AN ANALYSIS OF TYPING ERRORS BY JFL LEARNERS

AND THE CAUSES OF THOSE ERRORS

BY

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ABSTRACT

The present study investigated the tendency of common typing errors by JFL (Japanese as a Foreign Language) learners, focusing on errors that relate to long vowels and the causes of those errors. With the widespread use of computers and the Internet, communication through "typing" such as e-mailing and social networking has increased more than ever. Also, activities and assignments which require skills of Japanese word-processing have been increasing in Japanese courses. To maximize the benefit of those new types of language tools, accurate typing skills are essential. The present study examined the following hypotheses. 1) JFL learners make typing errors because they are unable to perceive Japanese duration contrast and thus cannot spell words accurately. 2) JFL learners make typing errors because they are unable to use appropriate *romaji* or Roman alphabet to input Japanese words correctly to computers. Forty-two JFL learners (21elementary and 21 intermediate learners of Japanese) and eight Japanese native speakers participated in this study. Three tasks were conducted in order to test the hypothesis: the mora counting task, the romanization task, and the *hiragana* transcription task. The results indicated that the problem of perceiving duration contrasts mainly affected the accuracy of transcribing words with long vowels. On the other hand, the inability of romanization affected the scores of all of the word types regardless of the presence of long vowels. Another finding was that romanization skills improve according to the amount of experience of typing Japanese, i.e., the intermediate group (IG) did better than the beginner group (BG) in the romanization task, whereas the perception of the duration contrasts does not develop greatly even as the learners'

proficiency level advances, i.e., there was no significant difference between the BG and the IG in the score of the mora counting task. The error analysis of the learner groups' answers revealed that the most common error of the transcription tasks was the wrong spelling of long vowels. Both the BG and the IG showed similar tendencies in this error type, though the error ratio was higher in the BG. Over all the results imply that it is easier to acquire the romanization of Japanese than the perception of Japanese duration contrasts. Therefore, introducing common errors in romanization in the early stage of Japanese typing instruction will let the JFL learners be aware of those errors and prevent them from occurring.

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Chapter 1. Introduction

With the amount of technological development in the past few decades, the use of computers has increased more than ever. Along with this trend, new types of communication have appeared. Previously, for learners of Japanese as a Foreign Language (JFL), most opportunities to communicate in the language came through personal interaction with Japanese nationals living abroad or through exposure in Japan. However, learners today are able to communicate with Japanese speakers through innovations in technology anywhere and anytime as long as they have Internet access. The increase of communication by typing has revolutionized the way people communicate. More and more people communicate through the Internet using e-mail, online chat, social networking services, and blogs (weblog). Even though the advent of live video chat has created a place where Japanese language can be spoken, the vast majority of online communications require typing skills.

The opportunity for using the Internet and word-processing programs in Japanese courses and self-study increases as the learners' proficiency levels advance. JFL learners use online and electronic dictionaries, which require typing in Japanese characters, to search for unknown vocabulary. Assignments in the Japanese classroom are increasingly done with computers. As the level of Japanese courses advances, more assignments involve typing in Japanese. These new tools require a different form of language proficiency. Japanese language instructors should acknowledge this shift in venue for language use in order to maximize learners' opportunities to use Japanese.

A questionnaire in the present study asked the participants (42 JFL learners) about the kinds of computer related activities they have done using Japanese. More than eighty

percent said they have used online Japanese dictionaries before (see Table 1). The results also showed that more than half of the participants have used Japanese in activities such as Internet searching, social networking, e-mailing, and writing Japanese essays. Another question asked the frequency of Japanese input into computers (see Table 2). About forty percent said they use Japanese on computers a few times a week. Another twenty percent said they use Japanese on computers almost every day. These responses indicate that many JFL learners do use the Japanese input on computers on a daily basis.

