



Phonological Awareness in Adult Japanese EFL Learners

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博 士 論 文

Phonological Awareness in Adult Japanese EFL Learners

(成人日本人英語学習者の Phonological Awareness に関する研究)

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1 INTRODUCTION

Phonological awareness is the awareness that speech consists of sound units such as phonemes, rimes, and syllables. Phonological awareness also refers to the ability to recognize such phonological units in a spoken word (Ball & Blachman,1991). This ability, what Høien et al (1995) called “phonological sensitivity” or “a language-sound analysis ability” is measured using a variety of tasks such as to detect, segment, combine, isolate or delete sound units of spoken words. Phonological awareness at the phoneme level is referred as phonemic awareness and distinguished from the awareness at larger phonological units (e.g., Bentin, 1992, Bryant et al. 1990, Goswami & Bryant 1990). Several empirical studies have shown that the sensitivity to rhyme and syllables develop earlier than the sensitivity to phoneme among English-speaking children (e.g. Bryant & Bradley, 1987). Liberman and et al (1974) demonstrated that the explicit analysis of spoken utterances into phonemes was significantly more difficult for the young child than the analysis into syllables. In short, the ability or sensitivity involving phoneme are more difficult to attain and later developed than the ability or sensitivity to rhyme or syllables. Considering alphabets represent the smallest sound units of the language, i.e., phonemes, development in phonemic awareness in English speaking children should strongly tie to the learning how to read and write at school. According to Mann (1986), several different research groups have, in fact, reported that adults who cannot read an alphabetic orthography were unable to manipulate phonemes. Nevertheless, according to some studies, sound units larger than phoneme play an important role in reading and spelling; Bryant et al (1990) demonstrated that the sensitivity to rhyme made a direct contribution to reading while Treiman et al (1995) showed a strong association between the ability to recognize onset / rime and reading and spelling.

A battery of studies demonstrated a strong relationship between phonemic awareness instruction and reading and spelling performance. For example, Ball & Blachman (1991) showed that the group of kindergartners who received phonemic awareness instruction combined with instruction in letter names and sounds significantly improved the reading and spelling skills compared to the group who received instruction in letter names and sounds only.

Effects of phonological awareness instruction on reading has been observed not only among children who speaks English as their first language but also among children who speak other alphabetic languages as their first language (e.g., Lundberg et al, 1998, Aidinis & Nunes, 2001). Schneider et al (1999) reported that phonological awareness instruction substantially reduced the risk of becoming dyslexic among German Kindergartners.

There is also research that showed that phonological awareness instruction is effective in second language learning. Lesaux & Siegel (2003) reported that phonological awareness instruction improved English reading skills equally in English-speaking children and children who spoke English as second language. Considering a positive L1 phonological awareness transfer to L2 phonological awareness found among children who speak and learn alphabetic languages (e.g. Comeau et al, 1999, Lindsey et al, 2003), a question arises so as to if EFL children with non-alphabetic language as L1 also can benefit from phonological awareness instruction. To explore the answers to this question, Yeung et al (2013) examined the effects of phonological awareness instruction on L2 development among young Chinese EFL learners. They found that children who received the phonological awareness instruction showed significant improvement on English word reading, spelling, and phonological awareness. In the study of Yeung and Chan (2013), examining the role of L1 and L2 phonological awareness and English reading among Chinese EFL learners, it was found that English phonological awareness both at the syllabic and subsyllabic level (rime and phoneme) made a strong contribution to English reading. These findings suggest that

phonological instruction is beneficial for Japanese EFL learners. A study is available that showed that English phonological awareness is related to English word-reading in Japanese speakers. In their study investigating into English phonemic awareness and reading comprehension among Japanese adult learners of English, Yoshikawa and Yamashita (2014) found that phonemic awareness significantly correlated with and contributed to pseudo-word reading. Their finding indicates enhancing English phonological awareness will improve word-reading among adult Japanese learners. As their study examined the phonemic awareness only, further research including phonological awareness at all levels will be valuable.

Piske (2008) claims that L2 phonological awareness develops through experience of being exposed to L2 native language and the use of that language. As Yeung et al.'s study (2013) showed that phonological training compensates the lack of L2 exposure and improve L2 phonological awareness, many Japanese speakers who receive/have received common English education in Japan may also benefit from the phonological awareness training. With an aim to provide educational implication beneficial for all Japanese EFL learners including both young and adult, this study first investigated into English phonological awareness among adult Japanese learners.

While we find no study on phonological awareness training and L2 learning among adult EFL learners, there have been studies that demonstrated adult learners improved their sensitivity to certain L2 phonological unit through intensive training. A series of laboratory training studies that trained adult Japanese speakers to identify English /r/ and /l/ showed that the training with natural token produced by multiple speakers was effective to enhance the ability (Logan et al, 1991), the enhancement retained overtime (Lively et al ,1994) and the knowledge gained thorough perceptual training transferred to the production domain (Bradlow et al, 1997). Tajima and Akahane-Yamada (2003) showed adult Japanese speakers improved the

syllable counting skill through self-training using computers and training effects were retained after a certain period of time. From these findings, we assume that adult Japanese EFL learners are able to improve their English phonological awareness at all levels (phonemes, rimes and syllables) through intensive training and training effects will transfer to their L2 production.

In summary, previous studies have shown that phonological awareness is closely related to reading and writing of both L1 and L2 and phonological awareness will improve through phonological awareness training among children. It has also been shown that adult learners can improve their sensitivity to certain L2 phonological unit through intensive training.

The studies in this paper were conducted to explore the role of phonological awareness in adult Japanese learners. Specifically, we had two aims: 1. to capture the general phonological awareness among adult Japanese learners and explore the relations between phonological awareness and their word-reading; 2. to examine the effects of phonological awareness training on phonological awareness, word-reading and word-spelling. Our studies were different from the previous studies on phonological awareness training in the following respects: First, to minimize the gap in vocabulary knowledge among the adult participants, only words with low familiarity were used in the tests and the training. Second, we evaluated word-reading and word-spelling not by judging them either correct or incorrect. We evaluated word-reading in terms of pronunciation goodness using multiple measures and word-spelling in terms of the number of errors within spelled words. In this study, misspellings were observed as inconsistent perception or the difficulty in perception of phonological units within spoken words. In this way, we assumed, the relations between phonological awareness and word-reading and spelling would be revealed in detail, thus the role of phonological awareness in L2 learners could be better described. Accordingly, we needed a pronunciation scale that examines learners' pronunciation segmentally as well as prosodically and evaluates it in terms of "goodness" or "nativeness."

Finding no such scale available, we made an exploratory assessment of Japanese learners' pronunciation using six metrics, which is reported as Study 3 in this paper. Lastly, as the phonological instruction and training were given by instructors in the studies with children, we used computer-programmed tests and training and trainees underwent training by themselves.

2. STUDY 1: ENGLISH PHONOLOGICAL AWARENESS IN ADULT JAPANESE EFL LEARNERS

The aim of this study is to capture the general phonological awareness among adult Japanese learners and explore the relations between phonological awareness and their word-reading. We also examined whether phonological awareness training would enhance phonological awareness among adult Japanese EFL learners as well as the training effects on their English word-reading and spelling.

2.1 METHOD

2.1.1 PARTICIPANTS

Participants were twenty Japanese university students and graduate students who have learned English as a school subject in Japan. None of them has received phonological training prior to the study nor has been abroad more than twelve months. None of them were majoring in English nor in other languages. They were divided into two groups: the training group which went through 16-20 session phonological awareness between the tests and the control group which took the tests only.

2.1.2 MATERIAL AND STIMULI

To reduce the word-knowledge gap among the participants, only unfamiliar words were used for both tests and training. About six hundred one- to six-syllable English words of low familiarity were selected from MRC Psycholinguistic Database for the study (http://websites.psychology.uwa.edu.au/school/MRCDatabase/uwa_mrc.htm).

The familiarity score of one- to four-syllable words was 100, the lowest score given in the database while that of five- to six-syllable words varied from 100 to 400 due to the limited number of these words available in the database.

The selected words were divided and assigned to five native speakers of American English (two males and three females) to read aloud and record. The recording was made by a professional at a recording studio. Native speakers were asked to pronounce the words naturally based on phonological transcriptions. They were also asked to pronounce and record all English phonemes individually, which were used in some feedback in the training. Model answers for some tasks were made by modifying the recording (e.g. model answer /'sæŋgl/ was made by deleting acoustic cue of /p/ from word *spangle* /'spæŋgl/). A list of all words used in the study is provided in appendix A. There were three kinds of tests: word-reading test, word-spelling test and phonological awareness test. Word spelling test consisted of thirty unfamiliar English words while reading test consisted of thirty unfamiliar English words plus twelve familiar English words registered in a loan word dictionary.

The words in the reading tests were:

abode, acorn, adage, chamois, consummation, dell, egotistical, emperor, emporium, euphemism, evangelist, exasperation, goddess, humankind, impropriety, levity, littoral, malaria, originator, ostrich, pique, prosaic, ramrod, rarity, rhombus, salvation, severance, superfluity, supposition, tun, bathtub, catalog, countdown, cauliflower, drugstore, gasoline, headphone, hitchhike, kilometer, labelling, plaza, zipper

The words in the spelling tests were:

suffrage, magnesium, astronomy, atrocity, originality, yore, lagan, detonation, abscess, ostentation, functionary, phantom, beau, incantation, wicker, offshoot, midshipman, dwelling, trey, betterment, gauntlet, mocker, truism, plaice, slough, brisket, lateral, bramble, vitriol, rosebud

Phonological awareness test consisted of 45 unfamiliar words. The training did not include the words used for the test. They were randomly assigned to each session so as to avoid having the same word occur within the same block or occur more than twice within a session. The number of syllables was also taken into account in allocating words. The words in the phonological awareness tests were:

For the task "Initial phoneme isolation":

boisterous, feudalism, mutilation, pugilist, sophisticated

For the task "Final phoneme isolation":

anvil, enigma, noxious, replete, tripod

For the task "Initial phoneme deletion"

despot, gavel, mica, periodical, quietude

For the task "Second syllable deletion"

busybody, immensity, impediment, impunity, metropolis

For the task "Second phoneme deletion"

clung, excise, obstinate, spangle, steadfast

For the task "phoneme counting"

debonair, harem, immortality, mallet, undulation

For the task "syllable counting"

elaboration, intermission, allege, tuberculosis, impediment

For the task "rime detection":

*immortality-immensity, noxious-tuberculosis,
antitoxin-intermission, feudalism-harem, anvil-gavel*

2.1.3 PROCEDURE

2.1.3.1 PRETEST AND POSTTEST

Pretests and posttests were administered using a laptop in a closed and quiet room at Kobe university. The training group took pretests on the first day of the training and posttests on the last day of the training. The posttests for

the control group took place one or two weeks after the pretests. The same tests were administered in both pre-and posttests. In the word spelling test, test words were auditorily presented through a headset and subjects typed the spelling into the box on the monitor screen using a keyboard. They were instructed to guess the spelling from the audio stimuli. They were allowed to listen as many times as necessary by pressing the “play” button placed next to the spelling box. Test outcome was evaluated in terms of the number of substitutions, elisions and epenthesis in spelled words. The plausible pronunciation of each spelled word was transcribed by a phonetically- trained Japanese-English bilingual and compared with the pronunciation in the dictionary.

In the word-reading test, the spellings of the test words were displayed in the middle of the monitor screen and participants were asked to read them aloud and record them. At the bottom of the screen buttons to “start/stop recording”, “listen”, “save”, and “go to the next” were placed in an array. Recording could be overwritten until being saved and the participants were instructed to record their best production. Recording was made through a headset and saved on a memory stick. Test outcome was first transcribed with IPA and then evaluated by a phonetically-trained bilingual using six metrics: phoneme substitution, elision, epenthesis, primary stress, rhythm, and overall goodness. The number of occurrences was counted to evaluate phoneme substitution, elision and epenthesis. Primary stress was first labeled with “0”: no stress placement, “1”: stress placement on a wrong syllable”, or “2”: stress placement on a right syllable” and evaluate by the accuracy (the ratio of “2” to the total). Rhythm and overall goodness were rated on a scale of 1 to 5 (1=very poor, 5=very good) with one-syllable words excluded. The tasks and the procedure of phonological awareness test were the same as those for a session of the training, only no feedback was given. There were forty phonological tasks in the test and one point was given to each correct response, i.e. the perfect score was forty. Before the tests, a brief

phonological instruction was given to make sure that participants understood what phonemes/rimes/syllables are.

2.1.3.2 PHONOLOGICAL AWARENESS TRAINING

The training took place in a closed and quiet room at Kobe University. The training group went through 16-20 sessions over two-three weeks. The average duration of a session was 20 minutes and the average duration of the training was 6 hours. The direction of tasks in Japanese and a “play” button were always displayed on a monitor for every trial and every task. By pressing “play” button trainees were able to listen to the stimuli as many times as they needed. Feedback followed immediately after trainees gave answers by pressing buttons or saved recordings. Trainees were instructed to confirm the correct answer or the model answer before moving on. Presentation of audio stimuli and recording of responses were made through a headset. A session of phonological awareness training consisted of eight blocks, each of which addresses to different phonological awareness task:

Block 1. Initial phoneme isolation: this task involves with a phonemic awareness, the ability to identify one phoneme in a word. Participants listened to a word in isolation and were asked to pronounce an initial phoneme of the word only. Both vowels and consonants appeared as target phonemes. The direction was “Say the first phoneme of the word”. There were five items in this task. One point was given to each correct response and the maximum score was 5.

Block 2. Final phoneme isolation: this task involves with a phonemic awareness, the ability to identify one phoneme in a word. Participants listened to words in isolation and were asked to pronounce their final phonemes only. Both vowels and consonants appeared as target phonemes. The direction was “Say the last phoneme of the word”.

There were five items in this task. One point was given to each correct response and the maximum score was 5.

Block 3. Initial phoneme deletion: this task involves with a phonemic awareness, the ability to manipulate phonemes in words. Participants listened to words in isolation and were asked to pronounce the words without their initial phonemes. The direction was “Say the word without the first phoneme”. There were five items in this task. One point was given to each correct response and the maximum score was 5.

Block 4. Second phoneme deletion: this task involves with a phonemic awareness, the ability to manipulate phonemes. Participants listened to words in isolation and were asked to pronounce the words without second phonemes (e.g. *spangle* /spæŋgəl/ → /sæŋgəl/). Many words with a consonant cluster on their onset of their first syllable appeared in this task. The direction was “Say the word without the second phoneme”. There were five items. One point was given to each correct response and the maximum score was 5.

Block 5. Phoneme counting: this task involves with a phonemic awareness, the ability to segment words by phoneme. Participants listened to words in isolation and were asked to count phonemes in them. The direction was “Count the number of phonemes in the word”. There were five items in this task. One point was given to each correct answer and the maximum score was 5.

Block 6. Syllable counting: this task involves with a phonological awareness, the ability to segment words by syllable. Participants listened to words in isolation and were asked to count syllables in them. The direction was “Count the number of syllables in the word”. There were five items in this task. One point was given to each correct answer and the maximum score was 5.

Block 7. Second syllable deletion: this task involves with a phonological awareness, the ability to segment and manipulate syllables in words. Participants listened to words in isolation and were asked to pronounce them without second syllable. For example, the correct answer for the item *immensity* /ɪmensəti/ was /ɪsəti/. The direction was “Say the word without the second syllables”. There were five items in this task. One point was given to each correct response and the maximum score was 5.

Block 8. Rhyme detection: this task involves with a phonological awareness, the ability to identify rhyming words presented in pairs. Participants listened to pairs of words and were asked to judge if they rhymed. The direction is “Do these two words rhyme? Press “Y” for yes, “N” for NO”. There were five items in this task. One point was given to each correct answer and the maximum score was 5.

