THE EFFECT OF AWARENESS OF MORAIC STRUCTURE ON NATIVE ENGLISH SPEAKERS' LISTENING COMPREHENSION OF JAPANESE-ENGLISH SPEAKERS

by

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ABSTRACT

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The main aim of the series of three experiments presented here was to find interventions to reduce miscommunication between native and non-native English speakers. Thirty four Standard English (SE) speakers in Experiment 1, twelve SE speakers in Experiment 2, and one hundred and thirty one SE speakers in Experiment 3 were recruited from the Psychology Participant Pool at the University of Texas, Arlington. Experiments 1 and 3 served (1) to analyze the effect of differences in phonetic rhythm between Japanese and SE language on SE speakers' listening comprehension of Japanese-accented English; (2) to analyze the effect of training types on a mora test (Japanese segmentation of spoken words); (3) to explore the relationships among demographics, self-reported listening test performance, evaluations of the speaker, listening response times, and listening test performances; and (4) to explore correlations among accuracy, response time, accessibility index, and frequency index of each word. Experiment 2 was conducted to examine SE speakers' listening comprehension of another SE speaker, and to pilot Experiment 3. General procedures started with obtaining informed consent

and instructing participants to respond to a demographic survey and questions dealing with exposure to Japanese culture. Participants were then randomly assigned to different training conditions. After the training, participants received a mora test followed by listening comprehension tests in randomized order. A self-report scale of listening comprehension and an evaluation scale were measured after each listening test. Results from Experiments 1 and 3 suggested that it was important for Japanese-English speakers to make the right syllabification when they speak words to reduce miscommunication. Although mora training enhanced native English speakers' understanding of a Japanese accent, it did not improve the listening comprehension of Japanese-accented English. This indicated that there was a gap between understanding a foreign accent and using that information to improve the listening comprehension of accented English. In item level analyses, faster responded words tended to be more accurately responded, and more accessible words were responded faster. Application of these findings to enhance cross-linguistic communication was discussed.

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CHAPTER 1

INTRODUCTION

1.1 Background

More than 20 billion dollars (25 trillion Yen) in trade occurs between Japan and the United States annually (Trade Statistics of Japan, 2006). Usually these transactions are conducted in English, but Japanese people often speak English poorly, which creates opportunities for miscommunication in political, educational, and personal relationships as well as decreased trade and revenue loss between these two countries. In particular, Japanese speakers are reported to have the lowest average scores among Asian countries on the Test of English as a Foreign Language (TOEFL, ETS, 2005), the most widely used test of Standard English (SE) fluency for non-native speakers (Ohishi, 2001).

It is also reasonable to assume that both the ability of an individual to listen to a foreign language and speak the language is important to communication. If this is so, both the speakers' and listeners' skills need be investigated to enhance communications. Although fluency of speech of Japanese-English speakers has been studied extensively (Davies, Hamp-Lyons, & Kemp, 2003), listening skills of SE speakers for accented English have not received the same amount of attention. This line of research aims to develop practical interventions for SE speakers and Japanese-English speakers in order to reduce miscommunication.

It was generally difficult for English as second language (L2) speakers to acquire fluent English. First, it appeared to be unrealistic for many L2 English speakers to achieve the fluency of native (L1) English (Bouton, 1994; Snow, 1998; Strange et al, 1998). Second, the age of at which L2 was learned appeared to be more important than the years spent learning L2

(Johnson & Newport, 1989), and years of learning L2 affected listening skills, but it did not seem to improve speech skills as much (Flege, 1988; Flege, 1995, Flege, Frieda, & Nozawa, 1997, Flege, Bohn, & Jan, 1997). Third, cognitive processes in L2 were inferior to cognitive processes in L1 because large portions of cognitive resources were used for linguistic processes. This phenomenon was named the "foreign language effect" (Takano & Noda, 1993). Thus, it was very difficult for non-native English speakers to achieve the level of fluency of L1 English speakers, and even when they became somewhat fluent in English they tended to sacrifice other cognitive processes in English.

Several factors are specifically related to the poor fluency of native Japanese speakers of spoken English (Kouno, 2007). First, English education in Japan tends to focus on grammar, reading, and writing, because these forms of English are traditionally important for high school and college entrance examinations. Second, many English teachers in Japan are not themselves fluent in spoken English. Thus, they are not ideal instructors for teaching the spoken form of SE. Third, because Japan is mainly composed of one ethnicity, Japanese, it is not necessary to speak English on a daily basis. Fourth, Japanese's volume of speech tends to be low. However, not only the Japanese who were L2 English speakers but also those who were L1 English speakers contribute to the miscommunication.

Miscommunication occurs with L1 English speakers as well as with L2 English speakers. Various studies have reported that effective oral communication depended on the mutual cooperation between speakers and listeners (Ervin-Tripp, 1970; Grice, 1975). Although effective communication was reported to be dependent on mutual cooperation of speakers and listeners, enhancement of L1 English speakers' listening skills of accented English has been overlooked (Davies, Hamp-Lyons, & Kemp, 2003). For example, even in many non-English speaking countries, many people have to take SE proficiency examinations, such as TOEFL (ETS, 2005), for academic or business, but SE speakers rarely receive training on non-native English speakers' accents when even they travel overseas (Davies, Hamp-Lyons, & Kemp,

2003). Because there are many non-SE L2 speakers, SE is ideal where English was nationally or conventionally used, while World English (WE), which included nonnative English as well as SE, is more appropriate and practical in international settings.

Several factors were reported to affect the listening comprehension of English spoken by an L2 speaker such as one that was Japanese. One of the most influential factors was the need to focus on differences between Japanese and English in phonetics (acoustic aspects of spoken language) and the rhythm of speech (Kubozono & Honma, 2002; Rouas, 2005). This was because listener's comprehension was based on a listeners own language's sound structure rather than that of the language being spoken (Mehler, Dommergues, Grauenfelder, & Segui, 1981; Cutler & Norris, 1988; Inagaki, Hatano, & Otake, 2000; Otake, et al., 1993; Weber & Cutler, 2004). In other words, the L1 sound structure overrode the L2 sound structure (Cooper, Cutler, & Wales, 2002). There were several levels in the sound structure of a language (Figure 1). The smallest sound unit of language was traditionally viewed as the phoneme, but it has been reported that people process spoken sounds as groups (chunks) of phonemes, such as a stressed-syllable or a mora (Japanese segmentation of spoken sounds) rather than phonemes, in word level listening comprehension (Mattys & Melhorn, 2005; Kouno, 2007).

1.2 Differences in Linguistic Rhythm Between Japanese (Mora) and English (Syllable)

Languages have been generally categorized into three types of phonetic rhythm: syllable rhythm, stressed-syllable rhythm, and mora rhythm languages (Kubozono & Honma, 2002). Rhythmic differences, which were found in the second (more) and the third lowest (syllable) level of the hierarchy of sound structure among spoken language (Figure 1.1), were reported to be one of the most important units in the sound structure that affected listening performance.

Sentence speech (Higher level)
|
Metric phrase
|
Metric word
|
Foot
|
Syllable
|
Mora
|
Phoneme (Lower level)

Figure 1.1 Phonetic structure of a sentence speech

In syllable rhythm language, people perceive spoken words based on syllable rhythm (Mehler, Dommergues, & Frauenfelder, 1981; Kolynsky, Morais, Cluytens, 1995; Floccia et al., 2003). French and Spanish were categorized as this type of language. For example, French speakers perceived the word “syllable” as syl/ la /ble (‘/’ represents segmentation), where an accent tends to be controlled by a pitch. Second, in stressed-syllable rhythm language, people perceived spoken words based on stressed and non-stressed syllables. English was categorized as this type of language (Cutler & Norris, 1988). English speakers perceived “syllable” as syl’/ la/ ble where both syllabification and stress at ‘syl’ had important functions. Third, in mora rhythm language, people perceived spoken words based on morae (Kubozono & Honnma, 2002). Japanese (Kureta, Fushimi, & Tatsumi, 2006), Korean (Moon-Hwan, 2004), and Telugu (Murthy, Otake, Cutler, 2007) were categorized as this type of language. For example, Japanese speakers perceived “syllable” as sy/ lla/ bu/ lu where segmentation was based on mora.

Both morae and syllables are composed of combinations of consonant (C) and vowel (V). In English, a syllable is an important phonological unit and is formed around a V, and a V

can take up to three proceeding Cs and four subsequent Cs. The most common form of syllable is CVC. In contrast to English, mora is a very important phonological unit of duration in Japanese language (McQueen, Otake, Cutler, 2001; Kubozono & Honnma, 2002; Kouno, 2007). A mora is the smallest sound segmentation that is perceived and processed in Spoken Japanese, which is generally composed of a V or combination of CV. A mora is generally expressed in large case Japanese characters although there are a few exceptions:

1) The sokuonn (促音) sound (geminated consonant) is counted as 1 mora although it is expressed in a small case Japanese letter. (e.g. ガッツ = guts)

2) The tyouboin (長母音) sound (a long vowel) is counted as 1 mora although it does not represent any sound by itself. (e.g. コーン= Corn)

3) The youon (拗音) sound (a Japanese mora with a vowel-like sound that is somewhere between the consonant and vowel) is combined with a preceding character to be a mora. (e.g. シャイン= shine)

4) The hatsuon (撥音) sound is composed of double consonants such as “nn”. (e.g. イン = inn)

Most of these exceptions were originally used for foreign borrowing words such as Chinese loan words, or English loan words, and are thus “parasites” on the preceding mora, which means that they cannot exist without the preceding mora. A mora as opposed to a syllable can be used as a physical unit to measure sound length. For instance, the time it takes to pronounce a two morae word is approximately twice as long as a one mora word, and a three morae word is about three times as long as a one mora word. Because of this property, accent in Japanese language is not based on stretching or shortening of sounds, but based on pitch changes. Unlike the stretching of sounds in English where accents are expressed in stressed (lengthened) syllables, an accented-mora in a word is pronounced in a high pitch. In Japanese, many words have accent in the third mora counted from the last mora in a word in Japanese while many words have accents in the first stem-syllable in English. Despite these differences,

there are some similarities between Japanese and English phonetic units because there are universal constrains for segmentation of spoken words (Norris et al., 2001). For example, at least one V is needed to form a word. Thus, both Japanese and English sound structures have distinct sounds with little similarity between them. These structural differences between Japanese and English languages are the central tenet of this study proposal.

