.0
Dictation	(30)	21.66	4.79	13.5	29.5
Memory	(7)	2.37	1.29	0.0	5.0

To answer research question one, whether shadowing and dictation exercises have an effect on the development of listening comprehension ability, the means of the listening pre- and post-tests were compared. The t-test calculated the significance of the difference between the two mean scores. Table 2 shows that the difference was significant at $p < .001$.

Table 2 *t*-test on the Scores of the Listening Pre- and Post-Tests in Study 1 (N=43)

Measure	Mean	*t* value	df	p
Listening pre-test	32.09	3.626	42	$p < .001$
Listening post-test	34.63			

Table 3 displays the correlations among the four measures. All of the measures were positively related. The listening post-test scores were strongly related only to the

shadowing scores and moderately related to the dictation and memory scores.

Table 3 Spearman Correlation Coefficients among Measures in Study 1 (N=43)

Measure	Listening post-test	Shadowing	Dictation	Memory
Listening post-test	1.00	.60	.52	.50
Shadowing		1.00	.74	.53
Dictation			1.00	.43
Memory				1.00

All correlations significant, $p < .01$

Discussion

The first and basic requirement for foreign language acquisition to take place is not only large amounts of exposure to the language to be acquired, but also constant articulatory rehearsal of the input in the phonological loop. Study of the working memory has provided evidence that constant rehearsal activates the phonological memory, which stores linguistic information. In order for foreign language learners to build up and enhance their phonological memory, they require a large amount of rehearsal in the phonological loop. Nonword repetition ability in first language acquisition can measure language knowledge, especially the ability to learn new vocabulary. In terms of foreign language acquisition, nonword repetition and immediate memory performance tests can measure listening comprehension ability as well as new vocabulary acquisition. Shadowing and dictation exercises that require heavy repetition were used to see whether these exercises activate and enhance the phonological memory and develop listening comprehension ability.

The first research question asked whether shadowing and dictation exercises promoted listening comprehension ability. As the results show, these exercises can promote listening comprehension ability. The difference between the pre- and post-test scores was significant at $p < .001$. Among the exercises, shadowing was strongly related to the post-test; that is, those who did well on shadowing had good listening ability. Interestingly enough, shadowing and dictation showed the strongest correlation, at .74, of all the measures. This strong correlation between shadowing and dictation proves that the two exercises have similar effects on improving the phonological memory since they both require heavy repetition. On the other hand, the correlation between the listening post-test scores and the shadowing scores was .60, and between the listening post-test and dictation scores only .52. The reason for this is because five learners (out of 43, 11.6%) who performed well on both exercises had below average listening scores. That may explain why both correlations were weaker than the one ($r = .74$) for shadowing and dictation. That is, five learners did shadowing or dictation without understanding what they were saying or writing. The majority of the students (88.4%) who did well on shadowing and dictation had good listening ability. Therefore, it is reasonable to conclude that these two exercises have an effect on the development of listening comprehension ability.

The second research question concerned whether EFL learners who have better phonological memory have better listening ability. Table 3 shows that memory-test scores were moderately related to the listening post-test at .50, to shadowing at .53, and to dictation at .43. Therefore, based on this evidence, all of the differences were significant. That is, EFL learners who have better phonological memory have better listening ability.

A question arose, however, whether these two types of exercises would be effective in expanding the phonological memory. Study 2 was designed to answer this question.

STUDY 2

The improvement of children's memory span over their childhood years has been reported by Gathercole (1998). Gathercole & Hitch (1993) claim that phonological memory seems to be present in very young children; however, the subvocal (articulatory) rehearsal process does not appear until children are older. Although five-year-old children do not have a fully developed subvocal rehearsal process, there is experimental evidence that they can be trained to utilize subvocal rehearsal strategies through overt repetition exercises (Gathercole, 1998). In the case of EFL learners, if their subvocal rehearsal process is not developed, they may be impaired in maintaining and comprehending information.