Table 1 *Computer related activities in which the participants have used Japanese before*

Activities	Percentage of the responses
Consulting online dictionaries	83%
Internet Searching	76%
Social Networking	67%
E-mailing	57%
Writing essays in Japanese	52%
Online Chatting	48%
Blogging	24%

Table 2 *The Frequency of Japanese Input into Computers*

Frequency	Beginner Group	Intermediate Group
Almost every day	1	7
A few times a week	7	10
A few times a month	6	2
A few times a year	7	1
Never	0	1
Total	21	21

The big difference between conversation by speaking and typing or writing is the availability of immediate feedback and nonverbal information. When you are talking to someone face to face, you have verbal information, nonverbal information, and contexts of the conversation to help you understand the content. If there is anything unclear, the listener can ask the speaker for a clarification immediately. On the other hand, when you read an email, the typed words are the main information you get to understand the content of the message. No nonverbal information is available. There is a delay in communication between a sender (speaker) and a receiver (listener). Therefore, communication through typed messages can afford fewer errors and ambiguity than spoken conversation to avoid miscommunication.

1.1. Common Typing Errors in Japanese by JFL Learners

Typing errors by JFL learners are mainly of the following three types: grammatical errors, spelling errors, and careless mistakes. The focus of this study is spelling errors. A pilot study that I conducted investigated typed materials, which were turned in as Japanese course assignments from three levels of JFL learners. The data collection was during the spring of 2009. The analyzed materials included three different assignments: a total of 409 blog posts in Japanese by second-year Japanese students, a total of 80 e-mail messages written by third-year Japanese students, and a total of 156 Japanese short essays by forth-year Japanese students. Each e-mail assignment consisted of about 80 Japanese characters, and each Japanese essay consisted of about 800 characters. Table 3 shows the results of the pilot study. Most spelling errors were either insertion or omission of long vowels or geminate consonants.

Table 3 *Results of the Pilot Study*

Places of errors	Insertion of GCs	Omission of GCs	Insertion of LVs	Omission of LVs	Total
Word-initial	3	17	6	34	60
In front of the moraic /n/	1	-	-	1	2
Plain past form of verbs	3	29	-	-	32
Te-form[1]	10	49	-	-	59
After a glide	3	7	6	19	35
Middle of the word	-	7	3	6	16
Word-final	-	-	26	46	72
Total	20	109	41	106	

Note. GCs=Geminate Consonants and LVs=Long Vowels

Various studies have investigated the perception of Japanese duration contrasts, such as distinguishing short and long vowels and single and double consonants by non-native speakers of Japanese (Enomoto, 1992; Muroi, 1995; Minagawa, 1995; 1997; Toda, 1998a; 1998b; Oguma, 2000). Previous studies suggest that it is difficult for non-native speakers to perceive those Japanese duration contrasts. It is especially difficult if the learners' native language does not have such elements. The present study examined those common typing errors related to the learners' perception of Japanese duration contrasts. In other words, the learners' level of accuracy in perceiving the Japanese duration contrast is closely related to the tendency of learners' typing errors.

[1] *Te*-form is one of the forms of verbs and adjectives in Japanese. Te-form does not express tense by itself. It is used to connect verbs and adjective phrases and sentences. There are various structures that use *te*-form, as well.

1.2. Inputting Japanese to Computers

One of the factors that complicate typing in Japanese is the conversion function. Japanese has four different scripts: *hiragana*, *katakana*, *kanji* and *romaji*. The first three scripts are well established as Japanese scripts, but the status of *romaji* or Roman alphabet as a Japanese script is ambiguous and is rarely used in writing. The occasion that Japanese people most commonly use *romaji* is when they input Japanese characters into computers. Because of the existence of different scripts, the Japanese input method has multiple steps to input an appropriate script.