1.3 Main Purposes of The Current Research

The main purposes of the current study were to investigate (1) the effect of differences in sound structure (rhythms/segmentations) between Japanese and English languages on SE speakers' listening comprehension of Japanese-accented English, (2) the effect of a short training of Japanese sound structure on SE speakers' listening comprehension of Japanese-accented English, (3) the relationships among demographics, self-reported listening test performance, evaluations of the Japanese-English speaker, listening response times, and Japanese-accented English listening test performances were explored, and (4) the relationships among item properties, reaction time, and accuracy. The study was composed of three experiments. Experiments 1 and 3 served to investigate the aims described above, and Experiment 2 was conducted to investigate how well SE speakers listened to another SE speaker for descriptive purposes and to make modifications for Experiment 3.

CHAPTER 2

EXPERIMENT 1

2.1 Introduction

There were four specific aims of Experiment 1. First, the effect of segmentation of a spoken a word (mora or stressed syllable) by a Japanese-English speaker and training method (written mora training or placebo training) on SE speakers listening comprehension of Japanese-accented English were investigated. Second, the effect of training on proportion of accuracy in mora testing was investigated. Third, the relationships among demographics, self-reported listening test performance, evaluations of the Japanese-English speaker, listening response times, and listening test performances were explored. Finally, relationships among accuracy of each word, response times for each word, normalized accessibility index of each word, frequency index of each word, numbers of morae, and numbers of syllables in each word were explored at the item level.

2.2 Method

2.2.1 Participants

Thirty four SE speakers who were enrolled in Introductory Psychology at the University of Texas at Arlington participated in Experiment 1. One participant was dropped from the analysis because of a computer malfunction, leaving 33 participants for the statistical analyses. This sample consisted of 10 males and 23 females, with a mean age of 21.0 years (*SD* =3.3). Participants participated in Experiment 1 in order to fulfill a course requirement, and informed consent was obtained from each participant.

2.2.2 Materials

2.2.2.1 Computer Software

E-prime Version 1.1 (Psychology Tools Software, 1996) was used to collect the data.

2.2.2.2 Demographic Scale

Participants' age and gender were collected in this 2-item scale (Appendix A-1).

2.2.2.3 Exposure Scale

An Exposure to Japanese culture scale (Appendix A-2) was used to assess previous exposure to the Japanese Culture. The scale contained nine, five-point Likert-type items. Internal consistency of the 9-item-exposure scale was .85. Item statistics were shown in Table 2.1.

Table 2.1 Item statistics for the exposure to Japanese culture scale (Experiment 1)

Item	Mean	*SD*	r_{it}	*N*
Item 1	1.9	0.9	0.8	33
Item 2	2.0	1.1	0.7	33
Item 3	1.9	1.1	0.3	33
Item 4	2.3	1.0	0.4	33
Item 5	1.1	0.7	0.6	33
Item 6	1.1	0.7	0.6	33
Item 7	2.0	1.0	0.7	33
Item 8	1.9	1.2	0.7	33
Item 9	1.1	0.4	0.5	33

2.2.2.4 Mora training

Mora training was developed to teach native English speakers the basic sound segmentation (rhythm) of Japanese Language (Appendix A-3). This training was based on information about Japanese rhythm of speech in Kubozono and Honnma (2002). A short training rather than long training was used, because the purpose was to design a realistic, practical, efficient, and useful quick intervention to enhance SE speakers' listening

comprehension of accented English rather than mastering Japanese accents. Placebo training was designed to teach basics about the written form of Japanese language based on the information from a college level Japanese textbook called “Yokoso!” (Tohsaku, 1999).

2.2.2.5 Mora Test

Immediately after the training, participants were asked to answer the number of morae for 30 stimulus words (Appendix A-4). This test was used to measure the degree of participants' understanding of moraic structure. Internal consistency of the mora test was .89. Item statistics were shown in Table 2.2. For the mora test, item statistics were not used to eliminate items because the mora test was well accepted in an experimental entity of psychology as opposed to a correlational entity of psychology (Cronbach, 1957).

Table 2.2 Item statistics for mora test (Experiment 1)

Item	Mean accuracy	*SD*	r_{it}	*N*
answer	0.3	0.5	0.5	33
bag	0.4	0.5	0.5	33
board	0.2	0.4	0.6	33
city	0.5	0.5	-0.3	33
coat	0.4	0.5	0.7	33
exercise	0.1	0.3	0.3	33
gift	0.5	0.5	0.8	33
government	0.2	0.4	0.3	33
grass	0.3	0.5	0.6	33
ground	0.1	0.3	0.3	33
heat	0.4	0.5	0.7	33
laugh	0.1	0.3	-0.3	33
leader	0.3	0.5	0.6	33
mad	0.4	0.5	0.4	33
marriage	0.2	0.4	0.2	33
mess	0.3	0.5	0.3	33
mountain	0.1	0.3	0.3	33
need	0.4	0.5	0.7	33
needle	0.2	0.4	0.5	33
platoon	0.1	0.3	0.3	33
pull	0.2	0.4	0.1	33
question	0.3	0.5	0.5	33

Table 2.2 - Continued

read	0.5	0.5	0.9	33
religion	0.2	0.4	0.5	33
ride	0.4	0.5	0.7	33
rough	0.2	0.4	-0.1	33
salad	0.3	0.5	0.5	33
walk	0.4	0.5	0.7	33
warm	0.5	0.5	0.9	33

2.2.2.6 Listening Comprehension Test

In general, there are three ways to measure listening comprehension; multiple choice, oral reproduction, and dictation tasks. A dictation task was used in the present study, because dictation was believed to be the least confounding tasks of the three. Multiple choice tasks were confounded by guessing problems, and it was difficult to set an objective criterion for oral reproduction tasks (Toya, 2005). Forty items were used in the mora rhythm (Japanese segmentation) condition, and forty items were used in the stretched syllable rhythm (English segmentation) condition (Appendix A-5). Items were taken from a frequency and an accessibility of word list from Nelson, McEvoy, & Schreiber (1998), and items in each condition were randomly chosen but approximately equalized by an accessibility index, which stood for how easy it would be to access the word in long term memory. A higher accessibility index implied easier accessibility to a word in long term memory. The frequency index represented the printed and spoken frequency of a word. Test materials were developed in the following way. A female native Japanese speaker spoke individual English words in both mora and syllable rhythm. Her English proficiency met the CBT TOEFL requirement of 230 or equivalent for undergraduate admission to the University of Texas at Arlington. In the mora condition, the speaker recorded 40 words in a typical Japanese-English accent based on the Japanese katakana alphabet. Katakana is a specific Japanese alphabet that is used to express foreign loan words. In the syllable condition, the speaker recorded 40 words in a stressed-syllable

rhythm based on the online Merriam-Webster dictionary (2007). Participants participated in both conditions in completely random order, and they were asked to type each word immediately after hearing it. Internal consistency for the 67-item listening test was .75 (13 items were not included in the calculation of internal consistency due to the lack of variance because some items were answered all correct or all wrong). Item statistics were shown in Table 2.3. For the listening test, item statistics were not used to eliminate items, because the listening test belonged to an experimental entity of psychology rather than a correlational entity of psychology (Cronbach, 1957).

Table 2.3 Item statistics for listening test (Experiment 1)

Item	Mean accuracy	*SD*	r_{it}	Condition	*N*
act	0.1	0.3	0.3	Mora	33
aerobics	0.3	0.5	0.3	Mora	33
architect	0.2	0.4	0.4	Mora	33
asphalt	0.1	0.3	0.1	Mora	33
astronomy	0.7	0.5	0.4	Mora	33
athlete	0.0	0.2	0.2	Mora	33
barbecue	0.1	0.3	0.0	Mora	33
butter	0.4	0.5	0.2	Mora	33
cereal	0.2	0.4	0.2	Mora	33
cloud	0.0	0.2	0.3	Mora	33
correct	0.7	0.5	-0.1	Mora	33
corrupt	0.6	0.5	0.2	Mora	33
crowd	0.5	0.5	0.2	Mora	33
egg	0.4	0.5	0.2	Mora	33
electric	0.1	0.3	0.3	Mora	33
grammar	0.4	0.5	0.3	Mora	33
honest	0.4	0.5	0.4	Mora	33
infection	1.0	0.2	-0.1	Mora	33
instruction	1.0	0.2	-0.1	Mora	33
maid	0.1	0.3	0.4	Mora	33
massage	0.2	0.4	0.3	Mora	33
neck	0.7	0.5	0.6	Mora	33
obstacle	0.1	0.3	0.0	Mora	33
opportunity	0.6	0.5	0.2	Mora	33
personality	0.7	0.5	0.4	Mora	33