The aim of Study 2 is to investigate whether shadowing and dictation exercises are effective in expanding the phonological memory over time.

Method

Participants

Sixty-two Japanese college freshmen majoring in English (50 females and 12 males) participated in Study 2 in 2002.

Materials

The same materials used in Study 1 were used in Study 2.

Procedure

Study 2 followed the procedure of Study 1.

Data

1. Listening Comprehension Pre- and Post-Tests

The students took a listening pre-test at the beginning of April and a listening post-test at the end of July in 2002. The NHK Intermediate II Listening Test from 1999 was used for the listening pre-test, and the NHK Intermediate II Listening Test from 2001 was used for the post-test. The Intermediate I test used in Study 1 may not be a reliable test for English-major students since three students got full scores (40), one on the pre-test and two on the post-test. In Study 2, different NHK intermediate II listening tests were used for the pre- and post-tests since there may be an expectation that the same pre- and post-tests may not be reliable for measuring accurate improvement in listening ability.

2. Measurement of Phonological Memory Using a Sequence of Digits

In Study 1, unfamiliar words for immediate memory performance were used for assessing the phonological memory. In Study 2, a digit span test was used for assessing

the phonological memory. The digit span test is the most widely used method for assessing the phonological memory function (Gathercole, et al, 1999).

The digit span test used in Study 2 consisted of a sequence of digits that was sampled randomly and recorded by a native speaker of English. The sequence was increased in increments starting with four digits and continuing to eleven digits. The first sequence consisted of four digits, such as 7, 1, 5, 2, the second sequence five digits, the third sequence six digits, and so on up to a sequence of eleven digits. The native speaker read the four digits in about two seconds, or approximately one digit every 0.5 seconds. After he read the first sequence of digits, he paused and then read the second sequence of digits.

The sixty-two students took the digit span pre-test immediately after the listening pre-test. The procedure of the test is as follows. The students listened to a recorded sequence of digits. They were told to write down the digits in the same order on a piece of paper immediately after they heard the sequence of digits. The same task was repeated until they had heard and had written down each sequence of digits. The instructor made a brief stop right after each sequence to make sure all the students finished writing.

Scoring of the digit span pre-test is as follows: If students correctly remembered and wrote down the four- and five-digit sequences, they got five points; if they correctly remembered and wrote down the four- and six-digit sequences, but not the five-digit one, they got 5.5 points. Their score was the longest consecutive sequence that they correctly wrote down. For example, if they correctly wrote down all the sequences through six digits, they got six points, and for all the sequences through seven digits, they got seven points.

The digit span post-test was conducted and scored according to the same procedure as the digit span pre-test. The same students took both the digit span pre- and post-test right after the listening pre- and post-tests. The same span test was used for both the pre- and the post-tests.

Statistical Analysis

The statistical analysis for Study 2 followed that of Study 1.

Results

This section presents the scores on the listening pre- and post-tests and the digit span pre- and post-tests. The statistics in Table 4 describe the mean scores and standard deviation (SD) of each test. The minimum and maximum scores on each test are also shown in Table 4.

Table 4 Descriptive Statistics for All Tests in Study 2 (N=62)

Measure	(Total possible)	Mean	SD	Minimum	Maximum
Listening pre-test	(40)	24.92	5.96	13	39
Listening post-test	(40)	28.32	5.12	18	38
Digit span pre-test	(11)	5.17	1.17	0	7
Digit span post-test	(11)	5.65	1.11	4	9

To answer the question whether shadowing and dictation exercises are effective in expanding phonological memory, the means of the digit span pre- and the post-tests were compared. Table 5 shows the results. The difference was significant at $p < .001$. Table 5 also shows the results of the t-test that calculated the significance of the difference between the listening pre- and post-tests. The difference in Study 2 as in Study 1 was significant at $p < .001$.