In choosing tasks, we used *The Phonological Awareness Test 2* (Robertson and Salter, 2007) and the phonological awareness training in Yeung et al (2013). as references. We left out *letter knowledge* (ask the name of a letter) in Yeung et al (2013) for the lack of difficulty and *blending* (blend sound units to form a word) and *substitution* (change a phoneme in a word to another phoneme to form a new word) in Robertson and Salter (2007) due to the limits of computer-programmed training. A task, *second phoneme deletion* was, on the other hand, uniquely added to the training in this study with an aim to test/train adult Japanese learners’ sensitivity to consonant clusters which are absent in their L1.

In counting tasks, trainees gave answers by pressing one of the buttons displayed at the bottom of the monitor. Numerical buttons from one to twelve were displayed in the phoneme counting task, and from one to ten in the syllable counting task. The correct answer and the phonetic transcription of the trained word were provided in the feedback. In identification and deletion

tasks, participants gave responses by pronouncing and recording. Recording could be overwritten until it was saved. The correct answer in auditory and visual form, the spelling and the phonetic transcription of the trained word were presented in the feedback. In the rhyme detection task, trainees gave answers by choosing either “Y” button for *yes* or “N” for *no* button. The correct answer, the spelling and the phonetic transcription of the trained word were given in the feedback. Monitor screens for each task and feedback are given in Appendix C.

2.2 RESULT

2.2.1 PHONOLOGICAL AWARENESS TEST

Figure 1 illustrates the mean percentage of correct response for each task in the phonological awareness test at pretest. One-way ANOVA showed a main effect of task [$F(7,19) = 2.38, p < 0.05$], and a multiple comparison (Ryan’s method) indicated a significant difference between the best performed task *initial phoneme isolation* and the least performed task *phoneme counting* ($p < 0.001$). The mean scores of each phonological awareness task at pretest and posttest for each group are shown in table 1.

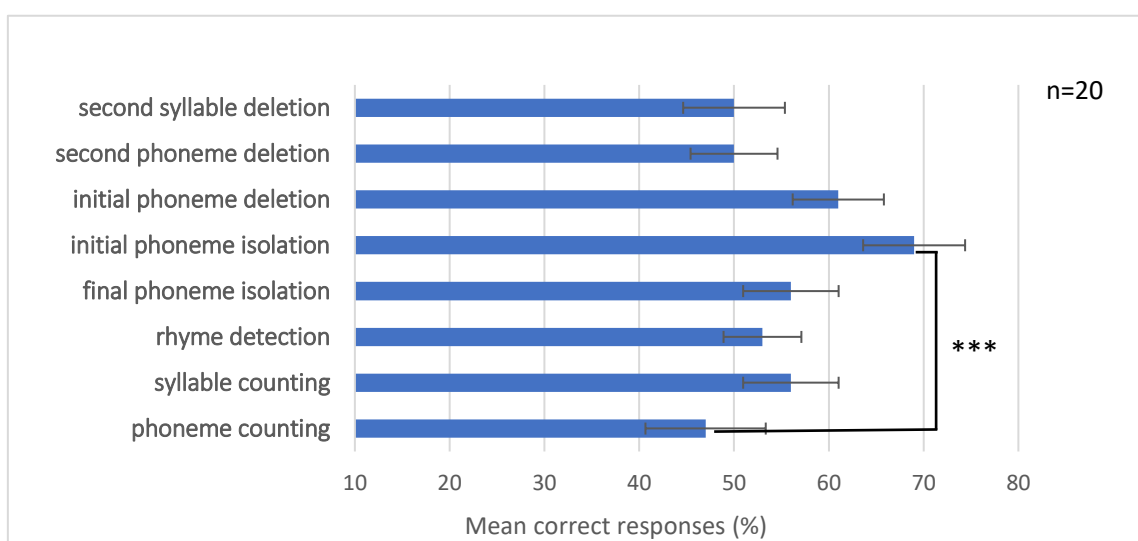


Fig 1 Mean percentage of correct responses for each task at the pretest.

Table 1 Mean scores, standard deviations and mean percentage of correct responses of all the tasks in the phonological awareness test

	Training group (N=10)		control group (N=10)	
	M(SD)	correct (%)	M(SD)	correct (%)
Initial Phoneme identification				
Pretest	3.7 (1.1)	74	3.2(1.08)	64
Posttest	4.3 (0.64)	86	3.2 (0.75)	62
Final phoneme identification				
Pretest	2.9 (1.04)	58	2.7(1.1)	54
Posttest	3.7 (1.05)	74	2.6(1.11)	52
Initial Phoneme deletion				
Pretest	3.6 (0.63)	72	2.5 (1.02)	50
Posttest	3.8 (0.60)	76	2.7 (1.0)	54
Second Phoneme deletion				
Pretest	3.1 (0.83)	62	2.9 (1.04)	58
Posttest	4.1 (0.54)	82	3.1 (0.83)	62
Second syllable deletion				
Pretest	2.8 (0.6)	56	2.0 (1.34)	40
Posttest	3.1 (1.2)	62	1.7 (1.27)	34
Syllable counting				
Pretest	3.0 (0.89)	60	2.60 (1.20)	52
Posttest	4.2 (0.6)	84	3.20 (0.87)	64
Phoneme counting				
Pretest	2.5 (1.28)	50	2.20 (1.33)	44
Posttest	2.2 (1.0)	44	2.21 (1.22)	42
Rhyme detection				
Pretest	2.4 (0.7)	50	2.9 (0.9)	54
Posttest	2.8 (0.7)	60	2.4 (0.8)	48

Training effects on phonological awareness was examined by performing a two-way ANOVA with group (training and control) and test phase (pre and post) as variables for each task. The interaction between the variables was marginally significant in rhyme detection [$F(1,18) = 3.86, p=0.065$], in second syllable deletion [$F(1,18) = 3.86, p=0.089$], and in second phoneme deletion [$F(1,18) = 3.16, p=0.095$], but not significant in all the other tasks. A significant main effect of group was found on initial phoneme isolation [$F(1,18) = 8.69, p<0.01$] and second syllable deletion. [$F(1,18) = 4.59, p<0.05$]. Both a significant main effect of test [$F(1,18) = 6.63, p<0.05$] and a significant main effect of group [$F(1,18) = 7.6, p<0.05$] was found on syllable counting task. Each graph in Figure 2 illustrates a pretest-posttest comparison of mean percentage correct responses for each task in the phonological awareness test.

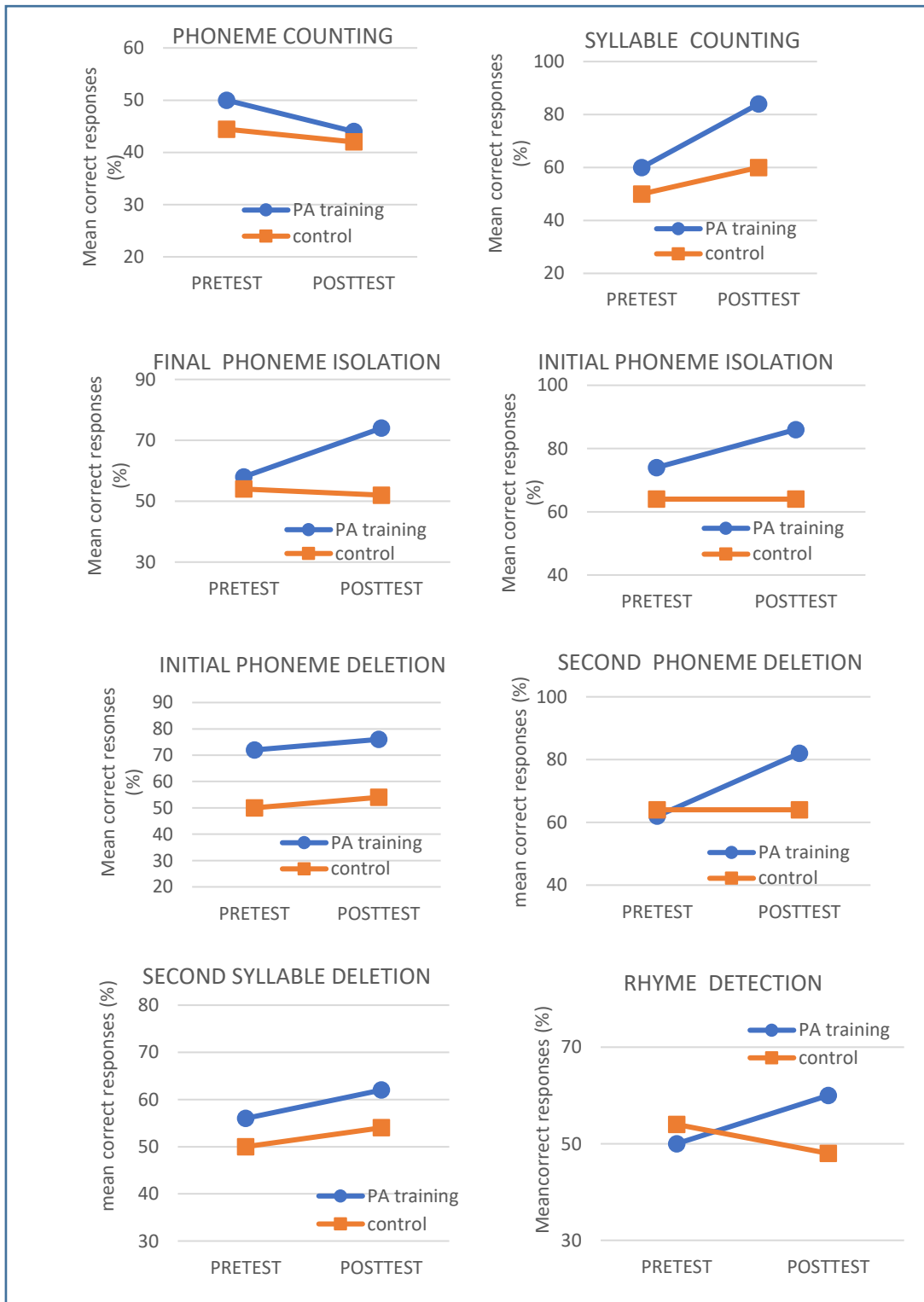


Fig2 Pretest-posttest comparisons of all phonological awareness measures in the phonological awareness test. “PA “stands for *phonological awareness*. (top row left: phoneme counting, top row right: syllable counting, second row left: initial phoneme isolation, second row right: final phoneme isolation, third row left: initial phoneme deletion, third row right: second phoneme deletion, bottom row left: second syllable deletion, bottom row right: rhyme detection)

2.2.2 WORD-SPELLING TEST

The mean number of occurrences and standard deviation for each measure by group are shown in table 2. A Two-way ANOVA with group (training and control) and test phase (pre and post) as variables were conducted on each measure to examine the training effects on word-spelling. No significant interaction between two variables was found for any of the measures. A significant main effect of test phase was found in substitution [$F(1,18) = 14.58, p < 0.005$], and in epenthesis [$F(1,18) = 4.75, p < 0.05$]. Each graph in Figure 3 illustrates the pretest-posttest comparison of mean percentage correct responses for each measure.

Table 2 Mean number of occurrences and standard deviation by groups for each measure in the spelling test

	Training group (N=10)		Control group (N=10)	
	Mean	(SD)	Mean	(SD)
Substitution				
Pretest	22.2	(6.9)	21.1	(5.1)
Posttest	19.0	(6.2)	19.0	(3.0)
Epenthesis				
Pretest	4.6	(2.0)	4.9	(2.6)
Posttest	3.3	(2.1)	3.4	(1.6)
Elision				
Pretest	6.2	(2.6)	4.8	(1.8)
Posttest	5.4	(1.6)	5.0	(3.1)

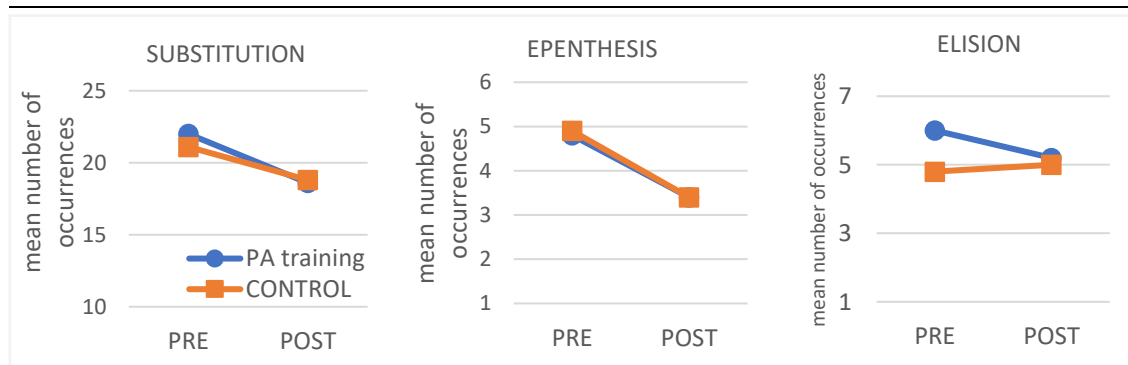


Fig3 Pretest-posttest comparisons of all measures in the spelling test (left: substitution, center: epenthesis, right: elision)

2.2.3 WORD-READING TEST

Mean value and standard deviation for each metric were obtained by group and test phase (Table 3). Two-way ANOVAs with group and test phase as variables, performed separately for each metric, indicated a significant interaction of two variables in primary stress [$F(1,18) = 8.02, p < 0.05$], rhythm [$F(1,18) = 5.26, p < 0.05$], overall goodness [$F(1,18) = 4.75, p < 0.05$] and substitution [$F(1,18) = 9.8, p < 0.01$]. Follow-up analyses indicated a significant main effect of test on primary stress [$F(1,18) = 23.73, p < 0.001$], rhythm [$F(1,18) = 33.2, p < 0.001$], overall goodness [$F(1,18) = 28.11, p < 0.001$] and substitution [$F(1,18) = 22.79, p < 0.001$] with the training group. The pretest-posttest comparison for each metric was illustrated in each graph in Figure 4.