Table 2.3 - Continued

priest	0.1	0.3	0.3	Mora	33
rope	0.0	0.2	0.3	Mora	33
rule	0.0	0.2	0.3	Mora	33
sausage	0.2	0.4	0.3	Mora	33
size	0.7	0.5	0.3	Mora	33
stomach	0.8	0.4	0.3	Mora	33
tape	0.2	0.4	0.4	Mora	33
unique	0.9	0.4	0.0	Mora	33
unknown	1.0	0.2	-0.1	Mora	33
anarchy	0.8	0.4	0.2	Syllable	33
athletic	0.9	0.3	0.2	Syllable	33
authority	1.0	0.2	-0.1	Syllable	33
bottle	0.4	0.5	-0.3	Syllable	33
breath	0.7	0.5	0.2	Syllable	33
calories	0.2	0.4	0.2	Syllable	33
camera	1.0	0.2	-0.1	Syllable	33
chain	0.2	0.4	0.6	Syllable	33
cheat	0.3	0.5	0.3	Syllable	33
condition	0.9	0.2	0.0	Syllable	33
confusion	0.9	0.3	0.4	Syllable	33
deodorant	0.2	0.4	0.2	Syllable	33
drill	0.0	0.2	-0.3	Syllable	33
exciting	0.9	0.2	0.0	Syllable	33
experiment	0.9	0.4	0.4	Syllable	33
hurricane	0.8	0.4	0.2	Syllable	33
kiss	0.9	0.4	-0.3	Syllable	33
lady	0.3	0.5	0.0	Syllable	33
mud	0.7	0.5	0.1	Syllable	33
nail	1.0	0.2	-0.3	Syllable	33
odor	0.1	0.3	0.0	Syllable	33
pierce	0.7	0.5	0.4	Syllable	33
pool	0.7	0.5	0.0	Syllable	33
protection	0.7	0.5	0.1	Syllable	33
psychology	0.8	0.4	0.4	Syllable	33
razor	0.8	0.4	0.0	Syllable	33
responsibility	0.8	0.4	0.4	Syllable	33
sandwich	0.8	0.4	0.2	Syllable	33
snake	1.0	0.2	-0.1	Syllable	33
underground	0.9	0.2	0.0	Syllable	33
unsure	0.9	0.2	-0.1	Syllable	33
vanilla	0.1	0.2	0.2	Syllable	33
wool	0.1	0.3	0.1	Syllable	33

2.2.2.7 Self-Report of Listening Comprehension Scale

A self-report scale of listening comprehension (Appendix A-6) that had previously been validated was used to investigate the accuracy of participants' metacognition. Internal consistency of the 7-item self report scale was .95. Item statistics were shown in Table 2.4.

Table 2.4 Item statistics for self-report of listening test (Experiment 1)

Item	Mean	*SD*	r_{it}	*N*
Item 1	1.7	0.8	0.7	33
Item 2	1.6	0.8	0.8	33
Item 3	1.6	0.8	0.9	33
Item 4	1.6	0.8	0.9	33
Item 5	1.7	0.8	0.9	33
Item 6	1.6	0.9	0.9	33
Item 7	1.8	0.9	0.8	33

2.2.2.8 Evaluation Scale

An Evaluation scale (Appendix A-7) was developed to assess the speaker's fluency as perceived by the participants. Internal consistency of the 4-item evaluation scale was .90. Item statistics were shown in Table 2.5.

Table 2.5 Item statistics for the evaluation of fluency scale (Experiment 1)

Item	Mean	*SD*	r_{it}	*N*
Item 1	2.7	0.6	0.8	33
Item 2	2.6	0.5	0.7	33
Item 3	2.4	0.6	0.7	33
Item 4	2.5	0.6	0.8	33

2.2.3 Design

2.2.3.1 Design for Aim 1

A 2 (listening tests for mora/syllable segmentation of spoken words) x 2 (mora training/placebo training) mixed design with the exposure scale as a covariate was used to analyze the effect of segmentation of a word, and the effect of training types on native English speakers' listening comprehension of Japanese-accented English.

2.2.3.2 Design for Aim 2

A between participants design with 2 conditions was used to investigate the effect of training on proportion of accuracy in the mora test.

2.2.4 Procedure

After obtaining informed consent orally, the procedure of Experiment 1 was explained to participants. Participants were then presented with the demographic survey and exposure to Japanese culture scale. They were then randomly assigned to either the mora training or placebo training condition. After training they received a mora test for 30 words. Fourth, the 40 mora accented words and 40 stressed syllable accented words were presented. The mora condition and stressed syllable condition were presented in random order, and words within each condition were also presented in random order. After the presentation of each word, participants were given the dictation task. After the dictation task for the listening comprehension, self-report scale and evaluation of fluency scales were completed. Finally, they were debriefed and released. The whole experiment took approximately 30 minutes to complete.

2.2.5 Data Analysis

2.2.5.1 Aim 1 and Hypothesis 1

To investigate the effects of segmentation of spoken words (mora or stressed syllable) by a Japanese English speaker and training methods (written mora training or placebo training) on dictation performance (listening comprehension), a 2 x 2 mixed ANCOVA with score on the

exposure to Japanese culture scale as a covariate. It was hypothesized that participants' performance on the dictation task would be more accurate in the stressed-syllable condition for the segmentation variable and in the written mora training condition for the training variable. Also, whether or not the exposure scale as a covariate made a significant adjustment to the dictation accuracy was investigated.

2.2.5.2 Aim 2 and Hypothesis 2

To investigate the effect of training methods (written mora training or placebo training) on proportion of accuracy in the mora test, an independent-groups *t*-test was used as a manipulation check. It was hypothesized that participants' performance on the mora test would be better in the mora training condition as compared to the placebo training condition because of improvement in understanding of mora.

2.2.5.3 Aim 3

Correlations among demographics, self-report of listening comprehension test, evaluations of the speaker, listening response times, and listening test performances were explored.

2.2.5.4 Aim 4 & Hypothesis 3

Correlations among accuracy of each word, response times for each item, accessibility of each word, and frequencies of each word were explored.

2.3 Results

2.3.1 Data Screening

Severe violations for assumptions were not detected during the data screening. Descriptive statistics for the variables used in the analyses were presented in Table 2.6.

Table 2.6 Descriptive statistics for Experiment 1

Variable	Mean	*SD*	*n*
Age	21.0	3.3	32
Mora Test ACC	.65	.26	33
Listening ACC	.58	.15	33
Listening RT (ms)	6577	1244	33
Exposure	22.0	4.7	33
Evaluation	11.5	2.5	33
Self Report	16.5	4.3	33

		Frequency
Gender		
	Female	23
	Male	10

2.3.2 Aim 1 & Hypothesis 1

A 2 (listening tests for mora/syllable segmentation of spoken words) x 2 (mora training/placebo training) mixed ANCOVA with exposure as a covariate was performed to investigate the effects of segmentation and training on accuracy on the dictation task (listening test). As Hypothesis 1 predicted, accuracy (ACC) of the listening test was significantly higher for the stressed syllable segmentation condition than for the mora segmentation condition, F (1, 30) = 23.02, $p < .001$, partial η^2 = .43 (adjusted descriptive statistics in Table 2.7).

Table 2.7 Accuracy in listening comprehension for conditions for segmentation

Rhythm	Mean ACC	*SD*	*n*
Mora	.59	.01	33
Stressed Syllable	.34	.02	33

Contrary to expectations, accuracy of the listening test did not differ between the mora training and placebo training conditions, F (1, 30) = 1.69, *N.S.,* partial η^2 = .05 (adjusted descriptive statistics in Table 2.8).

Table 2.8 Accuracy in listening comprehension for training

Training	Mean ACC	*SD*	*n*
Mora	.48	.02	16
Placebo	.45	.02	17

There was not significant interaction between segmentation and training, F (1, 30) = .73, *N.S.*, partial η^2 < .01. (adjusted descriptive statistics in Table 2.9). Also, exposure as the covariate did not have a significant adjustment, F (1, 30) = 1.16, *N.S.*, partial η^2 < .01.

Table 2.9 Accuracy in listening comprehension for speaker x training interaction

Phonetic Rhythm	Mean ACC		*SD*		*n*	
	Mora	Placebo	Mora	Placebo	Mora	Placebo
Mora	.35	.33	.03	.03	17	16
Stressed Syllable	.61	.56	.01	.01	17	16

2.3.3 Aim 2 & Hypothesis 2

As predicted, mora test accuracy for the mora training group (M=.50, SE = .03) was significantly better than for the placebo group (M=.07, SE = .03), t(31) = 9.2, p < .001, *Cohen's d* = 1.30. Thus, mora training enhanced understanding of mora structure compared with placebo training on the written form of Japanese language.

2.3.4 Aim 3

Table 2.10 shows that the demographic variables, self-report variables, evaluation variables, and response times were uncorrelated with dictation accuracy. However, there was a moderate positive correlation between gender and self report of listening test performance, implying males tended to have higher self-performance ratings. Also, there was a large positive correlation between self report of listening test performance and evaluation, implying participants who evaluated their own listening performance higher tended to evaluate the Japanese speaker higher. Self-report of listening test and evaluation would be significantly positively associated with larger sample.

Table 2.10 Correlation among demographics, self-report, evaluation, response time, and Accuracy (Aim 3, Experiment 1)

Variable	1.	2.	3.	4.	5.	6.
Participants (*n* = 32 due to the listwise deletion)						
1. Age	--	.08	-.03	.11	-.11	.24
2. Gender		--	.45**	.17	.02	.10
3. Self-report			--	.77**	-.22	.29
4. Evaluation				--	-.06	.27
5. Listening RT					--	-.06
6. Listening ACC						--

**Significant at *p* = .01 level

2.3.5 Aim 4

The descriptive statistics for the scale items appear in Tables 2.1-2.5, and frequency and accessibility of the words appear in Appendix A-5. There was a moderate negative correlation between response time and the listening test (Table 2.11), implying items that were

responded to faster tended to be reported more accurately. Also, there was a small negative correlation between response time and accessibility of words (Table 2.11), implying highly accessible items were responded to faster. In addition, there was a moderate negative correlation between response time and word frequency (Table 2.11), implying more common words were responded to faster. Finally, accessibility index and frequency index were positively correlated (Table 2.11), implying that highly accessible items were frequently used.

Table 2.11 Correlation among mean accuracy and response time of listening test and items' properties (Aim 4, Experiment 1)

Variable	1.	2.	3.	4.
		Items (n = 80)		
1. Accuracy	--	-.50**	.15	.20
2. RT		--	-.26*	-.51**
3. Frequency			--	.37**
4. Accessibility				--

*Significant at p = .05 level; **Significant at p = .01 level

2.4 Discussion

The purpose of Experiment 1 was to investigate (1) the effect of differences in sound structure (rhythms and phonemes) between Japanese and English languages on SE speakers' listening comprehension of accented English, (2) the effect of a short training of Japanese sound structure on native English speakers' listening comprehension of accented English, (3) the relationships among demographics, self-reported proficiency, evaluations of the speaker, listening response times, and listening test performances, and (4) the relationships among item properties and accuracy. Results suggested that the participants for whom English was their L1 performed better on the listening comprehension test when they listened to words in English-like

stressed syllable segmentations than on Japanese-like mora segmentations. Although this finding was straightforward and supported Hypothesis 1, native English speakers' listening comprehension of SE might be related to listening to a Japanese-accented English speaker. Therefore, Experiment 2 explored descriptive statistics for SE listening comprehension test scores to determine whether the SE listening test was used as a covariate in Experiment 3.