Table 5 *t*-tests on the Scores for All Tests in Study 2 (N=62)

Measure	Mean	*t* value	df	p
Digit span pre-test	5.17	3.507	61	p< .001
Digit span post-test	5.65			
Listening pre-test	24.92	6.201	61	p<.001
Listening post-test	28.32			

Table 6 summarizes the correlation between digit span and listening ability. The digit span pre-test correlated significantly with the listening pre-test at $r = .48$ and the listening post-test at $r = .41$. The digit span post-test correlated with the listening pre-test at .25; however, there was no correlation between the digit span post-test and the listening post-test.

Table 6 Spearman Correlation Coefficients among Measures in Study 2 (N=62)

Measure	Listening pre-test	Listening post-test
Digit span pre-test	.48**	.41**
Digit span post-test	.25*	n.s.

(**p< .001 *p< .05)

Discussion

Study 2 further pursued whether shadowing and dictation exercises promote phonological memory. Study 2 also took into account concern about the reliability of the listening comprehension pre- and post-tests since the same NHK intermediate I listening test was used for both tests in Study 1; that raised a question of whether one might expect that the students would do better the second time, having already heard the material once.

The results of Table 5 show that both shadowing and dictation exercises expand memory span, that is, the phonological memory. The difference between the digit span

pre- and post-tests was significant at .001. Thus, we can conclude that the shadowing and dictation exercises conducted in Study 2 expand the phonological memory over time. The correlation study summarized in Table 6 showed that the digit span pre-test was strongly correlated with both the listening pre-test ($r = .48$, $p < .001$) and the listening post-test ($r = .41$, $p < .001$). The digit span post-test was weakly correlated with the listening pre-test ($r = .25$, $p < .05$); however, there was no correlation between the digit span post-test and the listening post-test scores. As discussed earlier, digit span measures the phonological memory; however, listening comprehension may involve not only operation of the phonological memory but other complex functions. Recent studies (Baddeley et al., 1998; Baddeley, 2000; Saito, 2000) tell us that the working memory is no longer considered independent from LTM. We can, therefore, assume that the digit span test, which measures only the phonological memory, cannot easily measure those complex functions, and perhaps that accounts for the lack of correlation between the digit span and listening post-test scores.

Regarding the reliability of the listening pre- and post-tests, the t-test on the scores of pre- and post-tests were both significantly different, $p < .001$ in Study 1 and $p < .001$ in Study 2; the same test was used in Study 1, but different tests were used in Study 2 for the listening pre- and post-tests.

CONCLUSIONS

This paper has argued that the phonological memory in the working memory model plays an important role in storing linguistic information. In order to play an adequate role, the phonological memory has to be very efficient since the phonological memory processes information in a fleeting moment. Much of language learning requires holding sequences of language in the phonological memory. These studies have demonstrated that the efficient use of the phonological memory is necessary for processing sequences of information and is promoted through dictation and shadowing exercises. Study 1 has demonstrated that there are correlations between listening ability, shadowing, dictation ability, and efficient use of the phonological memory. Study 2 has demonstrated that shadowing and dictation exercises are effective in expanding the phonological memory over time; however, the development of the phonological memory was not correlated with the development of listening ability in this study.

Study 2, however, raised another question: whether the digit span test, which measures the phonological memory, can predict listening comprehension skill. This question remains to be resolved in further quantitative studies.

NOTES

1. A pseudoword is a word that sounds like an English word but which has no meaning and is created especially for experimental use. It is also called as a nonword in various studies in experimental cognitive psychology.

2. The NHK Intermediate I and II Listening Tests consist of 40 questions each. The reliability coefficient is 0.968 for the Intermediate I test and 0.929 for the Intermediate II

test, while the reliability coefficient for the TOEFL is usually 0.95 (NHK Intermediate II Listening Test, 2001). Therefore, the NHK tests are as reliable as the TOEFL.