Table 3 Mean value and standard deviation by group for each metric in the word-reading test

	<u>Training group (N=10)</u> Mean (SD)	<u>control group (N=10)</u> Mean (SD)
Substitution (the number of occurrences)		
Pretest	59.5 (15.5)	59.1 (17.9)
Posttest	48.5 (11.9)	58.3 (18.6)
Epenthesis (the number of occurrences)		
Pretest	8.8 (4.14)	11.3 (3.5)
Posttest	7.5 (1.96)	10.8 (2.7)
Elision (the number of occurrences)		
Pretest	4.0 (1.73)	3.0 (1.48)
Posttest	2.9 (1.22)	3.0 (0.77)
Primary stress (accuracy in %)		
Pretest	71.0 (9.67)	74.1 (9.62)
Posttest	81.0 (6.61)	75.9 (8.82)
Rhythm (max 5)		
Pretest	2.71 (0.44)	2.93 (0.39)
Posttest	3.17 (0.32)	3.00 (0.35)
Overall goodness (max 5)		
Pretest	2.75 (0.39)	2.98 (0.35)
Posttest	3.09 (0.26)	3.02 (0.30)

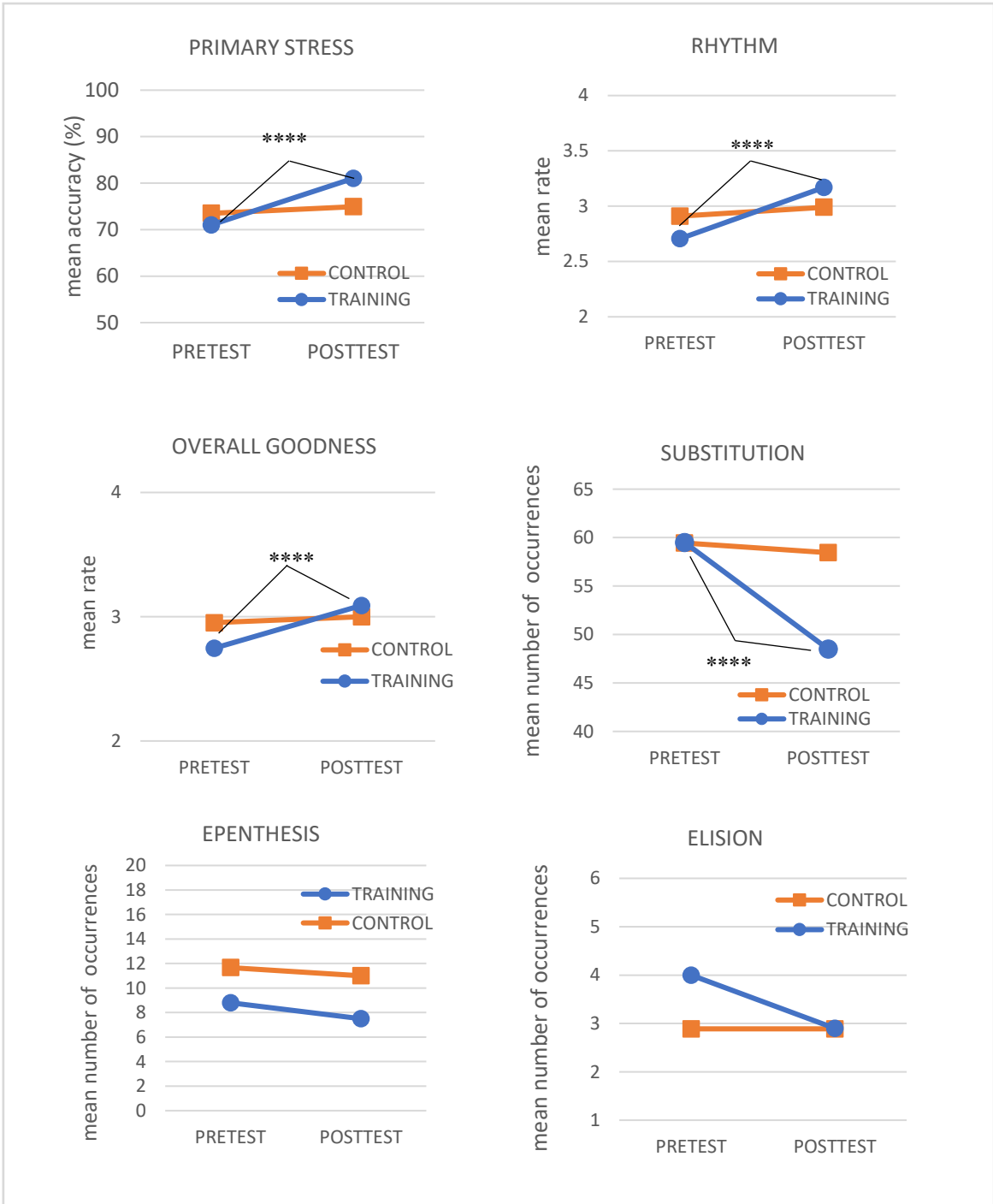


Fig 4 Pretest-posttest comparisons of all the metrics in the word reading test. TRAINING=phonological awareness training group, CONTROL=control group (top row left: primary stress, top row right: rhythm, middle row left: overall goodness, middle row right: substitution, bottom row left: epenthesis, bottom row right: elision)

Note: Stars indicate a significant main effect of test phrase where the interaction between the variables was found **** $p < 0.001$

2.3 DISCUSSION

2.3.1 PHONOLOGICAL AWARENESS IN ADULT JAPANESE LEARNERS

The outcome of phonological awareness pretest demonstrated that there was no significant performance difference among the phonological tasks. Phoneme counting, however, seems to be challenging for adult Japanese learners. When comparing the three tasks involving phonemes, (initial phoneme isolation, second phoneme deletion, phoneme counting), the task difficulty increases in order of isolation < deletion < counting, which coincides with the result of Yoshikawa and Yamashita (2014), whose study administered a phonological awareness test using familiar words to seventy-one Japanese university graduate students. We also compared the performance in two deletion tasks (phoneme deletion and syllable deletion) at the pretest in our study to that in the study of Yeung et al (2013). As predicted in the studies on phonological awareness introduced earlier, the kindergartners in Yeung et al's study performed syllable deletion (the mean correct responses: 51.3%) much better than phoneme deletion (the mean correct responses: 5.4%) while adult learners in this study performed phoneme deletion (the mean correct responses: 61%) and syllable deletion (the mean correct responses: 54%) not differently. This suggest that even though Japanese EFL learners are not aware of phonemes in their L1, they acquire phonemic awareness to some extent through language experience and learning at school. Learning to write with Romaji (alphabetic transcription of Japanese syllabary *Kana*), which formally starts at elementary school in Japan, must play a role in their phonemic awareness development. To explore the relations between phonological awareness and word-reading, we calculated correlation coefficients between the mean correct responses of each phonological awareness task and the mean value of each metric in the word reading test.

We found, however, no correlations between any of the pairs, which presumably the small sample size accounted for.

The training group performed better on some of the phonological tasks at posttest, but statistical analyses showed no significant effects of phonological training on any of the phonological awareness skills. The significant improvement found between the tests in both groups suggest syllable counting skill will improve relatively fast and easily to a certain degree among adult Japanese learners. As Japanese has a phonological unit *Mora*, which is roughly equivalent to a syllable and also syllabary *Kana* in the writing system, counting syllables may become less complicated once the definition of 'syllable' is clarified. Taken all the results into account, we conclude that developing phonological awareness requires phonological knowledge and great amount of training for adult Japanese learners.

2.3.2 THE EFFECT OF PHONOLOGICAL AWARENESS TRAINING ON WORD READING AND SPELLING

The results of ANOVA showed a significant decrease in the number of errors in the spelling for both groups. The effect of phonological awareness training on word-spelling was, therefore, not observed. The decrease in the number errors in control group may suggest the phonological instruction given to all the participants had positively affected on their perception, it seems, however, very unlikely that adult learners' L2 sounds perception improves without any training. In conclusion, the findings in this study only suggests that the perception of sounds in unfamiliar English words was very inconsistent among adult Japanese learners. We attempted, nonetheless, to explain the decrease in the number of substitutions by examining the accuracy in identifying /r/ and /l/, which is well-known to be very challenging for Japanese listeners, in the following test words: *suffrage, astronomy, originality, astronomy, atrocity, lagan, functionary, dwelling, trey, gauntlet, truism, plaice, slough, lateral,*

bramble, vitriol, rosebud. The mean accuracy of eighteen occurrences of /r/ and /l/ in those words was obtained by subject, group and test. A two-way ANOVA with group and test phases as variables was conducted, which demonstrated no significant improvement between the pretest and the posttest in both groups (Fig 5). As a series of studies has shown that an intensive training designed to enhance the perceptual identification of these two phonemes was effective (e.g. Logan et al, 1991), the result indicates qualitative and quantitative limitations of the phonological awareness training as a mean to promote the perception of individual phonemes. To explore unique effects of phonological awareness training, we examined the perception of a final phoneme, dark /l/. Examined words are: *lateral, bramble, vitriol*, where dark /l/s were all preceded by a weak vowel /ə/. First, we found that this phoneme was frequently misspelled with *r* or *u* in the test outcome. A statistical analysis, then, found no significant main effect of group nor test phase on the accuracy in the perception. However, an improving accuracy in the training group was observed while the accuracy was decreasing in the control group, which indicates that the perception of the phoneme remained inconsistent (Fig 6).

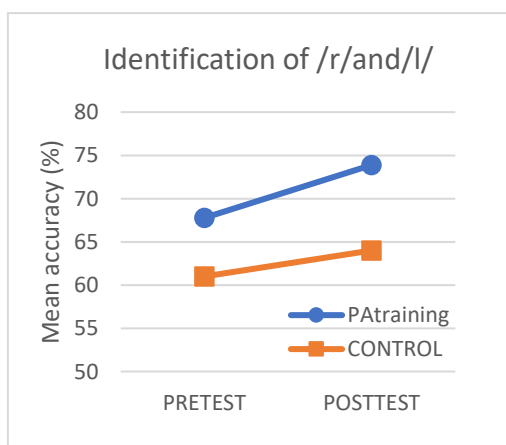


Fig 5 mean accuracy of the perceptual identification of /r/and/l/ in 18 occurrences in the spelling test

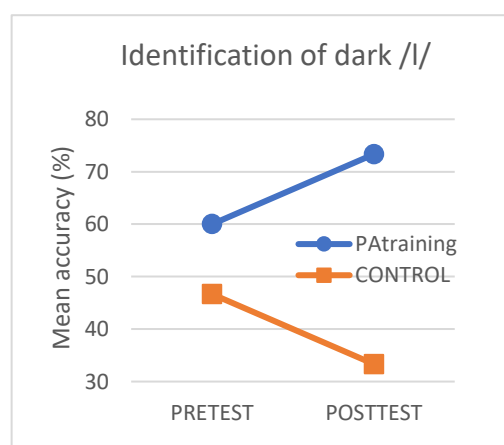


Fig6 mean accuracy of the perceptual identification of dark/l/ in 3 occurrences in the spelling test

Even though spelling skill is not our main concern in this study, we would still like to note that a number of studies have shown that phonological awareness training had positive effects on spelling among young learners. These studies argued that unlike the general belief that the acquisition of graphemes-phonemes correspondence is important to learn how to spell and read, the recognition of larger phonological units than phonemes plays a greater role in predicting or regularizing a link between spelling and sound (e.g. Goswami, 1990; Treiman et al, 1995; Brown and Deavers, 1999). As most adult Japanese learners have learned letter-sound correspondences at school and able to match foreign sounds such as /θ /and /v/ to their corresponding letters, improving the perception of individual sounds along with enhancing the sensitivity to larger phonological units will promote their word-spelling.

It was shown that the phonological awareness training group has significantly improved their word reading both segmentally and prosodically; the number of substitutions as segmental errors in pronunciation has declined, producing strong-weak prominence within words has been promoted, the accuracy in primary stress and overall goodness have improved. To explore what accounted for the significant decrease in the number of substitutions, we examined the change in weak-vowel production between pretest and posttest. As phonetic prominence is realized by pitch accent and not by strong-weak contrast in Japanese, schwa seems to be one of the most challenging phonemes to produce among Japanese EFL learners. A study, in fact, showed that the substitution of a stronger vowel such as /a/ and /ei/ for the weak vowel schwa /ə/ were frequently observed in Japanese learners' pronunciation (discussed in chapter 4). Thirty-seven occurrences of schwa in the word-reading test was examined and the mean accuracy for each group was obtained; the mean accuracy of the training group changed from 34.9% to 46.2 % while that of the control group changed from 45.1% to 47.0 % (Fig. 7). A two-way ANOVA with group and test phase as variables on the mean accuracy showed that the interaction between two variables was significant

[F (1,18) = 6.13, $p < 0.05$]. A follow-up analysis showed that a significant main effect of test was found in the training group [F (1,18) = 17.67, $p < 0.001$]. The result indicates that the phonological awareness training improved word-reading partly by reducing substitutions through promoting successful /ə/ production. Since the production of weak vowels directly contributes to the rhythm of word-reading, it must also account for the improvement in rhythm.

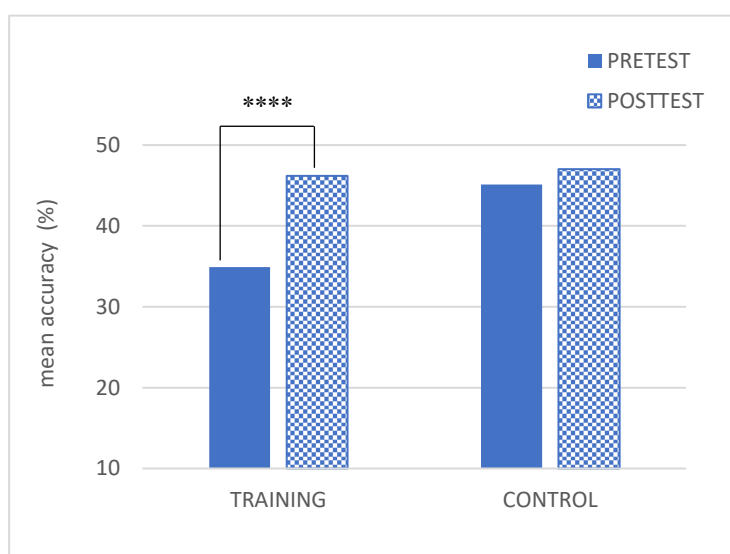


Fig 7 the pretest-post comparison of the mean accuracy of schwa production for each group.

TRAINING=phonological awareness training group, CONTROL=control group

The mean accuracy in 37 occurrences of schwa in the word-reading test

The phonological awareness training group significantly improved the accuracy of schwa production

2.4 CONCLUSION

The study showed that phonological awareness and phonemic awareness in adult Japanese learners are comparable unlike young learners. This suggest that even though they are not aware of or manipulate phonemes in their L1, adult Japanese learners have enhanced phonemic awareness and acquired ability to identify/ manipulate phonemes to some extent through language experience and learning at school. There was also no significant differences in task difficulties, except for phoneme counting, which suggests intensive

training to enhance the sensitivity to all phonological units simultaneously by undergoing intensive training with a variety of tasks may be more feasible for adult learners than younger learners. However, the improvement in phonological awareness through the training was not statistically significant. We conclude, although pre-existing phonological knowledge and ability may work in their favor, improving phonological awareness requires a great amount of intensive training for adult Japanese learners.

The study did not show that phonological awareness training improved word-spelling among adult Japanese learners. Both training group and control group performing better at posttest should be interpreted as a reflection of the fact that the perception of sounds in unfamiliar English words is very inconsistent among adult Japanese learners, rather than that the phonological instruction given to all the participants had positively affected on their perception. On the other hand, the study demonstrated that the phonological awareness training group significantly improved their word-reading in terms of both segmental and prosodic features. Since this improvement could not be explained by the gain in phonological awareness, we needed to evaluate the effects of phonological awareness training in other ways, for example, in comparison to other types of word-reading training, such as repeating or shadowing English words and sentences. Accordingly, we replicated this study, replacing the control group with the word-repetition group and examined the difference between two types of training in terms of their effects on phonological awareness, word-reading and word-spelling in the next study.

3. STUDY 2: A COMPARISON BETWEEN THE EFFECTS OF PHONOLOGICAL AWARENESS TRAINING AND THE WORD-REPETITION TRAINING ON LEARNERS' PHONOLOGICAL AWARENESS, WORD-READING AND WORD-SPELLING

This study compared the effects of phonological awareness training with the effects of word-repetition training on learners' phonological awareness, word-reading and spelling. By doing so, we explored unique benefits of enhancing phonological awareness for adult Japanese EFL learners. Ten adult native speakers of Japanese were recruited to go through word-repetition training and take the same tests as those administered to the participants in Study 1.

3.1 METHOD

3.1.1 PARTICIPANTS

Ten Japanese university students including some graduate students participated the study. They have learned English as a school subject in Japan and none of them had received phonological training prior to the study nor had been abroad for more than twelve months. There were no students who were majoring in English or in other languages.

3.1.2 MATERIAL AND STIMULI

The same material was used in Study 1 and Study 2. Details on the material are found in 2.1.2 in this paper.

3.1.3 PROCEDURE

3.1.3.1 PRETEST AND POSTTEST

The word-repetition group took the same three kinds of tests, i.e. phonological awareness test, word-reading test, and word-spelling test following the same procedure as the phonological awareness group and the control in Study 1. Details on the content and the procedure of each test are found in 2.1.3.1.