Contrary to expectations, there was no significant effect of the mora training on the listening test, although training improved the understanding of mora segmentation at the conceptual level (mora test). This implied that there was a distinction between understanding mora and listening to mora-accented words. In other words, participants encoded and used information for mora at a conceptual level (mora test), but not at an acoustic level (listening comprehension) to perform better on the listening test because they were not exposed to auditory examples of mora sounds. In order to fill in the gaps, conditions for mora training were expanded to both visual and auditory senses in Experiment 3 because dual encoding has been reported to improve explicit memory tasks more than single mode encoding (Weldon & Roedieger, 1987). Conditions in Experiment 3 were a) mora training with visual and auditory examples where participants saw sample mora segmentation with sound examples, b) mora training with auditory mora examples, c) mora training with written mora examples, d) mora training with auditory syllable examples (control condition for examples), and e) written Japanese training with placebo examples (control condition). This allowed to examine differences among dual encoding (mora training with visual and auditory example of mora examples condition), single mode visual encoding (mora training with visual mora examples), single mode auditory encoding (auditory mora examples condition), single mode encoding without mora examples (mora training with auditory syllable examples condition), and placebo training.

Item level analyses suggested that items with higher frequency and accessibility tended to be responded to faster and items that were responded to faster tended to be responded to more accurately.

CHAPTER 3

EXPERIMENT 2

3.1 Introduction

Experiment 2 was a small study conducted to investigate SE speakers' listening comprehension of SE for descriptive and piloting purposes. Descriptive statistics for the SE listening comprehension test accuracy were explored to determine whether the SE listening test was used as a covariate in Experiment 3.

3.2 Method

3.2.1 Participants

Twelve SE speakers who were enrolled in Introductory Psychology at the University of Texas at Arlington participated in Experiment 2. This sample consisted of 6 females and 6 males, with a mean age of 24.9 years (*SD* =8.76). Participants participated in Experiment 2 in order to fulfill a course requirement, and informed consent was obtained from each participant.

3.2.2 Materials

3.2.2.1 Computer Software

E-prime Version 1.1 (Psychology Tools Software, 1996) was used to collect the data.

3.2.2.2 Demographic Scale

Participants' age and gender were collected in this 2-item scale.

3.2.2.3 SE Listening Comprehension Test

An 80-item Listening comprehension of native English speaker test was measured. The words used in this test were the same as in the WE listing test in Experiment 1 (Appendix A-4) but a female SE speaker who was enrolled at the University of Texas at Arlington in Spring

2008 spoke the words instead of the Japanese-English speaker mentioned earlier. Only 47-items were analyzed for internal consistency due to the lack of variance (either responded all wrongly or correctly). Internal consistency was satisfactory at .73. Items statistics were shown in Table 3.1.

Table 3.1 Item statistics for the SE listening comprehension test (Experiment 2)

	Mean	*SD*	r_{it}	*N*
anarchy	0.92	0.29	0.44	12
athletic	0.92	0.29	0.37	12
authority	0.75	0.45	0.63	12
breath	0.92	0.29	-0.29	12
calories	0.92	0.29	0.10	12
camera	0.83	0.39	0.26	12
cheat	0.92	0.29	-0.03	12
condition	0.92	0.29	0.24	12
confusion	0.92	0.29	0.37	12
deodorant	0.67	0.49	0.16	12
hurricane	0.92	0.29	0.10	12
kiss	0.92	0.29	0.37	12
lady	0.92	0.29	0.10	12
odor	0.75	0.45	0.35	12
pool	0.67	0.49	0.32	12
protection	0.92	0.29	0.44	12
psychology	0.92	0.29	-0.36	12
responsibility	0.67	0.49	0.67	12
sandwich	0.75	0.45	0.44	12
snake	0.92	0.29	0.10	12
underground	0.83	0.39	0.06	12
unsure	0.83	0.39	0.16	12
wool	0.92	0.29	-0.03	12
health	0.83	0.39	0.63	12
aerobics	0.75	0.45	0.54	12
architect	0.75	0.45	0.09	12
asphalt	0.75	0.45	0.09	12
athlete	0.83	0.39	0.36	12
barbecue	0.17	0.39	0.17	12
cereal	0.67	0.49	-0.12	12
correct	0.83	0.39	0.52	12
crowd	0.92	0.29	-0.03	12
grammar	0.83	0.39	0.42	12
honest	0.92	0.29	0.37	12

Table 3.1 - Continued

instruction	0.92	0.29	0.24	12
length	0.83	0.39	-0.04	12
liquor	0.92	0.29	0.24	12
maid	0.25	0.45	0.24	12
neck	0.83	0.39	0.63	12
obstacle	0.83	0.39	-0.28	12
opportunity	0.92	0.29	-0.29	12
personality	0.83	0.39	0.06	12
priest	0.92	0.29	-0.29	12
regular	0.92	0.29	-0.03	12
rule	0.67	0.49	0.04	12
self	0.92	0.29	0.24	12
trailer	0.83	0.39	0.36	12

3.2.3 Procedure

Informed consent was explained and collected first. Second, participants were seated in front of a computer. Next, they answered the demographic survey and exposure scale. Then, they took the 80-item SE listening comprehension test. Words in the test were presented in random order. As soon as they finished the procedure, they were debriefed and released. Experiment 2 took about 20 minutes to complete.

3.2.4 Data Analysis

Descriptive statistics for the SE listening comprehension test were explored to determine whether the SE listening test was used as a covariate in Experiment 3.

3.3 Results & Discussion

Because the 99% confidence interval for the SE listening comprehension test was relatively large, and the average SE speakers' SE listening test accuracy was significantly different from 100%, $t(10) = -6.8$, $p<.001$, *Cohen's d* = 1.97 (Table 3.2), the SE listening comprehension test was included as a covariate in Experiment 3. This relatively large confidence interval may be attributed to combinations of typing errors, inattention by participants, and actual listening mistakes.

Table 3.2 Descriptive statistics for Experiment 2

Variable	Mean	*SD*	*n*
Age	24.9	8.7	12
SE listening Test ACC	.88	.06	12
99% CI			
Lower bound	.94		
Upper bound	.82		

	Frequency
Gender	
Female	6
Male	6

CHAPTER 4

EXPERIMENT 3

4.1 Introduction

Experiment 3 expanded upon and refined Experiment 1 in a larger sample, and the listening comprehension of SE was modified and added as a covariate because of the result from Experiment 2. The aims were basically the same as those of Experiment 1, but three additional training conditions were added. Thus, there were five training conditions in Experiment 3; a) a mora training with visual mora examples and spoken mora sound examples, where participants saw sample mora segmentation with spoken sounds, b) a mora training with auditory mora examples, c) a mora training with written mora examples, d) a mora training with auditory syllable examples, and e) a written Japanese training (control condition). This allowed examination of differences among dual encoding (mora training with visual and auditory example of mora examples condition), single mode visual encoding (mora training with visual mora examples), single mode auditory encoding (auditory mora examples condition), single mode encoding without mora examples (mora training with auditory syllable examples condition), and placebo training with placebo examples.

4.2 Method

4.2.1 Participants

One hundred and thirty one students were recruited from the participant pool at the University of Texas at Arlington. Five participants were dropped due to computer malfunctions, and one participant was dropped due to non-fluency in English. One hundred and twenty five participants were used in the analyses. This sample consisted of 80 females and 45 males,

with a mean age of 21.29 years (*SD* =5.60). Participants participated in this research in order to fulfill a course requirement, and informed consent was obtained from each participant.

4.2.2 Materials

4.2.2.1 Computer Software

E-prime Version 1.1 (EPS, 1996) was used to present tasks to collect the data. Additional modifications, internal consistencies, and items statistics for the materials are described below.

4.2.2.2 Demographic Scale

Participants' age and gender were collected in this 2-item scale.

4.2.2.3 Exposure Scale

Internal consistency of the 9-item-exposure scale was .73. Item statistics were shown in Table 4.1.

Table 4.1 Item statistics for the exposure to Japanese culture scale (Experiment 3)

	Mean	*SD*	r_{it}	*N*
Item 1	1.74	0.73	0.61	125
Item 2	1.78	0.89	0.54	125
Item 3	1.81	1.09	0.63	125
Item 4	2.17	1.13	0.30	125
Item 5	1.09	0.31	0.25	125
Item 6	1.10	0.55	0.31	125
Item 7	2.30	1.02	0.51	125
Item 8	1.86	0.95	0.36	125
Item 9	1.05	0.21	0.34	125

4.2.2.4. Trainings

Three additional training conditions were added to training (Appendix B-1), a) mora training with visual and auditory examples where participants saw sample mora segmentations with sound examples, b) mora training with auditory mora examples, c) mora training with written mora examples, d) mora training with auditory syllable examples, and e) written Japanese training with placebo examples (control condition).

4.2.2.5. Mora Test

Internal consistency of the 30-item mora test was reported in the result section. Internal consistency of the mora test was .79. Item statistics were shown in Table 4.2.