First, you need to input in *hiragana*, which represents the pronunciation. There are two ways to type in Japanese: *Kana* input and *romaji* input. *Kana* input is literally typing by hitting keys for which each Japanese character is assigned, while *romaji* input is typing in romanized Japanese by using alphabet keys. There are three major romanization styles: the *Kunrei* style, the *Nippon* style and the *Hepburn* style. Due to the ambiguous status of *romaji* as a Japanese script, computers are programmed to convert all of the three styles with some exceptions such as long vowels. I will explain about those different styles in more detail in the next chapter. To maintain consistency, I will use the *Kunrei* style in this thesis. The advantage of *romaji* input is that you only need to know 26 alphabet keys to type, while *Kana* input requires you to know 49 letter keys and some functional keys. Since each *kana* character is randomly assigned on the keys, even when you memorize the place of every character, it is not an easy way to type even for Japanese people.

Romaji input is the most common way to input Japanese to computers among native Japanese speakers. According to a 2009 survey of Japanese computer users, about

ninety percent said they used the *romaji* input method, and only ten percent said they used the *Kana* input method (Japan.Internet.com, 2009). Although there is no referential data about JFL learners, given that even the majority of Japanese speakers use *romaji* input, Japanese learners who are used to typing with the alphabet keyboard would most likely use the *romaji* input method as well. Furthermore, the *Kana* input method needs a keyboard that has Japanese characters on the keys. The unavailability of Japanese keyboards would also limit the use of the *Kana* input method for JFL learners not living in Japan.

After you input a word in hiragana, the computer converts the *hiragana* input to the appropriate *kanji* or *katakana*. There are many homophones in Japanese, and you will get various *kanji* conversion choices for one pronunciation. Even if you typed in the *hiragana* correctly, the wrong *kanji* conversion could make the meaning of a sentence completely different. If the *hiragana* spelling was wrong, you would not get the *kanji* you want. Learners often make errors when they input *hiragana*, and without noticing the error they convert the input into *kanji*. The converted *kanji* would be of course incorrect, but learners in many cases do not notice the wrong *kanji* conversion either. It is extremely difficult for a reader to interpret what the writer wanted to say if the first input in *hiragana* was wrong, or worse, if the *hiragana* was converted into the wrong *kanji*. Therefore, inputting *hiragana* correctly is very important to process the rest of the steps correctly and to make oneself understood. If most of JFL learners input Japanese in *romaji*, accurate romanization would be one of the important factors to type in Japanese correctly. It is possible that in the process of converting *hiragana* spelling into

romanized spelling, inaccurate romanization causes wrong input, and that leads to typing errors.

1.3. Purpose of the Study

The purpose of this study is, first, to investigate the factors that cause typing errors at the level of inputting *hiragana* when JFL learners type in Japanese. Second, to examine what kind of instructions and training are necessary when non-native speakers learn how to type in Japanese. In order to improve JFL learners' typing skill, recognizing their weaknesses and providing appropriate instruction that meets their needs are important. For example, if the problem is the perception of Japanese duration contrasts, it may not be very effective to just practice romanization since it is not the main problem. Similarly, the instruction for non-native speakers and native speakers should not be exactly the same. When non-native speakers learn how to type in Japanese, they already know how to type in English, whereas native speakers learn how to type in Japanese as they learn how to use computers. In other words, non-native speakers learn a new typing method with the knowledge of their standard typing method such as English.

It is difficult for instructors to recognize what is going wrong by just seeing the typing errors. By finding out the main cause of typing errors, language instructors will know what factors they need to pay attention to when they teach Japanese typing. Based on the problems that learners have, instructors will be able to provide instruction that directly takes care of the weaknesses of learners and prevent the anticipated typing errors. Appropriate instruction and feedback from instructors will help learners develop their typing skill more efficiently and reduce the risk of being misunderstood. Developing learners' typing skills will open up opportunities to communicate and express their

opinions in Japanese more effectively. Those who do not have many chances to use Japanese outside of the classroom will especially benefit from various online communication tools which are not restricted by where they are. Also, with the increase of computer use in Japanese language courses, accurate Japanese typing skills will be crucial for learners.