3.1.3.2 WORD-REPETITION TRAINING

Same as the phonological awareness training, the word-repetition training took place in a closed and quiet room at Kobe University. A session of word-repetition training consisted of forty trials and the total number of sessions was twenty so that both training groups went through the same number of trials in total, i.e., 800 trials. In the word-repetition training, trainees were asked to read words aloud and record them, following native speakers' model pronunciation. The direction of the task in Japanese saying "Read the word aloud following the model pronunciation" and the spelling of the trained word were displayed in the middle of the monitor screen. At the bottom of the monitor screen, buttons to "start/stop recording", "listen", "save", and "to the next" were placed in an array. By pressing "play" button placed on the left side of the monitor screen, trainees were able to listen to model pronunciations as many times as they needed. Recording could be overwritten until being saved and trainees were instructed to record their best pronunciation. Presentation of model pronunciation and recording were made through a headset and recording was saved on a memory stick.

3.2 RESULT

3.2.1 PHONOLOGICAL AWARENESS TEST

Figure 8 illustrates the mean percentage correct responses of all the phonological tasks at pretest for all the participants, including control group in study 1 (n=30). One-way ANOVA indicated no significant difference among the mean scores of all phonological tasks. The mean score with standard deviation for each task at pretest and posttest for the phonological awareness training groups and the word-repetition training group are shown in Table 4.

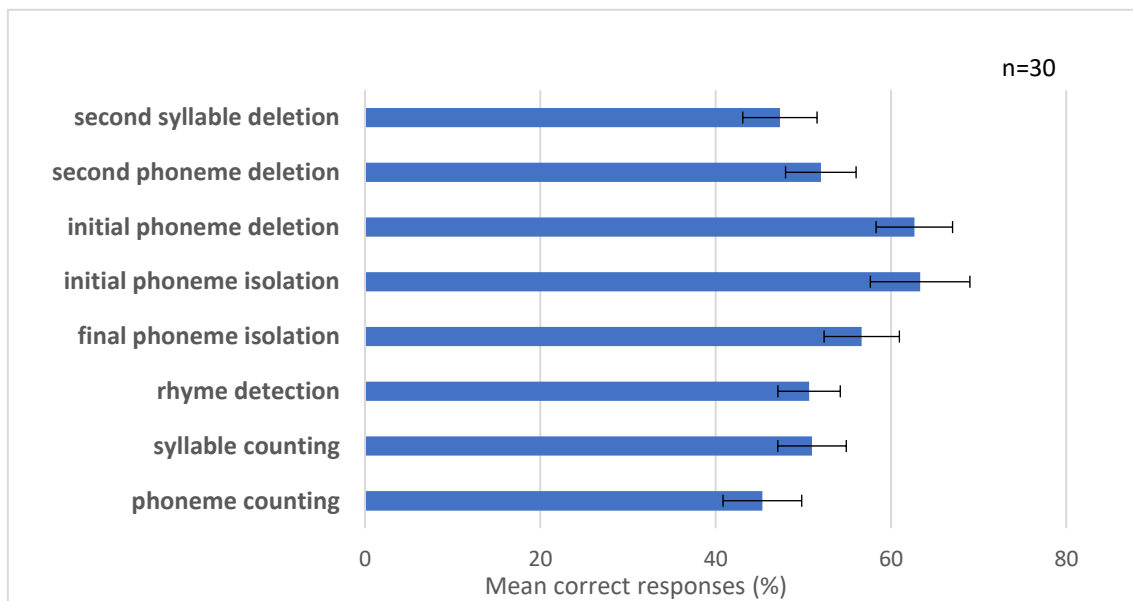


Fig 8 Mean percentage correct responses of all the participants in Study 1 and Study 2 for each phonological task at pretest

A Two-way ANOVA with group and test phase as variables were conducted on the averaged performance of each phonological task. The interaction between the variables was not significant in all the tasks. A significant main effect of test [F (1,18) = 8.10, $p < 0.01$] was found on final phoneme isolation. Both a significant main effect of test phase [F (1,18) = 6.63, $p < 0.05$] and a significant main effect of group [F (1,18) = 7.60, $p < 0.05$] was found on syllable counting task. Each graph in Figure 9 illustrates a pretest-posttest comparison for each phonological awareness task.

Table 4 Mean scores, standard deviations and mean percentage correct responses on all phonological tasks at pretest and posttest for phonological awareness (PA) group and word-repetition group

	PA training group (N=10)		Word-repetition group (N=10)	
	M(SD)	correct (%)	M(SD)	correct (%)
Initial Phoneme isolation				
Pretest	3.7 (1.1)	74	2.6 (2.01)	52
Posttest	4.3 (0.64)	86	2.8 (1.89)	56
Final phoneme isolation				
Pretest	2.9 (1.04)	58	2.9(1.3)	58
Posttest	3.7 (1.05)	74	3.3(1.27)	60
Initial Phoneme deletion				
Pretest	3.6 (0.63)	72	3.3 (1.42)	66
Posttest	3.8 (0.60)	76	3.3 (1.55)	66
Second Phoneme deletion				
Pretest	3.1 (0.83)	62	2.8 (1.47)	56
Posttest	4.1 (0.54)	82	2.9 (1.58)	58
Second syllable deletion				
Pretest	2.8 (0.6)	56	2.1 (1.22)	42
Posttest	3.1 (1.2)	62	2.1 (1.37)	42
Syllable counting				
Pretest	3.0 (0.89)	60	2.5 (1.03)	50
Posttest	4.2 (0.6)	84	3.0 (1.27)	60
Phoneme counting				
Pretest	2.5 (1.28)	50	2.1 (0.94)	42
Posttest	2.2 (1.0)	40	2.4 (0.92)	40
Rhyme detection				
Pretest	2.4 (0.7)	50	2.3 (1.1)	50
Posttest	2.8 (0.7)	60	2.2 (1.0)	40

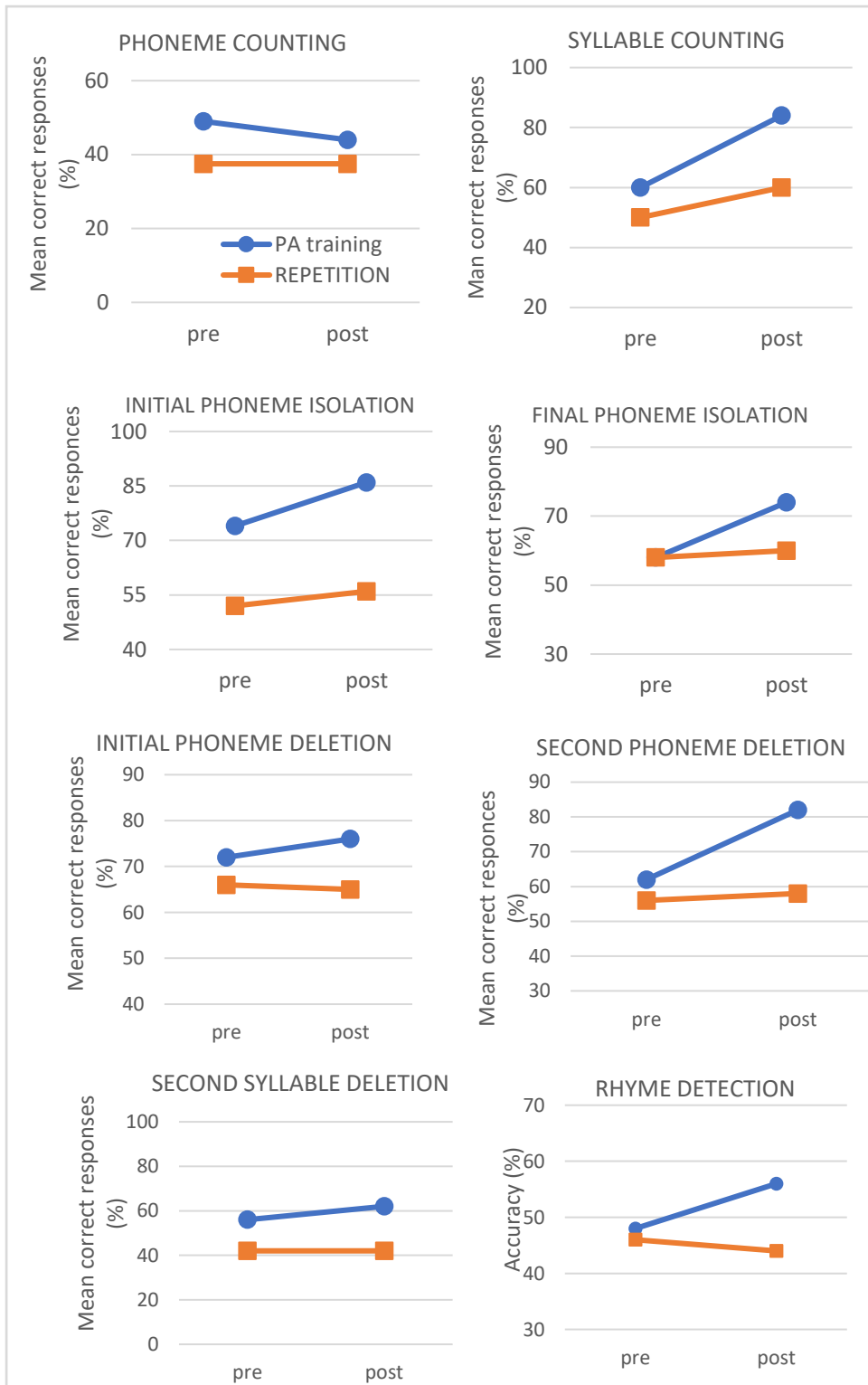


Fig9 Pretest-posttest comparisons of the mean correct responses for all phonological awareness measures in the phonological awareness test. (top row left: phoneme counting, top row right: syllable counting, second row left: initial phoneme isolation, second row right: final phoneme isolation, third row left: initial phoneme deletion, third row right: second phoneme deletion, bottom row left: second syllable deletion, bottom row right: rhyme detection)

3.2.2. WORD-SPELLING TEST

The mean number of occurrences and standard deviation for each measure and for each training group are shown in table 5. A Two-way ANOVA with group and test phase as variables conducted on each measure found no significant interaction between two variables. A significant main effect of test phase was found on all the measures: on substitution [$F(1,18) = 17.12$, $p < 0.001$], on epenthesis [$F(1,18) = 6.70$, $p < 0.05$], and on elision [$F(1,18) = 6.40$, $p < 0.05$] (Fig 10).

Table 5 Mean number of occurrences and standard deviation of each group for each measure in the selling test

	<u>PA* training group (N=10)</u> Mean (SD)	<u>Word-repetition group (N=10)</u> Mean (SD)
Substitution		
Pretest	22.2 (6.9)	23.6 (5.2)
Posttest	18.5 (6.2)	21.0 (6.3)
Epenthesis		
Pretest	4.6 (2.0)	4.2 (1.8)
Posttest	3.3 (2.1)	3.3 (1.7)
Elision		
Pretest	6.2 (2.6)	5.5 (2.3)
Posttest	5.4 (1.6)	4.5 (2.1)

*PA=phonological awareness

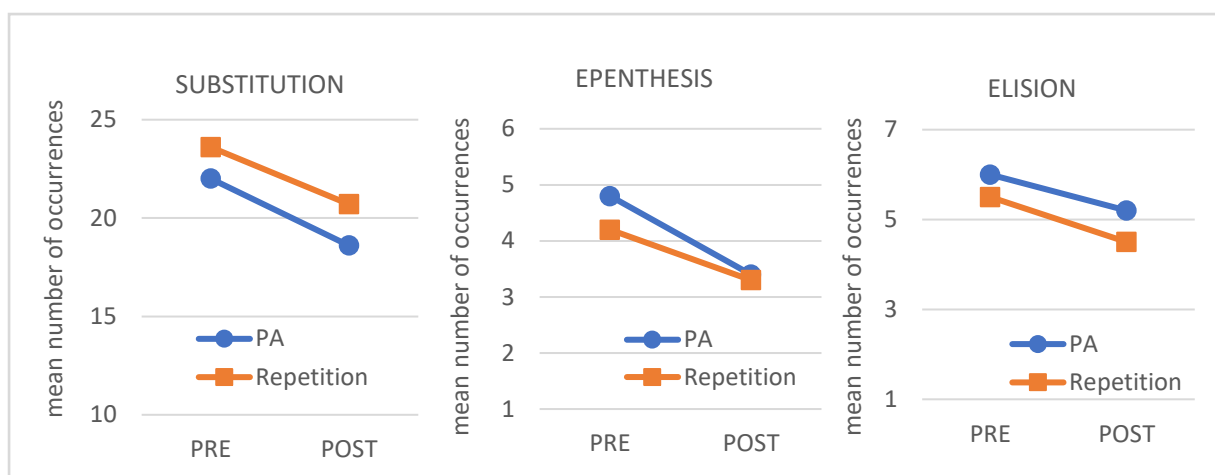


Fig10 Pretest-posttest comparisons of the mean numbers of occurrences of substitutions(left), epenthesis (center) and elisions (right) in the spelling test PA=phonological awareness training group, Repetition=word-repetition group

3.2.3 WORD-READING TEST

The mean value and standard deviation for each metric were obtained by group and test phase (table 6). Two-way ANOVAs with group and test phase as variables, performed separately for each metric, indicated a significant interaction of the variables in primary stress [$F(1,18) = 8.02, p < 0.05$], rhythm [$F(1,18) = 5.26, p < 0.05$], and overall goodness [$F(1,18) = 4.75, p < 0.05$]. A significant main effect of test was found on substitution [$F(1,18) = 20.20, p < 0.001$], on epenthesis [$F(1,18) = 7.88, p < 0.05$] and on elision [$F(1,18) = 6.62, p < 0.05$]. Follow-up analyses on each significant interaction between variables indicate a significant main effect of test on primary stress in the phonological training group [$F(1,18) = 23.73, p < 0.001$], on rhythm in both phonological awareness training group [$F(1,18) = 33.2, p < 0.001$] and word-repetition group [$F(1,18) = 6.35, p < 0.05$], on overall goodness in both phonological awareness training group [$F(1,18) = 28.10, p < 0.001$] and word-repetition group [$F(1,18) = 4.93, p < 0.05$]. On overall goodness, a significant main effect of group at pretest was also found [$F(1,36) = 4.75, p < 0.05$]. Each graph in Figure 11 displays the pretest-posttest comparison of the mean value for each metric.