Table 4.2 Item statistics for mora test (Experiment 3)

	Mean ACC	*SD*	r_{it}	*N*
answer	0.39	0.49	0.28	125
bag	0.39	0.49	0.40	125
board	0.36	0.48	0.31	125
city	0.31	0.47	0.25	125
coat	0.40	0.49	0.25	125
exercise	0.32	0.47	0.22	125
gift	0.40	0.49	0.34	125
government	0.45	0.50	0.35	125
grass	0.36	0.48	0.31	125
ground	0.41	0.49	0.27	125
heat	0.32	0.47	0.25	125
important	0.36	0.48	0.27	125
laugh	0.46	0.50	0.21	125
leader	0.37	0.48	0.35	125
mad	0.43	0.50	0.29	125
marriage	0.40	0.49	0.31	125
mess	0.46	0.50	0.28	125
mountain	0.35	0.48	0.33	125
need	0.42	0.49	0.31	125
needle	0.38	0.49	0.33	125
platoon	0.42	0.49	0.32	125

Table 4.2 - Continued

pull	0.36	0.48	0.25	125
question	0.40	0.49	0.38	125
read	0.49	0.50	0.27	125
religion	0.32	0.47	0.26	125
ride	0.42	0.50	0.35	125
rough	0.35	0.48	0.26	125
salad	0.38	0.49	0.32	125
walk	0.39	0.49	0.25	125
warm	0.34	0.48	0.39	125

4.2.2.6 Dictation Tasks in Listening Comprehension Test

Conditions for segmentations were the same as Experiment 1 (mora/syllable segmentations). Modifications to Experiment 1 and 2 were added. First, the items that did not have any variance (all participants responded correctly or wrongly) or items with low item-total correlations were replaced with new recordings by the same speaker. Second, the SE listening comprehension test was modified into a 40-item scale similar to the other listening conditions, and used to control for fluency of English (Appendix B-2). Third, a female and a male Japanese student who were enrolled at the University of Texas at Arlington in Spring 2008 rated the recorded spoken words in mora and syllable listening conditions as a manipulation check. Both raters' English proficiency met CBT TOEFL requirement of 230 or equivalent for undergraduate admission to the University of Texas at Arlington. Rater 1 categorized 98% of items (38 out of 40) correctly, and Rater 2 categorized 99% of items (39 out of 40) correctly. Raters showed very high agreement, *Cohen's Kappa* =.98, $p < .001$, indicating that items in each conditions were developed properly.

Internal consistency for the 80-item listening test was .72. Item statistics were shown in Table 4.3.

Table 4.3 Item statistics for listening test (Experiment 3)

	Mean ACC	*SD*	r_{it}	Condition	*N*
act	0.16	0.37	0.22	Mora	125
aerobics	0.58	0.49	0.20	Mora	125
architect	0.30	0.46	0.45	Mora	125
asphalt	0.02	0.15	0.21	Mora	125
astronomy	0.90	0.31	-0.03	Mora	125
athlete	0.02	0.13	0.11	Mora	125
barbecue	0.13	0.34	0.11	Mora	125
butter	0.10	0.30	0.26	Mora	125
cereal	0.03	0.18	0.33	Mora	125
cloud	0.06	0.23	0.07	Mora	125
correct	0.74	0.44	0.29	Mora	125
corrupt	0.39	0.49	0.21	Mora	125
crowd	0.39	0.49	0.38	Mora	125
egg	0.47	0.50	0.25	Mora	125
electric	0.03	0.18	0.23	Mora	125
grammar	0.26	0.44	0.16	Mora	125
health	0.00	0.00	0.00	Mora	125
honest	0.69	0.47	0.25	Mora	125
infection	0.90	0.31	0.04	Mora	125
instruction	0.76	0.43	0.28	Mora	125
length	0.02	0.13	0.17	Mora	125
maid	0.10	0.30	0.22	Mora	125
massage	0.71	0.45	0.25	Mora	125
neck	0.70	0.46	0.32	Mora	125
obstacle	0.10	0.30	0.03	Mora	125
opportunity	0.78	0.42	0.19	Mora	125
personality	0.55	0.50	0.15	Mora	125
priest	0.03	0.18	0.16	Mora	125
race	0.01	0.09	0.29	Mora	125
rope	0.03	0.18	0.30	Mora	125
rule	0.04	0.20	0.36	Mora	125
ruler	0.07	0.26	0.31	Mora	125
sausage	0.15	0.36	0.20	Mora	125
self	0.02	0.15	0.27	Mora	125
size	0.32	0.47	0.40	Mora	125
stomach	0.88	0.33	0.24	Mora	125
tape	0.31	0.47	0.29	Mora	125
trailer	0.02	0.13	0.16	Mora	125
unique	0.96	0.20	0.18	Mora	125
unknown	0.70	0.46	0.16	Mora	125

Table 4.3 - Continued

anarchy	0.76	0.43	0.12	Syllable	125
athletic	0.83	0.38	0.19	Syllable	125
authority	0.89	0.32	0.19	Syllable	125
blush	0.70	0.46	0.10	Syllable	125
bottle	0.30	0.46	-0.11	Syllable	125
breath	0.61	0.49	-0.11	Syllable	125
calories	0.15	0.36	0.26	Syllable	125
camera	0.85	0.36	0.11	Syllable	125
chain	0.87	0.34	0.02	Syllable	125
cheat	0.34	0.48	0.17	Syllable	125
condition	0.98	0.13	0.10	Syllable	125
confusion	0.94	0.23	0.18	Syllable	125
date	0.98	0.15	0.09	Syllable	125
deodorant	0.40	0.49	0.09	Syllable	125
diamond	0.95	0.21	0.07	Syllable	125
drill	0.50	0.50	0.30	Syllable	125
electron	0.22	0.42	0.11	Syllable	125
exciting	0.96	0.20	0.17	Syllable	125
experiment	0.90	0.31	0.14	Syllable	125
hurricane	0.93	0.26	0.16	Syllable	125
kiss	0.99	0.09	-0.01	Syllable	125
lady	0.95	0.21	-0.01	Syllable	125
liquor	0.00	0.00	0.00	Syllable	125
mud	0.26	0.44	0.06	Syllable	125
nail	0.96	0.20	-0.09	Syllable	125
odor	0.14	0.35	-0.08	Syllable	125
pierce	0.57	0.50	0.14	Syllable	125
pool	0.43	0.50	0.10	Syllable	125
protection	0.95	0.21	0.09	Syllable	125
psychology	0.76	0.43	0.25	Syllable	125
razor	0.96	0.20	0.12	Syllable	125
regular	0.97	0.18	0.12	Syllable	125
responsibility	0.80	0.40	0.20	Syllable	125
sandwich	0.86	0.35	0.15	Syllable	125
snake	0.96	0.20	0.09	Syllable	125
trigonometry	0.71	0.45	0.20	Syllable	125
underground	0.93	0.26	0.08	Syllable	125
unsure	0.86	0.34	0.08	Syllable	125
vanilla	0.39	0.49	0.21	Syllable	125
wool	0.25	0.43	-0.25	Syllable	125

Internal consistency was .49 for the 40-item SE listening test that was used as a covariate. Item statistics were shown in Table 4.4. The SE listening test should have about 97 items based on the Spearman-Brown prophecy formula in order to get internal consistency of .7.

Table 4.4 Item statistics for SE listening test (Experiment 3)

	Mean	*SD*	r_{it}	*N*
ability	0.98	0.15	0.14	125
angry	0.98	0.15	0.09	125
automatic	0.95	0.21	0.33	125
boss	0.87	0.34	0.25	125
call	0.98	0.13	0.05	125
carry	0.98	0.13	0.23	125
case	0.98	0.13	0.00	125
demonstration	0.86	0.35	0.37	125
desire	0.98	0.13	0.00	125
exclamation	0.78	0.42	0.09	125
find	0.98	0.15	0.12	125
garden	0.98	0.15	0.07	125
injury	0.95	0.21	0.39	125
leaf	0.97	0.18	0.14	125
major	0.98	0.15	0.07	125
management	0.88	0.33	0.24	125
monkey	0.98	0.13	0.14	125
mouse	0.87	0.34	0.10	125
murder	0.98	0.15	0.12	125
museum	0.82	0.39	0.05	125
nail	0.98	0.13	-0.03	125
neat	0.78	0.41	0.15	125
past	0.62	0.49	-0.03	125
pencil	0.98	0.13	0.29	125
pig	1.00	0.00	0.00	125
potato	0.74	0.44	0.08	125
professor	0.89	0.32	0.06	125
regular	0.98	0.15	0.12	125
romance	0.96	0.20	-0.06	125
second	0.98	0.13	0.02	125
shop	0.95	0.21	0.24	125
shopping	0.97	0.18	0.16	125
side	0.98	0.15	0.04	125
silver	0.95	0.21	0.31	125
suit	0.87	0.34	0.02	125

Table 4.4 - Continued

support	0.99	0.09	0.08	125
taste	1.00	0.00	0.00	125
terminal	0.98	0.13	-0.15	125
trailer	0.64	0.48	0.05	125
wheat	0.93	0.26	0.26	125

4.2.2.7 Self-Report of Listening Comprehension Scale

Internal consistency of the 7 item self report scale was .95 Item statistics were shown in Table 4.5.

Table 4.5 Item statistics for self-report of listening test (Experiment 3)

	Mean	*SD*	r_{it}	*N*
self1	2.59	0.63	0.72	125
self2	2.40	0.62	0.83	125
self3	2.50	0.70	0.77	125
self4	2.40	0.67	0.82	125
self5	2.46	0.69	0.85	125
self6	2.48	0.72	0.85	125
self7	2.52	0.71	0.88	125

4.2.2.8 *Evaluation Scale*

Internal consistency of the 4-item evaluation scale was .88. Item statistics were shown in Table 4.6.

Table 4.6 Item statistics for the evaluation of fluency scale (Experiment 3)

	Mean	*SD*	r_{it}	*N*
eval1	2.56	0.68	0.77	125
eval2	2.36	0.64	0.84	125
eval3	2.24	0.68	0.71	125
eval4	2.30	0.61	0.82	125

4.2.3 Design

4.2.3.1 Aim 1

A 5 (trainings) x 2 (segmentation-phoneme) mixed design with prior exposure to Japanese culture and listening comprehension of SE as covariates was used to analyze the effect of segmentation (rhythm of speech) of spoken words and the effect of training types on SE speaker's listening comprehension of Japanese-accented English after controlling for the covariates.

4.2.3.2 Aim 2

A between-participants design with 5 conditions was used to investigate the effect of training on proportion of accuracy in mora test.