3. The final tape (the fifth one) for each student was graded by the instructor and a native speaker in order to confirm the reliability of the grading. The interrater correlation was .52 ($p<.05$). Therefore, we can assume that the grading was reliable.

4. Unfamiliar words such as spade, wasp, flask, gill, pike, elk and larch were used.

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REFERENCES

Adam, A.-M. & Gathercole, S. E. (1996). Phonological working memory and spoken language development in young children. *The Quarterly Journal of Experimental Psychology,* 49A (1), 2216–233.

Anderson, J. (1995). *Learning and memory.* New York: John Wiley and Sons.

Baddeley, A. D. (1986). *Working memory.* Oxford: Oxford University.

Baddeley, A. D. (2000). The episodic buffer: a new component of working memory? *Trends in Cognitive Sciences,* 4 (11), 417–423.

Baddeley, A. D., Gathercole, S. E. & Papagno, C. (1998). The phonological loop as a language learning device. *Psychological Review,* 105 (1), 158–173.

Baddeley, A. D. & Hitch, G. (1974). Working memory. In G. A. Bower (Ed.), *The psychology of learning and motivation.* New York: Academic Press.

Baddeley, A. D., Papagno, C. & Vallar, G. (1988). When long-term learning depends on short-term storage. *Journal of Memory and Language,* 27, 586–595.

Ellis, N. C. & Sinclair, S. G. (1996). Working memory in the acquisition of vocabulary and syntax: Putting language in good order. *The Quarterly Journal of Experimental Psychology, 49A* (1), 234–250.

Eysenck, M. W. & Keane, M. (1995). *Cognitive psychology: A Student's handbook.* Hillsdale: Lawrence Erlbaum Associates Publishers.

Gathercole, S. E. (1998). The development of memory. *Journal of Child Psychology and Psychiatry,* 39 (1), 3–27.

Gathercole, S. E. & Baddeley, A. D. (1993). *Working memory and language.* Hove: Erlbaum.

Gathercole, S. E. & Hitch, G. J. (1993). Developmental changes in short-term memory: A revised working memory perspective. In A. Collins, S. E. Gathercole, M. A. Conway, & P. E. Morris (Eds.), *Theory of memory* (pp. 189–210). Hove, U.K.: Erlbaum.

Gathercole, S. E., Willis, C., Emslie, H. & Baddeley, A. D. (1992). Phonological memory and vocabulary development during the early school years: A longitudinal study. *Developmental Psychology,* 28, 887–898.

Gathercole, S. E., Service, E., Hitch, G. J., Adams, A.-M., & Martin, A. J. (1999).

Phonological short-term memory and vocabulary development: Further evidence on the nature of the relationship. *Applied Cognitive Psychology,* 13, 65–77.

Logie, R. H. (1996). The seven ages of working memory. In J. T. E. Richardson et al. (Eds.), *Working memory and human cognition*. New York: Oxford University Press.

Miller, G. A. (1956). The magic number seven, plus or minus two: Some limits on our capacity for processing information. *Psychological Review,* 63, 81–93.

NHK Intermediate II Listening Test. (2001).

Onaha, H. (1999). Phonological memory and language acquisition based on the theory of working memory. *Society of English Language Teachers-Okinawa Review,* Vol. 1, 1–14.

Orita, M. (2000). Japanese novice EFL learners and features of the stream of speech: replication activities. *Annual Review of English Learning and Teaching,* 5, 1–16.

Sadow, C. & Sather, E. (1998). *On the air: listening to radio talk*. Cambridge: Cambridge University Press.

Saito, S. (2000). Onin roupu to choukikioku to rizumu [Phonological loop, long-term memory and rhythm]. In N. Osaka (Ed.), *Brain and working memory* (pp. 277–297). Kyoto: Kyoto University Press.

Service, E. & Kohonen, V. (1995). Is the relation between phonological memory and foreign language learning accounted for by vocabulary acquisition? *Applied Psycholinguistics*, 16, 155–172.