Table 6 Mean value and standard deviation for each metric in the word-reading test by group and test

	<u>PA training group (N=10)</u> Mean (SD)	<u>Word-repetition group (N=10)</u> Mean (SD)
Substitution (the number of occurrences)		
Pretest	59.5 (15.5)	60.6(16.14)
Posttest	48.5 (11.9)	55.3(14.07)
Epenthesis (the number of occurrences)		
Pretest	8.8 (4.14)	7.4 (2.97)
Posttest	7.5 (1.96)	5,5 (1.91)
Elision (the number of occurrences)		
Pretest	4.0 (1.73)	3.6 (1.80)
Posttest	2.9 (1.22)	2.9 (1.1)
Primary stress (accuracy in %)		
Pretest	71.0 (9.67)	74.6 (10.02)
Posttest	81.0 (6.61)	76.4 (9.43)
Rhythm (max 5)		
Pretest	2.71 (0.44)	2.99 (0.46)
Posttest	3.17 (0.32)	3.20 (0.35)
Overall goodness (max 5)		
Pretest	2.75 (0.39)	3.10 (0.39)
Posttest	3.09 (0.26)	3.25 (0.34)

PA=phonological awareness

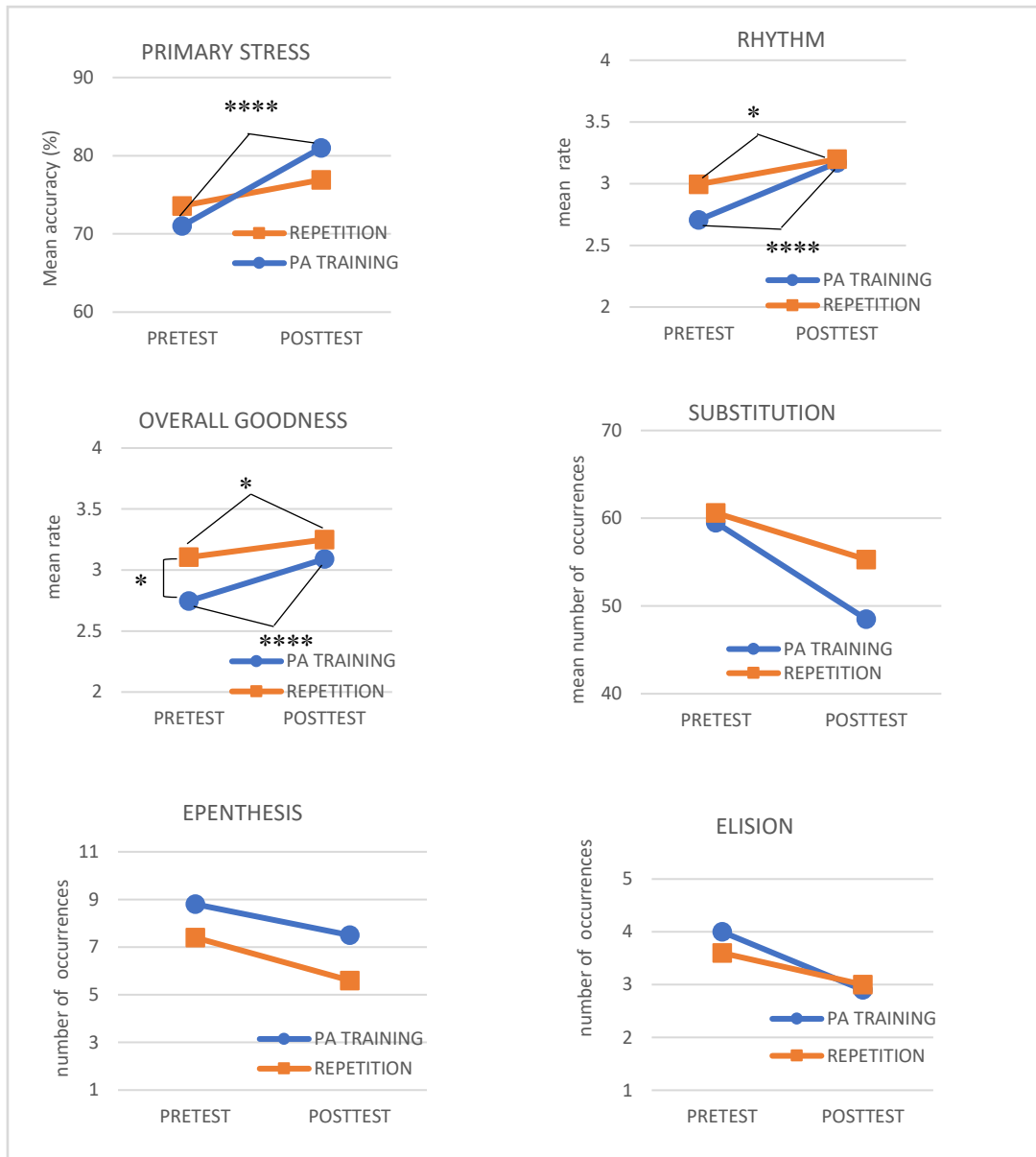


Fig 11 Pretest-posttest comparisons of the mean values of all the metrics in the word reading test
 note: stars indicate a significant main effect of training or test phrase where the interaction between the variables was significant
 *p<0.05, ****p<0.001

3.3 DISCUSSION

3.3.1 PHONOLOGICAL AWARENESS IN ADULT JAPANESE LEARNERS

The averaged performance on each phonological awareness task for all the participants in Study 1 and 2 ($n=30$) at pretest did not differ from the performance averaged for the participants in Study 1 alone ($n=20$): Task difficulty did not significantly vary depending on the phonological unit in question. A significant difference was not found between the best- and the least achieved tasks this time, yet phoneme counting still seems to be the most challenging task for adult Japanese learners. Another attempt to explore relations between phonological awareness and word reading was made using a larger sample size than Study 1 ($n=30$). We calculated the correlation coefficients between the mean correct responses of each phonological awareness skills and the mean values of each metric in the word reading at pretest. It resulted in showing a weak relationship between the following pairs: final phoneme isolation and overall goodness ($r=.35$, $p=0.057$), final phoneme isolation and the number of substitutions ($r=-.39$, $p=0.033$), syllable counting and the number of elision ($r=-.36$, $p=0.047$) and second syllable deletion and the accuracy in primary stress ($r=.35$, $p=0.060$). Although the relationships are weak in general, they are meaningful in a way they help us decide which phonological skill should be tested to measure phonological awareness among adult Japanese EFL learners and to train which phonological skills contribute what features of their word-reading. This study indicates, despite the need for improving reliability by extending the research, training with final phoneme isolation task, syllable counting task, and syllable deletion task effectively promotes learners' word-reading.

Same as in Study 1, both groups performed significantly better in syllable counting task at posttest. This suggests that a simple phonological instruction to teach learners what phonemes/rimes/syllables are will help

learners improve syllable counting skill to some extent and less amount of training will be required than improving other phonological skills. Pretest-posttest comparisons demonstrated that the phonological training group performed better on some of the phonological tasks at posttest, yet training effects was not statistically significant. This result, same as the result in Study 1 shows that enhancing phonological awareness requires phonological instruction and a great amount of intensive training for adult Japanese learners.

3.3.2 THE EFFECTS OF PHONOLOGICAL AWARENESS TRAINING AND WORD-REPETITION TRAINING ON WORD READING AND SPELLING

The study indicated the both training significantly reduced the number of substitutions, epentheses and elisions in the spelling. This suggests that both training had positive effects on learners' perception of the sounds in unfamiliar English words. Same as in Study 1, we examined the change in the mean accuracy in perceiving /r/, /l/, and dark /l/ between the tests in order to explore what contributed to the decrease in the number of substitutions. Eighteen samples of /r/ and /l/ appeared in the following words were examined: *suffrage*, *astronomy*, *originality*, *astronomy*, *atrocitiy*, *lagan*, *functionary*, *dwelling*, *trey*, *gauntlet*, *truism*, *plaiice*, *slough*, *lateral*, *bramble*, *vitriol*, *rosebud*. We observe that the mean accuracy in identifying two phonemes in both groups improved at posttest (Fig 12), yet an ANOVA found no significant main effect of test phase nor group. The mean accuracy in perceiving dark /l/ appeared in *lateral*, *bramble*, *vitriol* also improved at posttest in both groups (Fig 13), but neither a main effect of group nor test phase was significant according to an ANOVA.

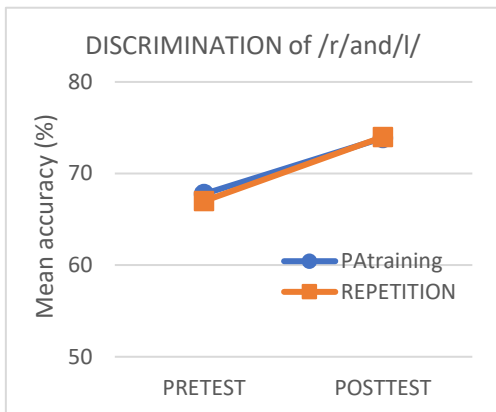


Fig 12 Mean accuracy in identifying /r/and/l/ in 18 occurrences in the spelling test.

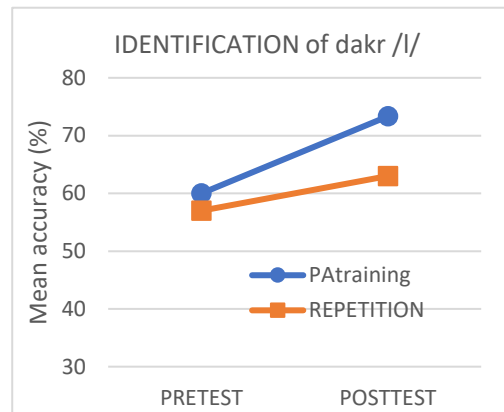


Fig 13 Mean accuracy in identifying dark/l/ in 3 occurrences in the spelling test.

The study also indicated that both training have significantly improved the trainees' word-reading. To compare the effectiveness of two types of training, we conducted separate t-tests for the mean pretest-posttest changes between the groups for all the metrics. The test results revealed that the improvement in primary stress, rhythm, and overall goodness found in the phonological awareness group was more significant than those found in the word-repetition group (table 7). These indicate that phonological awareness training improves trainees' prosodic features of word-reading more significantly than the word-repetition training. In other words, the gain in word prosody is greater when trainees pay attention to or manipulate phonological constituents within spoken words (more likely syllables or rimes than phonemes) than listen and repeat whole words. Worth being noted here is that the three tasks in the phonological awareness training did not involve "reading words aloud" and still worked more effectively on prosody than the word-repetition training.

Table 7 Results of t-tests for mean pretest-posttest changes between groups on each metric in the word-reading test

	Mean changes		t-value (9)*	p
	PA*	WR*		
Primary stress	10.0	1.79	2.61	0.028 †
Rhythm	0.34	0.15	2.48	0.035 †
Overall goodness	0.46	0.20	3.33	0.009 †
Substitution	-11.0	-5.3	-1.56	0.153
Epenthesis	-1.30	-1.9	0.46	0.657
Elision	-1.10	-0.6	-0.63	0.543

*PA=phonological awareness training group, WR=word-repetition group

* () = the degree of freedom

† statistically significant

We found no difference in the size of effects of two training on segmental features of word-reading, i.e., both training reduced the number of errors in pronunciation comparably. Same as in Study 1, we examined the difference between the improvement in the weak-vowel production of two groups. The phonological awareness training group improved the accuracy in schwa production from 32.9 % to 46.2 % while the word-repetition group from 49.1% to 55.7% (Fig 14). A two-way ANOVA with group and test phase showed no significant interaction between the variables [$F(1,18) = 1.18, p=0.29$] but the main effect of test was significant [$F(1,18) = 15.10, p<0.001$]. This result showing both training promoted the production of /ə/ suggests adult Japanese learners do not need to learn schwa as a phoneme to be able to produce it. On the contrary, no significant improvement in producing /ɹ/ was observed in either of the groups. We examined six samples of /ɹ/ in the word-reading test, which occurred respectively in a stress syllable in the following words: *exasperation, impropriety, originator, ramrod, rarity, rhombus*. The mean accuracy by the phonological awareness training group changed from 65.0% to 71.7 % while the mean by word-repetition group from 58.3 % to 56.7% (Fig

15). A two-way ANOVA performed on the mean accuracy of each group revealed no interaction between the variables [$F(1,18) = 1.47, p=0.24$], no main effect of either group [$F(1,18) = 1.08, p=0.31$] or test phase [$F(1,18) = 0.53, p=0.48$]. The results with the accuracy in schwa and /ɹ/ together demonstrate that raising phonemic awareness through phonological awareness training will not directly contribute to pronunciation accuracy of individual phonemes.

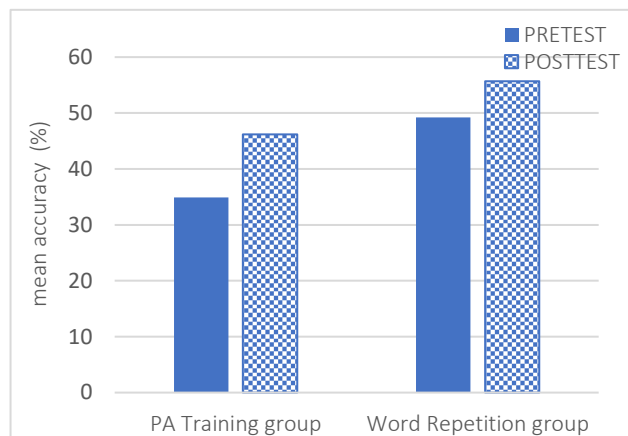


Fig 14 the pretest-posttest comparison of the mean accuracy of schwa production by phonological awareness training and word-repetition group. The accuracy in 37 occurrences in the word-reading test.

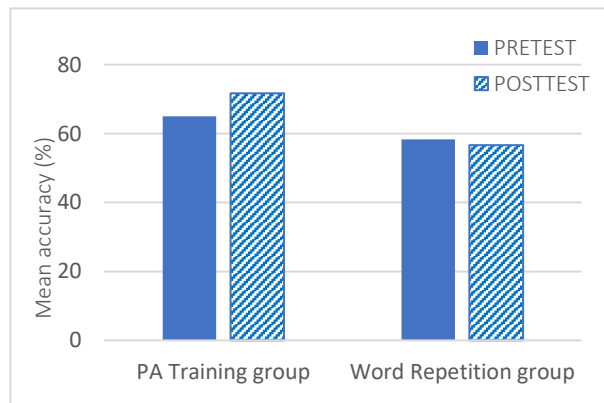


Fig 15 The pretest-posttest comparison of the mean accuracy of /ɹ/ production by phonological awareness training and word-repetition group. The accuracy in 6 occurrences in the word-reading test.

We also explored whether the two types of training had different effects on English words whose pronunciations are strongly influenced by

trainees' L1, i.e. twelve English loan words in the word-reading test. We compared the improvement by two training in reading these words by performing a two-way ANOVA with group and test phase as variables on the mean values of each metric; there was no significant interaction between the variables in any of the metrics but a main effect of test phase was significant on primary stress [$F(1,18) = 14.77, p < 0.005$], on rhythm [$F(1,18) = 27.51, p < 0.001$], on overall goodness [$F(1,18) = 20.81, p < 0.001$] and on substitution [$F(1,18) = 13.68, p < 0.005$]. A marginally significant main effect of test was found on epenthesis [$F(1,18) = 2.5, p = 0.09$] although epentheses occurred only among half of the trainees in each group (six in the phonological awareness training group and five in the word-repetition group). As for elision, there were only three occurrences in both groups and tests combined. The result suggests the effects of both types of training using unfamiliar English words will generalize to reading words with high familiarity which are heavily influenced by L1 phonologies.

3.3.3 CONCLUSION

The averaged performance on each phonological awareness for all the participants in Study 1 and 2 ($n=30$) consolidated the findings in Study 1 that the levels of sensitivity to phonemes, rimes and syllables do not vary significantly among adult Japanese learners. Weak correlations found between the phonological awareness measures and the word-reading measures tentatively suggest that both phonemic and phonological awareness are related to English word-reading among adult ELF learners. The varied levels of correlation found in this study provide beneficial implication for the future study as to which phonological skills should be tested to describe adult Japanese learners' phonological awareness and improving what skill is more beneficial for them.

The kindergartners in Yeung et al.'s study (2013) received the phonological awareness training along with their regular English lesson at school while the adult Japanese learners in this study underwent phonological awareness training by itself. This may partly explain that the kindergartner significantly improved their phonological awareness while the adult learners did not. This study also showed that phonological awareness at some levels improved through the phonological awareness training, but not thorough word-repetition training. These findings together indicate that phonological awareness training is essential for adult Japanese EFL learners to raise their phonological awareness, and the training effects may increase when the training is implemented additionally to other types of English learning.

The pretest and posttest comparison demonstrated that both phonological awareness training and word-repetition training improved segmental properties as well as prosodic properties of trainees' word-reading. By comparing two training in terms of the size of effects on each metric, we found that the phonological awareness training improved prosodic features of word-reading more significantly than the word-repetition training. In other words, to train adult Japanese EFL learners to enhance the phonological sensitivity or to improve the ability to manipulate sounds units within words is more beneficial than to train them by listening and repeating whole words. In the word-spelling test, on the other hand, the effects of phonological awareness training were not as clearly demonstrated as in the word-reading test; We found both the phonological awareness training and the word-repetition training significantly reduced the number of errors in the spelling in general. As discussed earlier, a series of laboratory studies had already demonstrated that adult Japanese listeners will improve their perceptual identification of particular English phonemes through intensive training. An interesting implication of this study is that the general accuracy in perceiving English phonemes may be raised through phonological awareness training.