4.2.4 Procedure

Informed consent was explained and collected first. Second, participants were seated in front of the computer. Next, they answered the demographic survey and exposure scale. Third, participants were randomly assigned to a training condition. After training they received the mora test of 30 words. Fourth, they received 40 mora rhythm English words spoken by a Japanese speaker, 40 syllable rhythm English words spoken by a Japanese speaker, 40 SE words spoken by a SE speaker in random order. Words within each condition were also presented in random order. After the presentation of each word, participants were given a dictation task. After each condition, the self-report of listening performance scale and the

evaluation of speaker's fluency scales were given. As soon as participants finished everything, they were debriefed and released. Experiment 3 took about 40 minutes to complete.

4.2.5 Data Analysis

4.2.5.1 Aim 1 & Hypothesis 1

A 5 (trainings) x 2 (segmentation-phoneme) mixed ANCOVA, with prior exposure to Japanese culture and listening comprehension of SE as covariates, was used to analyze the effect of segmentation (rhythm of speech) of spoken words and the effect of training types on SE speaker's listening comprehension of Japanese-accented English after controlling for covariates. It was hypothesized that participants' performance in the listening test would be more accurate in the stressed-syllable condition than in the mora condition. Also, the mora training condition with both visual examples and spoken wound (dual encoding condition) would have higher listening test accuracy than other training conditions, mora training conditions with mora examples would have higher accuracy than mora training with placebo examples, and mora training with placebo examples would have higher accuracy than the placebo training condition with placebo examples (control condition).

4.2.5.2 Aim 2 & Hypothesis 2

The effect of training conditions on the mora test was investigated by using a one-way between-participant ANOVA. It was hypothesized that the mora training with a sound example condition would improve native English speakers' listening comprehension accuracy compared with the other four training conditions, and single encoding mora training conditions would have higher mora test accuracy than would mora training with visual syllable examples and placebo training condition. Additionally, the mora training condition with visual syllable examples would have higher mora test accuracy than would the placebo training condition.

4.2.5.3 Aim 3

Correlations among demographics, self-reported proficiency, evaluations of the speaker, listening response times, and listening test performances were re-explored in the larger sample.

4.2.5.4 Aim 4 & Hypothesis 3

Correlations among accuracy of the listening performance, reaction time for the dictation task, accessibility of each word in the dictation task, and frequency of each word in the dictation task were explored. It was hypothesized that there would be a negative correlation between response time and dictation accuracy, a negative correlation between response time and frequency, and a negative correlation between response time and accessibility index based on the findings from Experiment 1.

4.3 Results

4.3.1 Date Screening

Severe violations of assumptions were not detected during the data screening. Descriptive statistics for the variables used in the analyses were presented in Table 4.7.

Table 4.7 Descriptive statistics for Experiment 3

Variable	Mean	*SD*	*n*
Age	21.93	5.60	125
Mora Test ACC	.39	.02	125
Listening ACC	.51	.07	125
Listening RT (ms)	4083	1833	125
Listening SE ACC	.92	.05	125
Exposure	14.90	4.20	125
Evaluation	9.46	2.30	125
Self Report	17.3	4.12	125
	Frequency		
Gender			
Female	45		
Male	80		

4.3.2 Aim 1 & Hypothesis 1

A 2 (mora/ syllable segmentation for listening test) x 5 (trainings) mixed ANCOVA with the SE listening test accuracy and exposure to Japanese culture as covariates was performed to investigate the effects of segmentation and training on accuracy on the dictation task (listening test) after controlling for covariates. As Hypothesis 1 predicted, accuracy of the listening test was significantly higher for the stressed syllable segmentation condition than for the mora segmentation condition, F (1, 118) = 5.29, $p < .01$, partial η^2 =. 04 (adjusted descriptive statistics in Table 4.8).

Table 4.8 Accuracy in listening comprehension for segmentation (mora/syllable accent) conditions

Rhythm	Mean ACC	*SD*	*n*
Mora	.70	.01	125
Stressed Syllable	.34	.01	125

Contrary to expectations, accuracy of the listening test did not differ between the mora training and placebo training conditions, F (1, 118) = .54, *N.S.,* partial η^2 = .02 (adjusted descriptive statistics in Table 4.9).

Table 4.9 Accuracy in listening comprehension for training

Training	Mean ACC	*SD*	*n*
Mora (Visual + Auditory Mora Ex)	.53	.06	125
Mora (Auditory Mora Ex)	.53	.08	125
Mora (Visual Mora Ex)	.50	.08	125
Mora (Auditory Syllable Ex)	.52	.07	125
Placebo	.49	.07	125

As significant interaction between segmentation and exposure to Japanese culture, F (1, 118) = 4.50, $p < .05$ partial $\eta^2 = .04$ (descriptive statistics in Table 4.10) indicated that higher exposure to Japanese culture helped listening to mora segmentation (b= .006, *SE*=.002, $p<.01$), but not syllable segmentation (b= .002, *SE*=.001, *N.S.*). The interaction between segmentation and the listening test of SE, F (1, 118) = .33, *N.S.,* partial $\eta^2 = .00$, and the interaction between segmentation and training, F (1, 118) = 2.3, *N.S.*, partial $\eta^2 = .07$, were not significant. Exposure had a significant adjustment, F (1, 118) = 7.90, $p < .01$, partial $\eta^2 = .06$. Mean accuracy and *SD* for each condition for interaction between training and segmentation after adjustments appears in Table 4.10. Thus, Hypothesis 1 was partially supported.

Table 4.10 Accuracy in listening comprehension for training x segmentation interaction

Training	Mean Accuracy		*SD*		*n*	
	Mora	Syllable	Mora	Syllable	Mora	Syllable
Mora (Visual + Auditory Mora Ex)	.37	.71	.10	.07	25	25
Mora (Auditory Mora Ex)	.36	.71	.10	.07	25	25
Mora (Visual Mora Ex)	.33	.66	.08	.07	25	25
Mora (Auditory Syllable Ex)	.33	.71	.09	.06	25	25
Placebo	.30	.69	.08	.07	25	25

4.3.3 Aim 2 & Hypothesis 2

There was a significant effect of training types on understanding mora structure, F (1, 118) = 136.00, $p < .05$, partial $\eta^2 = .82$ as predicted. Although there was not any difference among mora training conditions, each training condition had higher accuracy in mora test than the placebo training condition (Table 4.11). In short, mora training enhanced understanding of mora structure. Thus, Hypothesis 2 was also partially supported.

Table 4.11 Accuracy in mora test for training (Aim 2, Experiment 3)

Training	Mean ACC	*SD*	*n*
Mora (Visual + Auditory Mora Ex)	.48	.09	25
Mora (Auditory Mora Ex)	.48	.08	25
Mora (Visual Mora Ex)	.49	.09	25
Mora (Auditory Syllable Ex)	.44	.09	25
Placebo	.06	.18	25

4.3.4 Aim 3

Demographic variables, self-report of listening comprehension, evaluation of the Japanese-English speaker scale, and response times were uncorrelated with dictation accuracy (Table 4.12). Demographics were not associated with any of the other variables. Self-report of listening comprehension was highly associated with evaluation. Also, self report was mildly positively associated with listening test performance. Self-report scale was mildly positively correlated with Listening test performance. Finally, exposure to Japanese culture was moderately positively associated with listening test accuracy.

Table 4.12 Correlation among demographics, self-report, evaluation, and response time (Aim 3, Experiment 3)

Variable	1.	2.	3.	4.	5.	6.
		Participants (*n* = 123 due to the list wise deletion)				
1. Age	--	.29***	-.13	.04	-.02	-.07
2. Gender		--	-.04	-.08	.11	.07
3. Self-report			--	.69***	.13	.35**
4. Evaluation				--	.15	.19*
5. Listening RT					--	-.02
6. Listening ACC						--

**Significant at *p* = .01 level; ***Significant at *p* = .001 level

4.3.5 Aim 4 & Hypothesis 3

The descriptive statistics (mean and *SD*) for the scale items appears in Tables 4.1-4.6, and frequency and accessibility of the words in SE listening test appears in Appendix B-2. There was a moderate negative correlation between response time and dictation accuracy as Experiment 1 (Table 4.13), implying items that were responded to faster tended to be reported

more accurately. There was a negative correlation between RT and accessibility index as Experiment 1, implying that highly accessible items were responded faster. There was a moderate positive correlation between frequency index and accessibility index as Experiment 1 (Table 4.13), implying that highly frequent words were accessed more easily in long term memory. A negative correlation between RT and frequency was not replicated as opposed to Experiment 1 (Table 4.13). Thus, item level analysis in Experiment 1 was partially replicated.

Table 4.13 Correlation among mean accuracy and response time of listening test and items' properties (Aim 4, Experiment 3)

Variable	1.	2.	3.	4.
		Items (n = 80)		
1. Accuracy	--	-.58***	.03	-.07
2. RT		--	-.17	-.41***
3. Frequency			--	.37***
4. Accessibility				--

*Significant at p = .05 level; **Significant at p = .001 level

4.4 Discussion

The purpose of Experiment 3 was to modify, expand, and replicate Experiment 1. The aims were basically the same as those of Experiment 1, but three additional conditions were added for training types. In addition, the SE listening comprehension test was added to control for participants' SE fluency. The results suggested that the participants for whom English was their L1 performed better on the listening comprehension test when they listened to words in English-like stressed syllable segmentations rather than Japanese-like mora segmentations (Aim 1). Higher exposure to Japanese culture was associated with better performance in the

WE listening test. The interaction between exposure and segmentation indicated that when participants had high exposure to Japanese culture, their exposure helped participants to listen to a mora accent more correctly.