Chapter 2. Literature Review

2.1. Previous Studies

2.1.1. Mora and Syllable

How people divide a word into smaller units depends on their native language. In other words, the sense of phonological rhythmic units differs among various languages. Japanese is a "mora-based" language, whereas English is a "syllable-based" language. Tsujimura (2007) explains the difference between "mora" and "syllable" using the word "London". English native speakers would say that the word "London" consists of two units /lon-don/. On the other hand, Japanese native speakers would say it has four units /ro.n-do.n/.[2] A period here indicates mora boundary and hyphenation indicates syllable boundary. The difference occurs because English speakers divide a word into syllable units, while Japanese speakers divide a word into mora units.

Unlike syllable units, which have only one classification, mora units fall into three different groups. According to Tsujimura (2007), a mora is one of the following three types. A vowel (V) optionally preceded by a consonant (C) is the first case. For example, *aki* "autumn" is a two-mora word because /a/ and /ki/ each form a mora unit. This (C)V type comprises of over ninety percent of Japanese mora (Kubozono, 1995). The first part of a double consonant is the second one. In the case of the word *gakki* "musical instrument," the first /k/ of the double consonant stands alone as a single mora unit. Therefore, /gakki/ has three mora-units: /ga/, /k/, and /ki/. In the *hiragana* transcription, the first part of a double consonant is transcribed with a small /tu/. For instance, *gakki* in

[2] The word "London" in Japanese is transcribed as /rondon/.

hiragana is がっき, and *kitte* “stamps” is きって. A nasal consonant /n/ without an accompanying vowel is the third case. This /n/ is called the moraic /n/. For instance, *nenkin* “pension” is a four-mora word: /ne.n-ki.n/. The first part of a double consonant and the moraic /n/ are the only cases where a consonant can represent a single mora unit by itself.

JFL learners might think that each hiragana character represents one mora unit, but that does not apply to glides. The word *ryokan* “Japanese inn” is transcribed りょかん in *hiragana*, but it is a three-mora word /ryo.ka.n/. The /ryo/ consists of a palatalized consonant /r/ and a vowel /o/ (Tsujimura, 2007). Therefore, although /ryo/ is written with two hiragana characters, it is a one mora unit.

Error analysis has revealed the different characteristics of English and Japanese speech errors, and that also showed the presence of mora units in Japanese. Kubozono (1985) classified English speech errors by two characteristics. First, consonants never replace vowels; and secondly, long vowels and diphthongs never separate into two parts. For example, in English, /ma-za-gine/ is a possible speech error for /ma-ga-zine/ but errors like /am-ga-zine/ never occur because a consonant can replace another consonant but a consonant cannot replace a vowel. Similarly, /pope smiker/ [po(w)p smaykər] is a possible speech error for /pipe smoker/ [payp smo(w)kər] but an error such as /pop smoyker/ [pap smoykər], which splits the diphthong [ay] in [payp], never happens.

The characteristics of Japanese speech errors contrast with those in English. According to Kubozono (1985), Japanese speech errors allow separating long vowels and double consonants into two parts and also replacing vowels with consonants and vice versa. For instance, the following speech errors are commonly seen in Japanese (cited in

Kubozono, 1989). Left of the arrow is the intended utterance and right of the arrow is the speech error.

a. zyu.u-go pa.a-se.n-to "fifteen percent" → zyu.u-go pa.n-se.n-to

b. … de ko-ma.t-te i-ru "troubled with" → …de ko-ma.n-te i-ru

c. ku.u-bo mi.d-do-we.i "Aircraft Carrier Midway" → ku.b-bo mi.d-do-we.i

In example (a), the long vowel /aa/ splits into two and the moraic consonant /n/ replaces the second part of the long vowel. Example (b) is the case where a double consonant splits into two. The moraic /n/ replaces the first part of the double consonant. The error in example (c) is the replacement of the second part of the long vowel /u/ with a consonant /b/, which becomes the first part of a double consonant in the speech error. These errors would not occur in English because they violate the structure of a syllable unit. Therefore, these differences of speech errors indicate that English and Japanese have a different notion of phonological units.