4. STUDY 3: A MULTI-METRIC EVALUATION OF JAPANESE LEARNERS' PRONUNCIATION

In this study we evaluated Japanese learners' English pronunciation using six metrics: phoneme substitution, epenthesis, elision, primary stress, rhythm and overall goodness. The aim of this study was to make an exemplary assessment that examines learners' pronunciation by its segmental and prosodic properties and evaluates in terms of perceived goodness or native-likeness. There was a need for such an assessment to explore the relations between phonological awareness at various levels and trainees' word-reading as well as to measure and exhibit the effect of phonological awareness training on trainees' word-reading in Study 1 and 2. We found no such assessment in the previous studies on L2 pronunciation or foreign accents as many researchers seems to have agreed on the idea that native-like pronunciation is neither a realistic nor a suitable goal for learners of English as a second language (c.f., Isaacs, 2014) and studied on L2 pronunciation in terms of its effect on intelligibility or comprehensibility of the utterances (e.g., Derwing and Munro, 1995; Hahn, 2004; Isaacs, 2008).

4.1 METHOD

4.1.1 UTTERANCES

From the utterances obtained in Eguchi and Yamada (2018), thirty-nine English words of low and high familiarity produced by ten native Japanese speakers on word reading-aloud task were used, i.e., 390 utterances in total were examined. The age of speakers ranged from 19 to 40 and both male and female speakers were included. Their English ability in terms of grades or scores on English tests varied from EIKEN Grade 3 to TOEIC score 940, and none of them has been lived or studied abroad more than 12 months. The words examined were as follows:

ahead	allegory	amass	aperitif	belfry
badminton	believe	bring	calcium	caul
Christmas	conciliatory	curriculum	delicious	derelict
diode	disavow	discriminatory	doting	
emanate	flagellate	fossil	glucosamine	
grimace	habit	handkerchief	heterodoxy	
housework	imagine	interviewee	kilogram	
kiosk	lady	multimillionaire		
laurel	materialistic	mien	minus	peon

4.1.2 PROCEDURE

The utterances were auditorily examined and evaluated by a phonetically trained Japanese-English bilingual. Each utterance was first transcribed with IPA and then evaluated using six metrics: phoneme substitution; elision; epenthesis; primary stress; rhythm; and overall goodness. Occurrence of phoneme substitution, elision and epenthesis was counted by speaker and by word. Primary stress in utterances was first labelled with any of “0” = no stress placement, “1” = stress placement on a wrong syllable”, or “2” = stress placement on a right syllable”, then evaluated in term of accuracy. The accuracy by speaker and by word were obtained. Rhythm and overall goodness were rated on a scale of 1 to 5 (1=very poor, 5=very good) and average scores by speaker as well as by word were obtained. One-syllable words were excluded from the metric “primary stress” and “rhythm”.

4.2 RESULT

4.2.1 PHONEME SUBSTITUTION, EPENTHESIS, ELISION

Frequent instances are as follows:

- Substitution of /a/ or /eɪ/ for weak vowel /ə/ (eg. grim**a**ce, a**ma**ss)
- Substitution of /i/ for /ɪ/ (eg. im**a**gine, b**e**lieve)
- Substitution of /oʊ/ for /aʊ/ (eg. disav**o**w)
- Substitution of /r/ (alveolar flap) for /ɹ/ (eg. ap**e**ritif, cur**r**riculum)
- Epenthesis of /ʊ/ (eg. b_**u**ring, bel_**l**fry)
- Elision of /oʊ/ (eg. conciliat**o**ry, discriminat**o**ry)

There was a strong negative correlation between overall goodness and the substitutions ($r = -0.92$, $p < 0.001$) and the epenthesis ($r = -0.70$, $p < 0.05$) counted by subject. No correlation was found between overall goodness and the elision by subject ($r = 0.04$, $p = 0.9$) or any of the substitution ($r = -0.68$, $p < 0.005$), the epenthesis ($r = -0.29$, $p = 0.7$), or the elision (-0.45 , $p < 0.05$) by word (see Fig 16).

4.2.2 PRIMARY STRESS

Primary stress was perceived in all the bi- and polysyllabic words. The average accuracy by speaker varied from 50.0% to 86.1% and the average accuracy by word varied from 0% to 100%. A strong correlation was evident between overall goodness and the average accuracy by speaker ($r = 0.86$, $p < 0.001$) as well as the average accuracy by word ($r = 0.75$, $p < 0.001$)(see Fig 17).

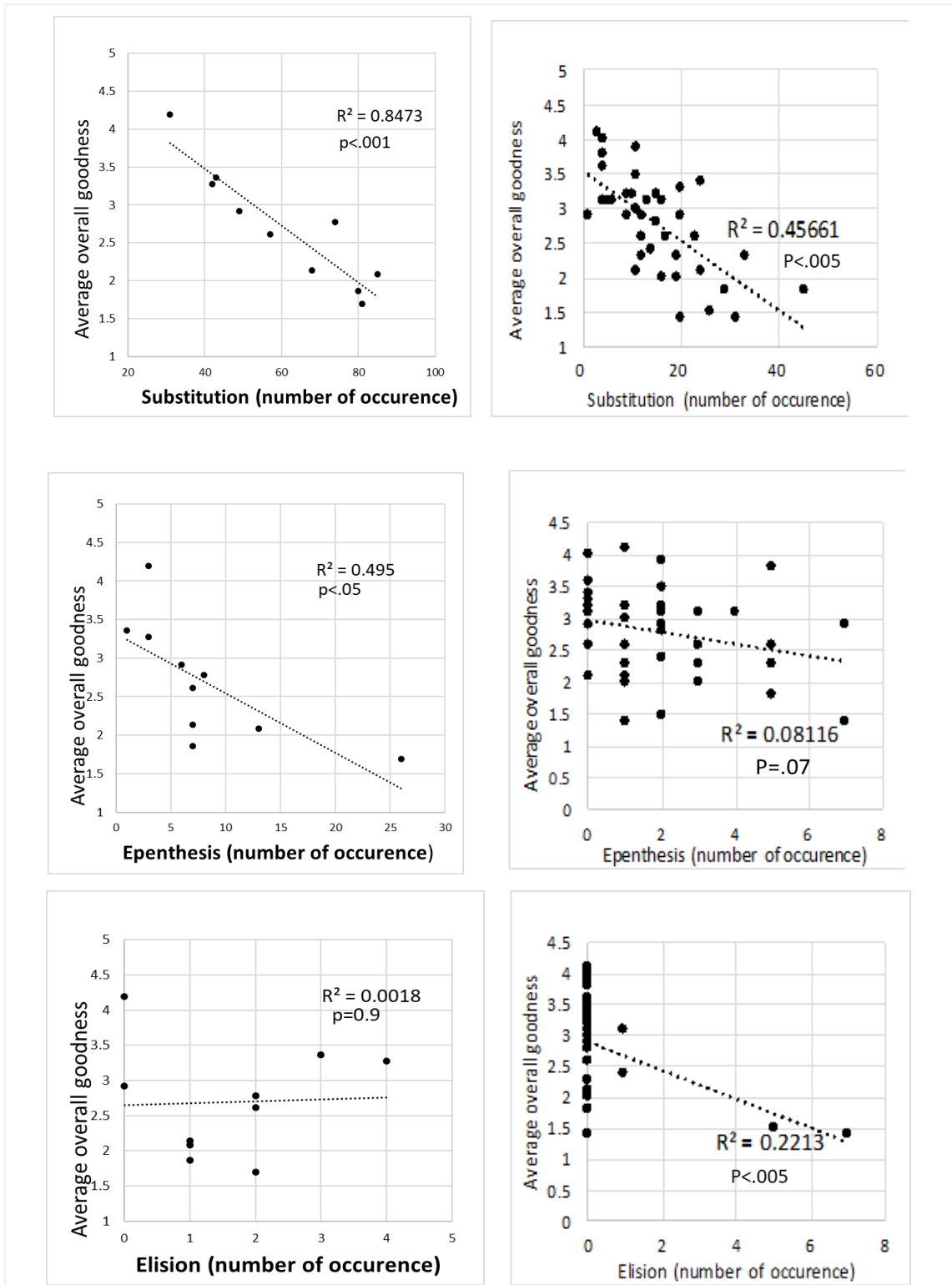


Fig 16 correlation between substitution, epenthesis, elision and overall goodness by speaker (the left column); by word (the right column)

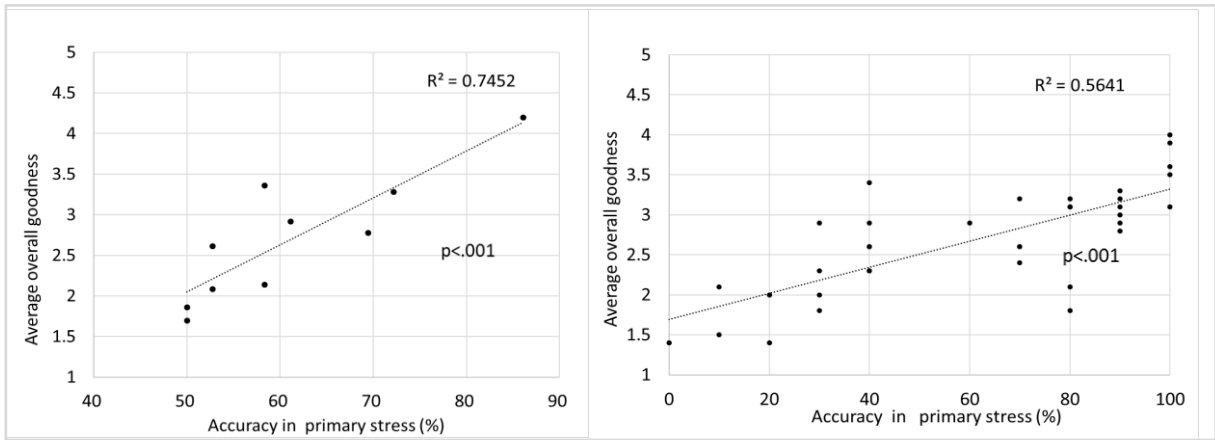


Fig 17 Correlation between primary stress and overall goodness by speaker (left) and by word (right)

4.2.3 RHYTHM

The average rhythm by speaker varied from 1.4 to 4.5 and the average by word varied from 1.4 to 4.1. A very strong correlation was found between overall goodness and the average rhythm by speaker ($r=0.98$) as well as the average by word ($r=0.92$, see Fig 18).

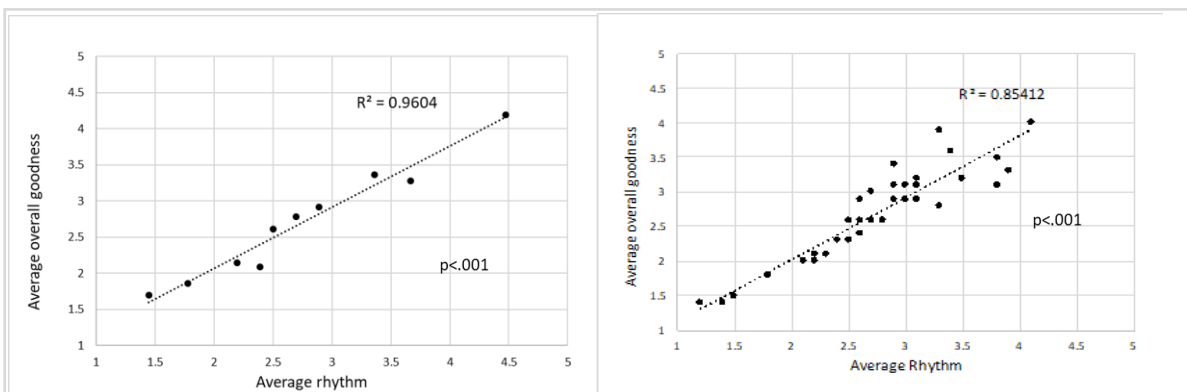


Fig 18 Correlation between rhythm and overall goodness by speaker (left) and by word (right)

4.3 DISCUSSION

4.3.1 PRONUNCIATION DIFFICULTIES AMONG JAPANESE LEARNERS

Apart from a well-known substitution of /r/ for /ɹ/ by Japanese speakers, the substitution of /a/ for /ə/ as well as /i/ for /ɪ/ were highlighted in the examination. Among substitutions of /i/, one instance was intriguing: Nine out of ten speakers substitute /i/ for /ɪ/ on the third syllable of the word “imagine” which made the preceding consonant /dʒ/ sound like /dʒ/. As these speakers pronounced the third syllable unstressed and some of them occasionally succeeded in producing /ɪ/ in other unstressed environments, the substitution of /i/ for /ɪ/ must occur frequently after /dʒ/ among Japanese speakers. A strong negative correlation between the number of substitutions and overall goodness suggests reducing substitution will contribute to good pronunciation. Successful production of weak/lax vowels, therefore, will be a great gain for many Japanese speakers. Since weak vowels are also a decisive component of English rhythm, we could expect a positive effect on their English rhythm as well. The correlation analysis indicated a strong association between overall goodness and phoneme substitution, primary stress and rhythm. The strongest correlation was found between rhythm and overall goodness. The limited number of instances does not allow us to discuss the correlation between elision / epenthesis and overall goodness in this study. It should also be mentioned that all the elisions except for one were /ɔ/ in discriminatory and conciliatory, which are likely to be reduced to /ə/ in natural speech.

To explore whether Japanese learners can overcome the difficulty in producing /ɪ/ through training, we examined the outcome of the word-reading test in Study 1 and Study 2. The mean accuracy in six samples of /ɪ/ in the following words were obtained by speaker and then by group: *hitchhike*, *impropriety*, *originator*, *littoral*, *supposition*, *zipper*. The phonological

awareness training group improved the accuracy from 51.7% to 61.6 %, the word-repetition group from 56.7 % to 61.7% while the mean accuracy of the control group stayed nearly unchanged (changed from 48.3% to 50.0%, see Fig 19). A two-way ANOVA revealed no interaction between the variables [$F(2,27) = 1.26, p=0.30$], but the main effect of test phase was significant [$F(2,27) = 6.68, p<0.05$]. The result suggests that intensive training will promote the production of /ɪ/ among adult Japanese learners and both phonological awareness training and word-repetition training are effective.

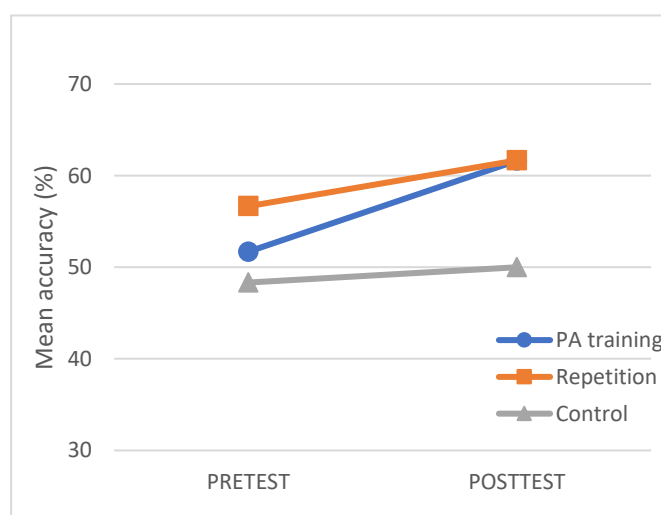


Fig 19 The pretest-posttest comparison on the mean accuracy in /ɪ/ production by three groups* in Study 1 and Study 2.