Contrary to expectations, there was no significant effect of mora training on listening performance even after the modifications (Aim 1) although training improved the understanding of mora segmentation on a conceptual level (mora test) as in Experiment 1 (Aim 2). This implied that there was still a distinction between understanding mora at a conceptual level and listening to mora-accented words at a performance level even when dual encoding was used. In other words, participants could use a schema for mora at a conceptual level (mora test), but not at a performance level (listening comprehension). These findings seemed to be explained by Krashen's acquisition-learning hypothesis that stated that there are differences between acquired language (L1) and learned language (L2). Specifically, more consciousness is needed to process L2 more than L1. This more effortful process in L2 rather than L1 is similar to Stroop effect where more automatic cognitive processes interfere with less automatic ones (Stroop, 1935a; Stroop, 1735b; Stroop, 1938; MacLeod, 1991). In the current research, phonetic rhythm in SE might have interfered with phonetic rhythm, in Japanese-accented English although participants understood the structure of Japanese rhythm better in training conditions. If this is the case, it is generally very difficult to overcome or reduce the Stroop effect of L1 on L2. Unfortunately there was little research conducted to investigate how effortful linguistic process is improved to be more automatic to the current point (Dekeyser, 2001). In order to improve the listening comprehension of Japanese-accented English among SE speakers, followings should be considered. First, trainees would have to process learned material more actively with feedback to transfer trained information into performance (Bates, Holton, & Seyler, 1996) such as taking listening training on accented English with feedback, or trainees would have to make a mora pronunciation with feedback. Second, participants' intention to use training information often affects outcomes (Holton, 1996). Therefore, participants' intention to use training

information should be measured and used as a covariate in the future study. Thus, there were still several barriers to transfer of trained material into performance in Experiment 3. Finally, higher exposure to Japanese culture was associated with better listening test performance as opposed to Experiment 1, implying that exposure to Japanese culture enhanced listening performance especially for strong Japanese accent (Aim 1).

As for correlational analyses (Aim3), self-reports were relatively accurate in evaluating one's own listening performance as opposed to Experiment 1. This finding made sense in terms of Krashen's monitor hypothesis (Krashen, 1985) that stated self-monitoring is relatively inaccurate in acquired language (L1) while self-monitoring is relatively accurate in learned language (L2) because higher consciousness is associated with L2. In addition, participants evaluated the speaker higher when they thought they did well in the listening test as in Experiment 1.

Item level analyses (Aim 4) suggested that items that were responded to faster tended to be responded to more accurately. Also, highly accessible items were responded faster. In addition, highly accessible words were more frequently used. RT and frequency was not associated as opposed to Experiment 1 because RT might be influenced by the Japanese-English speaker's clarity rather than frequency.

CHAPTER 5

GENERAL CONCLUSION

5.1 Summary of Findings and Interpretation

It appeared to be very important for non-native English speakers to get used to the stressed-syllable rhythm of SE to reduce miscommunication (Aim 1). Segmentation was very important to acquiring a proper English accent, because an English accent was based on syllabification. Segmentation appeared to be also important to acquire proper pronunciation because segmentation was related to the production of sound. For example, when segmentation of music notes were disorganized, it was impossible to reproduce the music because one could not reproduce the same rhythm and sound. In the same way, it was crucial for non-SE speakers to make the right segmentation in order to have proper SE accent pronunciation. Also, SE speaker's exposure to Japanese culture enhanced listening test accuracy, especially when a Japanese-English speaker spoke words in mora rhythm.

There seemed to be a gap between understanding non-native English speakers' accents in conceptual and auditory ways (Aim 2) and actually using that information to listen to accented-English (Aim 1). Several reasons would be related to the gap. According to Dronkers, Pinker, and Damasio (1991), there was a distinction between encoded information and actually using it in communication because encoded information must be activated and transformed into linguistic signals to communicate with others. In order to activate information for foreign language, related brain areas must be activated (Paradis, 1998). In order to strengthen the activation of the related area of brain, correct and repeated activation should be given. For instance, Bates, Holton, & Seyler's (1996) suggested that trainees need to process

learned material more actively, with feedback until they master the ability to transfer trained information into performance. In addition, trainees' intention to use learned information affects performance (Holton, 1996). However, in Experiments 1 & 3, participants were not explicitly instructed to use training information to listen to accented English. Thus, a combination of longer active training with feedback, trainees' intention to use information, and interaction with Japanese English speakers may reduce miscommunication.

In participants' level correlational analyses (Aim 3), although self-report was positively associated with listening test performance in Experiment 3, mere self-report was not good enough to measure SE speakers listening performance of accented English due to a low positive correlation with listening comprehension. In item level correlational analyses (Aim 4), there was negative association between accuracy and reaction time in Experiments 1 and 3, implying that slowing down conversational speed may not help listening comprehension because when SE listeners correctly listen to accented words, it happens more quickly. Also, highly accessible items were responded to faster. That implies that response to a spoken sound is related to accessibility of that perceived word. Because there was no association between reaction time and frequency in Experiment 3, accessibility index appeared to be more useful index.

5.2 Limitations, Future Directions, and Application of Findings

There were some limitations and future directions for the current studies. As for limitations, training should be modified to be longer and include more active processing of information presented with feedback as discussed above. Also, intention to learn training should be used as a covariate in the future. In addition, because the SE listening test showed low internal consistency, this test would need about 57 more items based on the Spearman-Brown prophecy formula in order to get internal consistency of .7. Therefore, SE listening comprehension test should have approximately 100 items instead of 40 items.

Findings from this study should be applied in the following ways. First, in order to teach non-native English speakers, English teachers should focus on rhythm of speech. In addition, because slowing down speech speed may not help to reduce miscommunication, Japanese speakers should focus on their rhythm of speech rather than their speed. Also, the effect of linguistic rhythm at larger phonetic unit such as perceptual listening unit, sentence level, and conversation level should be investigated. Finally, other cross-linguistic oral communication should be investigated.

APPENDIX A

SCALES AND TESTS

You will receive several surveys, a short lesson for the sound structure of Japanese language called “Mora”, training, test of understanding of “Mora”, listening test of Japanese-accented English in this experiment.

Push SPACE bar when you are ready to start.

1. Demographic Survey

1. Age ( ) Push SPACE bar to continue.

2. Gender ( ) Push SPACE bar to continue.

2. Exposure scale: Answer the following questions based on your experience.

1. How many Japanese English speakers do you know based on the following scale?

None	one-three	three-five	five-seven	more than seven
1	2	3	4	5

2. How long have you known Japanese English speakers in years (**list oldest ones**)?

None	one-three	three-five	five-seven	more than seven
1	2	3	4	5

3. How close you are to the one you consider yourself closest Japanese English speaker to?

Not close At all		Neutral		Very Close
1	2	3	4	5

4. How often do you see Japanese English speaker?

Very Rarely		Neutral		Very Often
1	2	3	4	5

5. How many times have you visited Japan?

None	one-three	three-five	five-seven	more than seven
1	2	3	4	5

6. How many months have you spent in Japan?

Less than one	one-three	three-five	five-seven	more than seven
1	2	3	4	5

7. How familiar are you with Japanese culture?

Very Unfamiliar		Average		Very Familiar
1	2	3	4	5

8. How familiar are you with the conversation of Japanese speakers?

Very Unfamiliar		Average		Very Familiar
1	2	3	4	5

9. How fluent are you in Japanese language?

Not at All		Average		Very Fluent
1	2	3	4	5

3. Training phase

Mora training

Languages are generally categorized into three types in terms of sound structure: Syllable based, Rhythmic-Syllable based, and Mora based language. Syllable based language is pronounced based on the segments of syllables. For example, French and Spanish belong to this type of language. Second, stressed syllable based language that produces rhythm and stress. For example, English belongs to this type of language. Mora based language is pronounced based on Mora. For example, Japanese, Korean, and Swedish belong to this type of language.

Many research reported that Japanese speakers show tendency to make a sound segment in a speech based on 1) consonants + vowel 2) single vowel 3) single consonants or 4) ng sound.

For example, “skunk” tended to be Moraically segmented as “s ka n k” by Japanese speakers while American-English speakers tend to pronounce “skunk” in a singly syllable “skunk”. Thus, there are four sound segmentations in Japanese-English while there is only a single segmentation in American English. You will see other examples in the following screen.

Target	# Mora	Japanese segmentation	# syllable	English segmentation
food	2	Foo d	1	Food
good	2	Goo d	1	Good
house	3	Ho u se	1	House
animal	4	A ni ma l	3	A ni mal
cold	3	Co l d	1	Cold

Placebo training
Now, you will take a short lesson for the sound structure of Japanese language. After the lesson, you will take a test of the Mora system, and a listening test of Japanese-accented English. Then, you will be asked to answer short surveys.

Written Japanese is composed of three different alphabetic systems, 1) Hiragana, 2) Katakata, and 3) Kanji.
Hiragana and Katakana are symbols that stand for sounds, while Kanji (Chinese characters) are symbols that stand for both sounds and meanings.

Each Hiragana and Katakana represents a syllable. For example, if there are two Hiragana letters or Katakana letters, there are two sounds. If there are three hiragana or katakana letters there are three sounds, and so on.

There are corresponding symbols in Hiragana and Katakana (46 for each). In other words, the same sound can be transcribed by both Hiragana and Katakana. However, there is a difference between Hiragana and Katakana.
Hiragana is usually used for indigenous Japanese words, while Katakana is used for foreign words. In the following slides, you will see some examples.
"Japan" is transcribed in Katakana since Japan is a foreign word for Japanese language.

As opposed to "Japan", "Nippon" (that means Japan in Japanese language) is transcribed in Hiragana because "Nippon" is a Japanese word.

Kanji (Chinese characters) appears to have complicated structures because Kanji are ideographs that may contain more than one sound and meaning. Because of this, kanji is useful and efficient to shorten written Japanese.

4. Test for the understanding of Moraic structure (Mora test)

Answer the # of segmentation of following words based on Moraic structure (Japanese English) by using # key.

Words	Correct Answer	Words	Correct Answer	Words	Correct Answer
answer	4	heat	3	platoon	5
bag	3	important	7	pull	2
board	4	laugh	2	question	5
city	2	leader	4	read	3
coat	3	mad	3	religion	4
exercise	6	marriage	4	ride	3
gift	3	mess	2	rough	2
government	5	mountain	5	salad	3
grass	3	need	3	walk	3
ground	4	needle	4	warm	3

5. Listening test of Japanese-accented English Samples of Words (WE listening test)
You will listen to Japanese-accented English words in the following section. After you listen to each word, type the word that you listen to (use small cases only). After finish typing each word push SPACE bar to continue.