*PA training=phonological awareness training group

Repetition=word-repetition group

Control=control group

The mean accuracy in 6 occurrences in the word-reading test.

A two-way ANOVA showed that both phonological awareness training and word-repetition training groups improved the accuracy in /ɪ/ production.

We also found that the number of syllables played a significant role in pronunciation: The result of one-way ANOVA [$F(5, 406) = 2.236, p < 0.05$] showed that the average overall goodness varied significantly by the number of syllables. A post hoc pairwise comparisons indicated that the average

overall goodness decreases as the number of syllable increases, except from two to three and four to five (Fig 19).

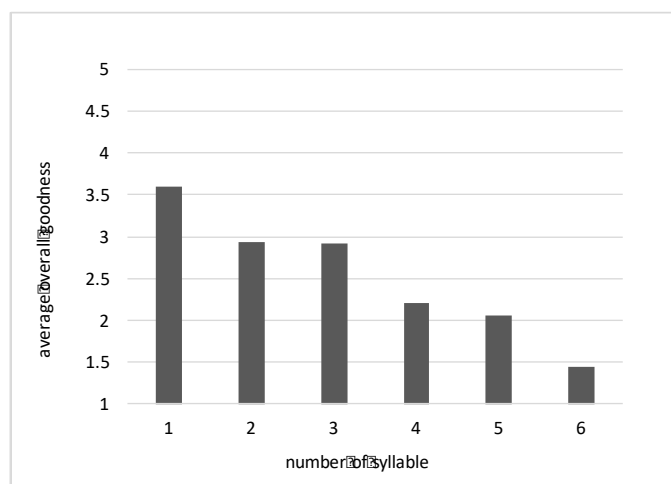


Fig 20 Correlation between the number of syllables and overall goodness

Nevertheless, to discuss effect of the number of syllables, words for the evaluation needs to be more carefully chosen in order to exclude other factors which may be associated with it, such as word familiarity or the number of unfamiliar sound units contained in a word.

4.3.2 A MULTI-METRIC PRONUNCIATION EVALUATION

Collecting the result from this type of pronunciation assessment is beneficial not only for deeper and broader understanding of the Japanese English but also to the development of pronunciation education: To provide learners with a detailed assessment helps them understand their difficulties and improve their pronunciation. Even though native speakers of English are usually served as raters for pronunciation assessment, this assessment needs raters not only fluent in English but with phonological expertise. As it is clear that involvement of more than one rater is needed to make the assessment more

reliable, we may suggest to have segmental components and prosodic evaluated by a different rater respectively. We believe that phonetically trained, advanced-level English speakers are able to rate prosodic features of pronunciation as well as native speakers do. Tominaga (2011) found a significant correlation between the evaluations by native speakers of English and those by non-native speakers with regard to rhythm and total impression. Her study indicates that non-native raters (advanced-level non-native speakers) and native raters have shared ideas and opinions towards the rhythm and overall goodness in learners' pronunciation. As mentioned earlier, there is a trend that native-like pronunciation is neither a realistic nor a suitable goal for learners of English as a second language. Learners' pronunciations, therefore, are evaluated only in terms of intelligibility or comprehensibility in the most of conventionally used English speaking tests (c.f., Appendix B). Having a good command on segmental and prosodic features, however, will encourage learners to speak up and speak out. Continuing this type of systematic pronunciation assessment will benefit Japanese EFL learners by making contribution to the development in pronunciation teaching and training. Computer-based pronunciation assessment and feedback, for example, will be more precise and instructive by integrating knowledge gained from such data.

5. GENERAL DISCUSSION

The studies in this paper were conducted to explore the role of phonological awareness in adult Japanese learners. Specifically, we had two aims: 1. to capture the general phonological awareness among adult Japanese learners and explore the relations between phonological awareness and their word-reading; 2. to examine the effects of phonological awareness training on phonological awareness, word-reading and word-spelling. It was found that the levels of sensitivity to phonemes, rimes and syllables in adult Japanese EFL learners do not vary significantly unlike young EFL learners who have stronger phonological awareness than phonemic awareness. This suggests adult Japanese EFL learners, despite their non-alphabetic L1, have implicitly acquired phonemic awareness through language experience and learning. Weak correlations found between phonological awareness measures and word-reading measures tentatively suggest that both phonemic and phonological awareness associate with English word-reading among adult EFL learners. It also offered some proposals for the future study as to which phonological tasks should be chosen to make training more efficient for adult Japanese learners.

In both Study 1 and Study 2, the effect of phonological awareness training on phonological awareness was not statistically significant, yet improvement in some of phonological skills through phonological awareness training was observed. Considering that young EFL learners in previous studies received phonological awareness training in addition to the regular English lesson at school, phonological awareness training may work more effectively when implemented in combination with other types of training than used by itself. It was also found that phonological awareness at some levels improved through the phonological awareness training, but not through word-repetition training. These findings together indicate that explicit phonological awareness

training is essential but not sufficient for adult Japanese EFL learners to improve their English phonological awareness.

Study 2 showed that to train adult Japanese learners to enhance the phonological sensitivity or improve the ability to manipulate sounds units within words improved prosodic features of their word-reading more significantly than to have them listen and repeat whole words. Training effects of the two types of training on segmental features of word-reading and perception of the phonemes, on the hand, were comparable. According to Yoshikawa and Yamashita (2014), studies on second language word recognition have repeatedly shown that EFL learners with logographic L1 background including Japanese tend to process English words more holistically than native speakers of English or EFL learners with alphabetic L1. Yeung et al (2013) argued that the children who have not undergone phonological awareness, thus, had relatively weak phonological awareness relied more on the lexical route in reading, while children who have acquired a certain level of phonological awareness use the sublexical route in the reading process. Taken these into account, we speculate that the phonological awareness training group in this study has enhanced their phonological awareness to some extent but not to the extent which allow them to segment words into smaller phonological units when reading or spelling English words.

The finding in Study 3 that the prosodic elements more strongly associate with the overall goodness of pronunciation than segmental elements underlines the value of phonological awareness training for adult Japanese EFL learners. The effects of phonological awareness training will become more remarkable and work more efficiently when we incorporate the findings with regard to particular phonological difficulties among Japanese learners into the training program. Furthermore, a multi-metric pronunciation assessment is meaningful not only for the phonological awareness training but also for English learners in general. It is especially beneficial for advanced non-native speakers, for whom an evaluation only in terms of intelligibility or

comprehensibility is no longer helpful for improving their pronunciation. Accumulating systematic pronunciation assessment will improve the quality of teaching and training pronunciation. For example, computer-based pronunciation assessment and feedback will be more precise and instructive by integrating knowledge gained from such data.

It is of our interest now to combine phonological awareness training and word-repetition training or another type of training to see if it increases trainees' gain in both phonological awareness and word-reading/spelling. When providing more than one types of training in the same time period, we may want to consider the order of training, i.e. administering which training first will maximize the effects. Yang and Yamada (2016) researched the order effect when Japanese speakers with no prior Chinese knowledge received perception training and vocabulary training to identify four different Mandarin tones. They found that the group which started with the perception training achieved a greater improvement in some of the tests. Eguchi and Yamada (2016), on the contrary, observed no order effect when Japanese speakers received pronunciation- and vocabulary training on English words of low familiarity. Fujiyuki et al (2017) also found no order effect when Japanese speakers received perception- and production training to distinguish English /ɹ/and/l/. These studies suggest that order effect is evident when items from different linguistic levels are involved in each training respectively (e.g. phonemes and lexicons). They also suggest experiences with or the exposure to the target language plays a role in order effect; order effect is prominent at earlier stages of L2 learning. Based on these findings, we may expect little order effect when adult Japanese learn English as a second language.

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7. PUBLICATION

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APPENDIX A. LISTS OF WORDS USED IN THE STUDY

WORD	IPA	WORD	IPA	WORD	IPA
baron	'berən	oasis	oʊ'eɪsɪs	dwelling	'dwelɪŋ
jeopardy	'dʒepərdi	calculus	'kælkjələs	muzzle	'mʌzəl
mercenary	'mɜːsənəri	feudalism	'fjuːdəlɪzəm	vestibule	'vestɪbjʊl
nicety	'naɪsəti	gregarious	grɪ'gæriəs	omen	'oʊmən
graphite	'græfʌɪt	sobriety	sə'brʌiəti	quietude	'kwaiətud
fissure	'fɪʃər	actuality	æktʃ'ʊæləti	henchman	'hentʃmən
theologian	θiə'loʊdʒən	egotistical	igoo'tɪstɪkəl	rick	rɪk
rogue	'rɒɡ	windmill	'wɪndmɪl	calculus	'kælkjələs
discolouration	disklə'reɪʃən	vigilance	'vɪdʒələns	maternity	mə'tɜːnəti
herdsman	'hɜːdzmən	judicious	dʒu'dɪʃəs	shaker	'ʃeɪkər
periodical	pɪri'ɒdɪkəl	thane	θeɪn	chassis	'tʃæsi
yore	jɔː	epistle	ɪ'pɪsəl	discolouration	disklə'reɪʃən
quean	kwiːn	gregarious	grɪ'gɜːriəs	zebra	'ziːbrə
inauguration	ɪnəʒjə'reɪʃən	functionary	'fʌŋkʃənəri	launder	'ləʊndər
justification	dʒʌstɪfə'keɪʃən	sophisticated	sə'fɪstəkeɪtɪd	pugilist	'pʊdʒɪlɪst
feudalism	'fjuːdəlɪzəm	molasses	mə'læsɪz	jobber	'dʒɒbər
WORD	IPA	WORD	IPA	WORD	IPA
redeemer	rɪ'diːmə	brigand	'brɪɡənd	redeemer	rɪ'diːmə
panoply	'pænəpli	cerebrum	sə'riːbrəm	upholstery	ʌp'hoʊlstəri
illiteracy	ɪ'lɪtərəsi	brocade	brə'keɪd	contamination	kəntæmə'neɪʃən
horsehair	'hɔːshər	epicure	'epəkjʊr	chasm	'kæzəm
responsibility	rɪspɒnsə'bɪləti	manufacturer	mænʃə'fæktʃərə	dormitory	'dɔːrmɪtəri
impunity	ɪm'pjʊnəti	overproduction	oʊvəprə'dʌkʃən	adder	'ædə
relativity	relə'tɪvəti	rhumb	rʌm	dowager	'daʊədʒər
loquacity	loʊ'kwæsjəti	chinchilla	tʃɪn'tʃɪlə	temperamental	tempərə'mentəl
evergreen	'evəgrɪn	disparagement	dɪ'spærɪdʒmənt	rhinoceros	raɪ'nɒsərəs
feline	'fɪliːn	unification	junəfə'keɪʃən	wicket	'wɪkt
lateral	'lætərəl	gingham	'ɡɪŋəm	craven	'kreɪvən
excise	'eksəɪz	herdsman	'hɜːdzmən	exasperation	ɪgzæspə'reɪʃən
xylophonexylophone	'zaɪləfoʊn	redeemer	rɪ'diːmə	cornet	'kɔːnət
ostentation	ɒstən'teɪʃən	lowland	'loʊlənd	cinder	'sɪndər
periodical	pɪri'ɒdɪkəl	reformation	rɪfɔː'meɪʃən	atrocious	ə'træsəti

WORD	IPA	WORD	IPA	WORD	IPA
manganese	'mæŋənɪz	compatriot	kəm'peɪtriət	disclosure	dɪs'klɔʊzər
labyrinth	'læbərɪnθ	delirium	də'liəriəm	solemnity	sə'lemnəti
tyrant	'taɪrənt	burial	'berɪəl	fatherland	'fɑðərlænd
clemency	'klemənsɪ	chamois	'ʃæmwɑ	cuisine	kwi:zɪn
beehive	'bi:haɪv	inauguration	ɪnəʊgje'reɪʃən	fuselage	'fju:zələʒ
lathe	leɪð	blunderbuss	'blʌndərbʌs	comestibles	kə'mestəbəlz
python	'paɪθən	affable	'æfəbəl	modernist	'mɒdərnɪst
nostalgia	nə'stældʒɪə	caustic	'kɔ:stɪk	ampere	'æmpɪər
microbe	'maɪkroʊb	emporium	ɪm'pɔ:riəm	jib	dʒɪb
nave	neɪv	tally	'tæli	sophisticated	sə'fɪstəkertɪd
cartilage	'kɑ:rtəlɪdʒ	buoyant	'bɔɪənt	aggressor	ə'ɡresər
antagonism	æn'tæɡənɪzəm	damsel	'dæmzəl	domicile	'dɒməsəl
dolt	dəʊlt	mastery	'mæstəri	rhumb	rʌm
emperor	'empərər	circumspect	'sɜ:kəmspekt	animosity	ænə'məsəti
regency	'rɪdʒənsɪ	disclosure	dɪs'klɔʊzər	albatross	'ælbətros
WORD	IPA	WORD	IPA	WORD	IPA
transformer	træns'fɔ:mər	resumption	rɪ'zʌmpjən	bison	'baɪsən
stanza	'stænzə	creeper	'kri:pər	precursor	pri'kɜ:sər
prosaic	prə'zeɪɪk	spangle	'spæŋgəl	querulous	'kwɛrjələs
blasphemy	'blæsfəmi	chloride	'klɔ:raɪd	plaza	'plɑ:zə
flexibility	fleksə'bɪlɪti	flighty	'flaɪti	schism	'skɪzəm
chronology	krə'nɒlədʒɪ	proficient	prə'fɪʃjənt	swage	sweɪdʒ
slough	slu	squib	skwɪb	sword	swɔ:rd
frieze	frɪz	stipend	'staɪpend	chronology	krə'nɒlədʒɪ
trapeze	trə'pɪz	treaty	'tri:ti	prow	prəʊ
slovenly	'slɒvənli	profiteer	prɒfə'tɪr	criterion	krɪ'tɪriən
dwelling	'dwelɪŋ	flighty	'flaɪti	brigand	'brɪgənd
brownie	'braʊni	grisly	'grɪzli	cuisine	kwi:zɪn
placard	'plækɑ:d	truism	'truɪzəm	cleaver	'kli:vər
stoic	'stɔɪk	scorpion	'skɔ:pjən	blunderbuss	'blʌndərbʌs
swage	sweɪdʒ	spangle	'spæŋgəl	tremulous	'tremjələs
proficient	prə'fɪʃjənt	trellis	'treɪlɪs	stipend	'staɪpend

WORD	IPA	WORD	IPA	WORD	IPA
promenade	prəmə'neɪd	lichen	'laɪkən	adherence	əd'hɪərəns
farthing	'fɑːðɪŋ	salvation	sæl'veɪʃən	continuation	kən'tɪnju'eɪʃən
malaria	mə'leəriə	truism	'truɪzəm	charlatan	'ʃɑːrlətən
gentry	'dʒentri	authoritative	ə'θɔːrətətɪv	dislocation	dɪs'ləʊ'keɪʃən
gullet	'gʌlət	benefactor	'benəfæktər	domicile	'dəməsaɪl
continuation	kən'tɪnju'eɪʃən	sanitation	sænə'teɪʃən	educator	'edʒəkətər
amethyst	'æməθɪst	dowry	'daʊri	compatriot	kəm'peɪtriət
benefactor	'benəfæktər	cello	'tʃeləʊ	solemnity	sə'lemnəti
periodical	pɪri'ɑːdɪkəl	adversity	əd'vɜːsəti	contamination	kəntæmə'neɪʃən
complacent	kəm'pleɪsənt	metropolis	mə'trɒpəlɪs	comforter	'kʌmfətər
aviator	'eɪviətər	hybrid	'haɪbrɪd	vitriol	'vɪtriəl
falsehood	'fɔːlshʊd	reprisal	rɪ'praɪzəl	windmill	'wɪndmɪl
infantry	'ɪnfəntri	microbe	'maɪkrəʊb	sufferance	'sʌfərəns
pioneer	pɪə'nɪr	medallion	mə'dæljən	immortality	ɪmɔːr'tæləti
harpsichord	'hɑːpsɪkɔːrd	habitation	hæbə'teɪʃən	sanitarium	sænə'terɪəm
WORD	IPA	WORD	IPA	WORD	IPA
wicker	'wɪkər	anteroom	'æntɪrəm	clung	klʌŋ
steadfast	'stedfæst	contradictory	kəntrə'dɪktəri	ardent	'ɑːdənt
fallacy	'fæləsi	philology	fɪ'lɒlədʒi	eccentricity	eksen'trɪsəti
receptacle	rɪ'septəkəl	unreality	ʌnrɪ'æləti	endeavour	ɪn'devər
equanimity	ɪkwə'nɪməti	cactus	'kæktəs	tremulous	'tremjələs
dexterity	dek'sterəti	parallelogram	pərə'leləgræm	accumulation	əkjuːmjə'leɪʃən
array	ə'reɪ	impersonation	ɪmpərsə'neɪʃən	allegory	'æləgəri
emporium	ɪm'pɔːrɪəm	audition	ɔː'dɪʃən	airship	'eɪʃɪp
intoxication	ɪntɒksə'keɪʃən	authentic	ɔː'tentɪk	authoritative	ə'θɔːrətətɪv
sophisticated	sə'fɪstəkeɪtɪd	apex	'eɪpeks	unbeliever	ʌnbɪ'lɪvər
impediment	ɪm'pedəmənt	Congress	'kɒŋɡres	octagon	'ɒktəɡən
mutilation	'mjʊtəleɪʃən	remittance	rɪ'mɪtəns	evangelist	ɪ'vændʒəlɪst
conveyance	kən'veɪəns	astronomy	ə'strɒnəmi	founder	'faʊndər
introductory	ɪntrə'dʌktəri	elaboration	ɪləbə'reɪʃən	indiscretion	ɪndɪ'skrefən
caravan	'kærəvæn	aristocracy	erə'stɒkrəsi	assemblage	ə'sembldʒ

WORD	IPA	WORD	IPA	WORD	IPA
burgher	'bʌgə	comforter	'kʌmfətə	superfluity	supə'fluəti
ostentation	astən'teɪʃən	immensity	ɪ'mensəti	oxymoron	ɒksɪ'mɒrən
exuberant	ɪg'zʊbərənt	brocade	brə'keɪd	castor	'kæstə
supposition	sʌpə'zɪʃən	technicality	tek'nə'kæləti	debonair	debə'neɪ
infringement	ɪn'frɪndʒmənt	evacuation	ɪvækju'eɪʃən	rigidity	rɪ'dʒɪdɪti
humankind	'hju:mənkaɪnd	precursor	prɪkɜ:sə	hamlet	'hæmlət
dunghill	'dʌŋhɪl	rheumatism	'rumətɪzəm	sufferance	'sʌfərəns
temperamental	temperə'mentəl	launder	'ləndə	modernist	'mɒdənɪst
consideration	kən'sɪdə'reɪʃən	embezzle	ɪm'bezl	perturbation	pɜ:tə'reɪʃən
adam	'ædəm	conveyance	kən'veɪəns	convocation	kən've'keɪʃən
raiment	'reɪmənt	projectile	prə'dʒektəl	loquacity	ləu'kwæsəti
verity	'verəti	sapphire	'sæfəɪ	introductory	ɪn'trə'dʌktəri
underworld	'ʌndərwɜ:ld	disavow	dɪsə'vaʊ	demeanour	dɪ'mi:nə
limelight	'laɪmlaɪt	firmament	'fɜ:məmənt	gabardine	'gæbərdɪn
indiscretion	ɪndɪs'krefjən	dormitory	'dɔ:mɪtəri		
WORD	IPA	WORD	IPA	WORD	IPA
anneal	ə'nɪl	hexagon	'heksəgən	infantry	'ɪnfəntri
benzene	'benzɪn	cedar	'sɪdə	impossibility	ɪmpəsə'bɪlɪti
conspirator	kən'spɪrətə	disclosure	dɪs'klɔ:ʒə	cynical	'sɪnɪkəl
insufficiency	ɪnsə'fɪʃənsi	sanitation	sænə'teɪʃən	chloride	'klɔ:raɪd
originality	ərɪdʒə'næləti	coulomb	'kʊləm	rhinoceros	raɪ'nəsərəs
elopement	ɪ'ləʊpmənt	enunciation	ɪn'ʌnsi'eɪʃn	ethical	'eθɪkəl
tuberculosis	tubəkjə'lʊʊsɪs	originality	ərɪdʒə'næləti	animosity	ænə'məsəti
dogmatic	dɒg'mætɪk	contradictory	kən'trə'dɪktəri	molasses	mə'læsɪz
commode	kə'mʊd	insolent	'ɪnsələnt	graphic	'græfɪk
inefficiency	ɪnɪ'fɪʃənsi	pacifism	'pæsəfɪzəm	sanitarium	sænə'terɪəm
infallibility	ɪnfælə'bɪlɪti	astronomy	ə'strɒnəmi	disquiet	dɪs'kwɪəɪt
bilious	'bɪlɪəs	aboriginal	æbə'rɪdʒənəl	hindrance	'hɪndrəns
cymbal	'sɪmbəl	algae	'ælgi	falconer	'fɒlkənə
upholstery	ʌp'həʊlstəri	illiteracy	ɪ'lɪtərəsi	anticipation	æntɪsə'peɪʃən
parallelogram	pərə'leləgræm	sobriety	sə'braɪti	indiscretion	ɪndɪ'skrefjən
perturbation	pɜ:tə'reɪʃən	animosity	ænə'məsəti	circumspect	'sɜ:kəmspekt

WORD	IPA	WORD	IPA	WORD	IPA
thicket	'θɪkɪt	artifice	'ɑrtəfɪs	boll	bɒl
audit	'ɒdɪt	assemblage	ə'sembldrɪdʒ	abominable	ə'bɒmənəbəl
anecdote	'ænlkdoʊt	armor	'ɑrmər	aster	'æstər
outpost	'aʊtpoʊst	aster	'æstər	clamor	'klæməər
xylophone	'zaɪləfoʊn	avowal	ə'vaʊəl	eccentricity	eksen'trɪsətɪ
newborn	'nju:bn	barnacle	'bɑ:nəkəl	anvil	'ænvɪl
bereavement	bɪ'rɪvmənt	copious	'kɒpiəs	plaise	pleɪs
enlightenment	ɪn'laɪtənmənt	meticulous	mə'tɪkjələs	kale	keɪl
settler	'setlər	immensity	ɪ'mensətɪ	complacent	kəm'pleɪsənt
gondola	'gɒndələ	unanimity	junə'nɪmətɪ	compatriot	kəm'peɪtriət
abode	ə'boʊd	handmaid	hænd'meɪd	dormitory	'dɔ:rmɪtəri
amplitude	'æmplɪtʊd	nightingale	'naɪtɪŋgeɪl	agility	ə'dʒɪlɪtɪ
antitoxin	ænti'tɒksɪn	gadfly	'gædflaɪ	aristocracy	erə'stɑ:kɹəsi
interim	'ɪntərɪm	franchise	'fræntʃaɪz	regency	'rɪdʒənsɪ
concave	kən'keɪv	pampas	'pæmpəs	namesake	'neɪmsəkeɪk
embrace	ɪm'breɪs	pancreas	'pæŋkriəs	caustic	'kɔ:stɪk
candid	'kændɪd	tempest	'tɛmpɪst	temperamental	tempərə'mentəl
dogmatic	dɒg'mætɪk	pugilist	'pʊdʒɪlɪst	receptacle	rɪ'septəkəl
ingratitude	ɪn'grætətʊd	carnage	'kɑ:nɪdʒ	clamour	'klæməər
falsehood	'fɒlshʊd	pyramid	'pɪrəməɪd	originator	ə'rɪdʒənɪtər
meticulous	mə'tɪkjələs	adam	'ædəm	cobweb	kɒbweb
bias	'baɪəs	antagonism	æn'tæɡənɪzəm	kabob	kə'bɒb
imitator	'ɪməteɪtər	abhor	əb'hɔ:ər	retention	rɪ'tenʃən
castor	'kæstər	endeavour	ɪn'devər	unification	junəfə'keɪʃən
impunity	ɪm'pjʊnətɪ	daybreak	'deɪbreɪk	buoyant	'bɔɪənt
inefficiency	ɪnə'fɪʃənsɪ	concave	kən'keɪv	dalliance	'dælɪəns
periodical	pɪrɪ'ɑdɪkəl	forethought	'fɔ:θɔ:t	harpsichord	'hɑ:psɪkɔ:d
temperamental	tempərə'mentəl	minaret	mɪnə'ret	commode	kə'moʊd
fencing	'fensɪŋ	octopus	'ɒktəpəs	upholstery	ʌp'həʊlstəri
python	'paɪθən	comestibles	kə'mestəbəls	dormitory	'dɔ:rmɪtəri

APPENDIX B. EXTRACTS FROM SPEAKING SKILLS RATING
IN CONVENTIONALLY USED ENGLISH TESTS


TEST	Criteria	Rating	DESCRIPTION
TOEIC	<input type="checkbox"/> Pronunciation (when reading aloud, pronunciation is:)	High Middle Low	Highly intelligible Generally intelligible Not intelligible
	<input type="checkbox"/> Intonation and stress levels (refer to the ability to use emphases, pauses, falling-rising pitch to convey meaning)	High Middle Low	Highly effective Generally effective Generally not effective
TOEFL	<input type="checkbox"/> Delivery difficulties with pronunciation or intonation patterns that effect intelligibility <input type="checkbox"/> Difficulties that requires listeners effort	4 3 2 1	Minor difficulties which do not affect overall intelligibility Minor difficulties which may require effort at times but do not affect intelligibility significantly Basically intelligible, though listener effort is needed because of unclear articulation, awkward intonation, or choppy rhythm and pace Consistent difficulties that cause considerable listener effort
CEFR (Common European Framework of Reference for Languages)	Pronunciation and intonation are omitted		
IELTS (International English Language Testing System) *public version	Pronunciation	Band.9 (highest)	<input type="checkbox"/> Use a full range of pronunciation with precision and subtlety <input type="checkbox"/> Sustains flexible use of features throughout <input type="checkbox"/> Is effortless to understand
		Band 6	<input type="checkbox"/> Use a range of pronunciation features with mixed control <input type="checkbox"/> Shows some effective use of features but this is not sustained <input type="checkbox"/> Can generally be understood throughout, though mispronunciation of individual words or sounds reduced clarity at times


APPENDIX C. MONITOR SCREENS FOR EACH TASK AND FEEDBACK IN THE TRAINING



PRODDN-A-PRON
問題を解いてください
トライアル番号 1/20

2つ目の音節を除いて発音してください



 確認 保存 答え合わせ

問題を解いてください
トライアル番号 1/20


2つ目の音節を除いて発音してください



$/ ' d ʒ \epsilon p \grave{a} d i /$
jeopardy
 $/ ' d ʒ \epsilon d i /$


 確認 保存 次へ

問題を解いてください
トライアル番号 1/20




音素の数を選んでください

1 2 3 4 5 6 7 8 9 10 11 12





問題を解いてください
トライアル番号 1/20




$/ ' v i d ʒ \theta l /$
音素の数を選んでください

1 2 3 4 5 6 7 8 9 10 11 12


 

問題を解いてください
トライアル番号 1/20




音節の数を選んでください

1 2 3 4 5 6 7 8 9 10





問題を解いてください
トライアル番号 1/20




$/ ' s i n i k \theta l /$
音節の数を選んでください

1 2 3 4 5 6 7 8 9 10

2/20
2つの英単語が続けて聞こえます。その2つが韻を踏んでいればYボタン、踏んでいなければNボタンを押してください



2/20

正解：N



interim cerebrum
 $/ ' i n t \grave{a} i m /$ $/ s p s \epsilon r \grave{e} b r \grave{a} m /$

rimeが違うので韻を踏んでいません



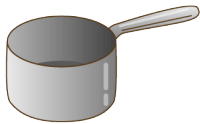
APPENDIX D. THE SLIDES USED IN THE PHONOLOGICAL INSTRUCTION

phoneme (音素)とは

ことばの音の一番小さな単位が音素です。

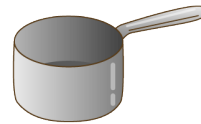
子音 (C) と母音 (V) に分けられます。

日本語の「な」は1音ではなく、子音/n/と母音/a/のかたまりで、音素の数は2つです。



英語 /p/ /a/ /t/

CVC 3音素



日本語 /n/ /a/ /b/ /e/

CVCV 4音素

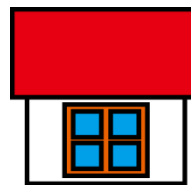
二重母音は1音素！

△ 英語では、母音が2つ続く二重母音は1つの母音、すなわち1つの音素とします。



/t/ /aɪ/ /m/

CVC 3音素



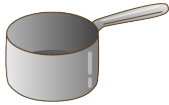
/h/ /aʊ/ /s/

CVC 3音素

Syllable(音節)とは

母音を1つを含んだ音素のかたまりを音節と呼びます。
単語の音節の数は単語に含まれる母音の数と同じです。

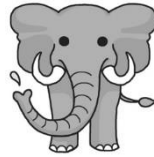
/p//ɑ//t/



CVC

母音は1つ→1音節

/ɛ//l//ə//f//ə//n//t/



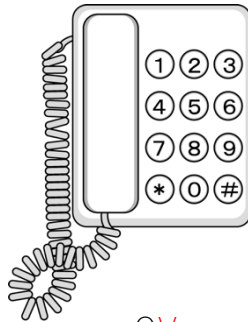
VCVCVCC

母音は3つ→3音節

音節の区切り

音節には必ず母音が1つだけ含まれます。
単語を音節に分ける際には母音の位置に注目しましょう。
区切った順番に「第1音節」「第2音節」…と呼びます。

/t//ɛ//l//ə//f//oʊ//n/



CV
第1音節

/t//ɛ/

CV
第2音節

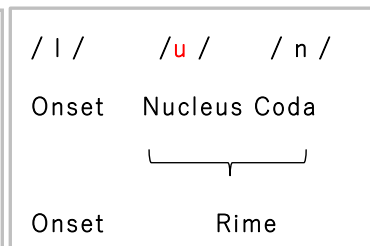
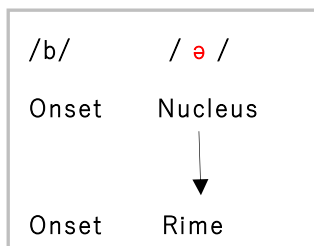
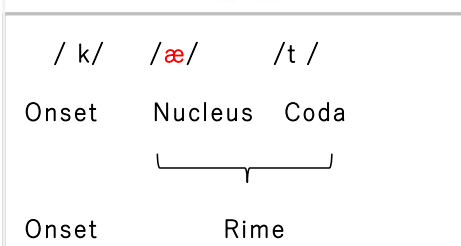
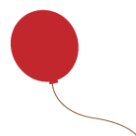
/l//ə/

CVC
第3音節

/f//oʊ//n/

音節の構造

音節内では、母音を Nucleus、母音の前の子音は Onset、母音の後ろにある子音を Coda と呼びます。音節には Coda がない場合もあります。Onset を以外の部分はまとめて Rime と呼ばれます。



第 1 音節

第 2 音節

韻を踏むとは

2つの単語の最終音節の Rime が同じ場合、その2つの単語は「韻を踏んでいる」といいます。

○ 韻を踏んでいる

/h/ æ t /



/k/ æ t /



✕ 韻を踏んでいない

/p/ a t /



/k/ æ t /