Target	Freq	Access	Mora	Syllable	Mora#	Sylla#	Condition
act	283	28	アクト	act	3	1	Mora
aerobics	1	9	エアロビクス	aer-o-bics	6	3	Mora
architect	22	7	アーキテクト	ar-chi-tect	6	3	Mora
asphalt	3	4	アスファルト	as-phalt	5	2	Mora
astronomy	24	8	アストロノミー	as-tron-o-my	7	4	Mora
athlete	9	16	アスリート	ath-lete	5	2	Mora
barbecue	13	11	バーベキュー	bar-be-cue	5	3	Mora
butter	27	30	バター	but-ter	3	2	Mora
cereal	17	21	シリアル	ce-re-al	4	3	Mora
cloud	28	27	クラウド	cloud	4	1	Mora
correct	52	25	コレクト	cor-rect	4	2	Mora
corrupt	8	9	コラプト	cor-rupt	4	2	Mora
crowd	53	24	クラウド	crowd	4	1	Mora
egg	12	26	エッグ	egg	3	1	Mora
electric	68	16	エレクトリック	elec-tric	7	2	Mora
grammar	4	8	グラマー	gram-mar	4	2	Mora
health	105	26	ヘルス	health	3	1	Mora
honest	47	27	オーネスト	hon-est	5	2	Mora
infection	8	7	インフェクション	in-fec-tion	6	3	Mora
instruction	26	6	インストラクション	in-struc-tion	8	3	Mora
length	116	15	レングス	length	4	1	Mora
maid	31	13	メイド	maid	3	1	Mora
massage	2	5	マッサージ	mas-sage	5	2	Mora
neck	81	23	ネック	neck	3	1	Mora
obstacle	10	6	オブスタクル	ob-sta-cle	6	3	Mora
opportunity	121	7	オポチュニティ	op-por-tu-ni-ty	5	5	Mora
personality	48	18	パーソナリティ	per-so-nal-i-ty	6	5	Mora
priest	16	24	プリースト	priest	5	1	Mora
race	103	30	レース	race	3	1	Mora
rope	15	30	ロープ	rope	3	1	Mora
rule	73	28	ルール	rule	3	1	Mora
ruler	3	25	ルーラー	rul-er	4	2	Mora
sausage	1	5	ソーセージ	sau-sage	5	2	Mora
self	40	23	セルフ	self	3	1	Mora
size	44	25	サイズ	size	3	1	Mora
stomach	37	22	ストマック	stom-ach	5	2	Mora
tape	35	20	テープ	tape	3	1	Mora

trailer	11	5	トレーラー	trail-er	4	2	Mora
unique	58	23	ユニーク	unique	4	1	Mora
unknown	47	20	アンノウン	un-known	5	2	Mora
anarchy	7	9	アナーキー	an-ar-chy	5	3	Syllable
athletic	18	8	アスレティック	ath-let-ic	6	3	Syllable
authority	93	29	アーソリティ	au-thor-i-ty	5	4	Syllable
blush	2	7	ブラッシュ	blush	4	1	Syllable
bottle	76	27	ボトル	bot-tle	3	2	Syllable
breath	53	24	ブレス	breath	3	1	Syllable
calories	7	8	カロリーズ	cal-o-ries	5	3	Syllable
camera	36	20	カメラ	cam-era	3	2	Syllable
chain	50	22	チェーン	chain	3	1	Syllable
cheat	3	26	チート	cheat	3	1	Syllable
condition	91	9	コンディション	con-di-tion	5	3	Syllable
confusion	44	21	コンフュージョン	con-fu-sion	6	3	Syllable
date	103	25	デート	date	3	1	Syllable
deodorant	2	10	デオドラント	de-odor-ant	6	3	Syllable
diamond	8	23	ダイアモンド	di-a-mond	6	3	Syllable
drill	33	5	ドリル	drill	3	1	Syllable
electron	30	5	エレクトロン	elec-tron	6	**2**	Syllable
exciting	29	19	エキサイティング	ex-cit-ing	6	3	Syllable
experiment	122	23	エクスペリメント	ex-per-i-ment	8	4	Syllable
hurricane	8	11	ハリケーン	hur-ri-cane	5	3	Syllable
kiss	17	23	キス	kiss	2	1	Syllable
lady	80	28	レディ	la-dy	2	2	Syllable
liquor	43	22	リカー	li-quor	3	2	Syllable
mud	32	27	マッド	mud	3	1	Syllable
nail	6	27	ネール	nail	3	1	Syllable
odor	14	24	オーダー	odor	4	1	Syllable
pierce	129	30	ピアス	pierce	3	1	Syllable
pool	111	31	プール	pool	3	1	Syllable
protection	68	17	プロテクション	pro-tec-tion	6	3	Syllable
psychology	14	30	サイコロジー	psy-chol-o-gy	6	4	Syllable
razor	15	6	レーザー	ra-zor	4	2	Syllable
regular	83	14	レギュラー	reg-u-lar	4	3	Syllable
responsibility	118	7	レスポンシビリティ	res-pon-si-bil-i-ty	8	6	Syllable
sandwich	10	25	サンドイッチ	sand-wich	6	2	Syllable
snake	44	26	スネーク	snake	4	1	Syllable
trigonometry	0	4	トリグノメトリー	trig-o-nom-e-try	8	5	Syllable
underground	19	5	アンダーグランド	un-der-grounground	8	3	Syllable

unsure	1	16	アンシュアー	un-sure	5	2	Syllable
vanilla	1	7	バニラ	va-nil-la	3	3	Syllable
wool	10	15	ウール	wool	3	1	Syllable

6. Self-report: Answer following questions based on self evaluation of your listening test performance.

1. How good were you at understanding the English speaker?

Very Poor		Average		Very Good
1	2	3	4	5

2. **On average,** how difficult was it for you to understand the **overall** English speaker?

Very Difficult		Neutral		Very Easy
1	2	3	4	5

3. How **often** did you find it difficult for you to understand the English speaker?

Very Often		Neutral	At all	Not often
1	2	3	4	5

5. **On average,** how difficult was it for you to understand the English **pronunciation** of the English speaker?

Very Difficult		Neutral		Very Easy
1	2	3	4	5

6. How **often** did you find it difficult for you to understand the English **pronunciation** of the English speaker?

Very Often		Neutral		Not often At all
1	2	3	4	5

7. **On average,** how difficult was it for you to understand the English **accent** of the English speaker?

Very Difficult		Neutral		Very Easy
1	2	3	4	5

8. How **often** did you find it difficult for you to understand the English **accent** of the English speaker?

Very Often		Neutral		Not often At all
1	2	3	4	5

7. Evaluation of the English Speaker in the Listening Test: Please evaluate the Japanese English speaker in the listening test.

1. Rate the English speaker's fluency.

Very				Very
Poor		Average		Good
1	2	3	4	5

2. Rate the English speaker's pronunciation.

Very				Very
Poor		Average		Good
1	2	3	4	5

3. Rate the English speaker's accent.

Very				Very
Poor		Average		Good
1	2	3	4	5

4. Rate the English speaker's clarity.

Very				Very
Poor		Average		Good
1	2	3	4	5

APPENDIX B

MODIFIED MATERIALS

1. Examples used in training

A. Auditory and visual presentation of mora examples

Ex) “Sy/ lla/ b/ le/ “ was both auditory and visually presented.

B. Visual presentation of mora examples

Ex) “Sy/ lla/ b/ le/ “was visually presented.

C. Auditory presentation of mora examples

Ex) “Sy/ lla/ b/ le/ “was auditory presented.

D. Visual presentation of syllable examples

Ex) “Syl/ la/ ble/” was visually presented.

E. Placebo examples on written Japanese language

Ex) Example of katakana“力“was presented.

2. Words used in the SE listening test

Target	Freq	Access	SE pron	Mora #	Sylla #	Condition
ability	74	18	ə-'bi-lə-tē	5	4	Native
angry	45	30	aŋ-grē	5	2	Native
automatic	0	3	"o-t&-'ma-tik	7	4	Native
boss	20	29	bäs	2	1	Native
call	188	26	ko□l	3	1	Native
carry	88	25	ka-rē	4	1	Native
case	362	23	kās	3	1	Native
demonstration	0	4	"de-m&n-'strA-sh&n	9	4	Native
desire	79	24	di-'zī(-ə)r	5	2	Native
exclamation	43	3	"eks-kl&-'mA-sh&n	9	4	Native
find	399	26	fīnd	4	1	Native
garden	60	28	gär-dən	4	2	Native
injury	27	19	inj-rē	5	3	Native
leaf	12	22	lēf	3	1	Native
major	247	23	mā-jər	3	2	Native
management	91	3	'ma-nij-m&nt	7	3	Native
monkey	9	23	məŋ-kē	4	2	Native
mouse	10	20	mau□s	3	1	Native
murder	75	28	mər-dər	4	2	Native
museum	32	5	myu-'zE-&m	5	3	Native
nail	6	27	'nAl	3	1	Native

neat	21	21	nēt	3	1	Native
past	281	25	past	3	1	Native
pencil	34	30	pen(t)-səl	4	2	Native
pig	8	27	pig	3	1	Native
potato	15	23	pə-'tā-tō	3	3	Native
professor	57	20	prə-'fe-sər	6	3	Native
regular	83	14	're-gy&-l&r	4	3	Native
romance	13	17	rō-'man(t)s	4	2	Native
second	373	15	se-kənd	4	2	Native
shop	63	24	shäp	4	1	Native
shopping	27	21	shäp-ing	5	2	Native
side	380	16	sīd	3	1	Native
silver	29	29	sil-vər	4	2	Native
suit	48	23	süt	3	1	Native
support	180	19	sə-'po□rt	4	2	Native
taste	59	30	tāst	4	1	Native
terminal	12	2	't&rm-n&l	5	3	Native
trailer	11	5	'trA-l&r	5	2	Native
wheat	9	22	hwēt	3	1	Native

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