These speech errors in Japanese imply that long vowels and double consonants are separable because they consist of two morae. The errors also suggest that vowels and consonants can replace each other because the replaceable consonants (moraic /n/ and the first part of a double consonant) can stand by themselves as a single mora unit. Therefore, the patterns of Japanese speech errors correlate directly with the classification of Japanese mora units.

2.1.2. The Acquisition of Japanese Duration Contrasts

Various studies have examined the perception and production of Japanese duration contrasts by L2 learners of Japanese. In Japanese, words with a long vowel contrast with words without a lengthened vowel. For example, /*to*/ "door" becomes /*to.o*/

"ten" when the vowel is lengthened. Also, a double consonant or a geminate contrasts with singleton consonant. For example, /*sa.ka*/ "hill" becomes /*sa.k.ka*/ "writer" with a geminate consonant. Previous studies imply that there are various factors that affect non-native speakers' perception of duration contrasts besides the influence of their first language. The problem is that L2 learners cannot detect the duration contrasts, and thus, they cannot produce the contrasts either.

One of the differences between native speakers' and L2 learners' perceptions of Japanese duration contrasts is the criterion of judging singleton and special morae (geminate consonants, long vowels, and a nasal consonant) in terms of length range. As I mentioned earlier, "mora" (plural: morae) is a phonological sound unit in Japanese. A single mora unit consists of one of the three conditions; (C)V, the first part of a long consonant, and a nasal /n/. In the case where a consonant /n/ stands alone without followed by a vowel, it is considered a mora. A consonant cannot stand alone unless it is either a geminate consonant or a moraic /n/ (Tsujimura, 2007). Also, the acoustic characteristics of a consonant affect the difficulty level of detecting special morae. Toda (1998a) compared the perception of special morae by English L2 learners of Japanese and native Japanese speakers. The proficiency levels of the L2 learners were elementary and advanced. The study investigated how long a geminate or long vowel should be in order to distinguish words with and without special morae. Toda created stimuli by manipulating the length of a special mora within a word. For example, for the stimuli of geminate consonants, the length of C2 in a C1V1C2V2 word, e.g., /ri.ka/ "science" was manipulated between 60 and 360 percent of the original length of the singleton consonant to create a three-mora word, /ri.k.ka/ "the first day of summer."

The results showed that the length boundary that L2 learners judged as special morae was more ambiguous than Japanese speakers. There were cases where Japanese speakers perceived a stimulus as a three-mora word while non-native speakers perceived it as a two-mora word. This suggests that there is a gap in the length boundary of judging the duration contrasts between native and non-native speakers. This may be because L2 learners pronounce singleton consonant too long and thus the contrast between singleton and geminate consonants becomes ambiguous (Toda, 1998a).

The results also revealed that consonant types make a difference in the perception of duration contrasts. Advanced learners performed similarly to the native speakers judging geminate consonants with stops ([t] and [k]), e.g., /ri.k.ka/. On the other hand, when the geminate consonant was a fricative [s], e.g., /i.s.so/, their judgment was as poor as elementary learners. This implies that for English speakers, it takes longer to acquire the perception of geminate consonants with a fricative [s] than those with stops. Given that geminate consonants with stops ([t], [k], and [p]) represent mora with a silent pause whereas geminate consonant with a fricative [s] is a continuation of [s], Toda (1998a) indicated the influence of acoustic differences on the difficulty level of the perception.

The position of special morae within a word also relates to the perception of duration contrasts. Moreover, errors such as shortening and lengthening vowels incorrectly at certain places do not disappear even after reaching an advanced level. Oguma (2006) investigated the acquisition of long and short vowels by L2 learners of Japanese (English, Chinese, and Korean speakers). She examined the acquisition process of producing long vowels from beginners to super-advanced-level learners through their spontaneous speech. According to the observations, errors by shortening long vowels in

the word-final position, e.g., /ki.re.e/ vs. /ki.re/, and lengthening short vowels in the word-initial position, e.g., /kyo.ne.n/ vs. /kyo.o.ne.n/, appeared even in the super-advanced level. The errors indicate that the perception and production of vowel length contrasts in these two positions are hard to acquire regardless of proficiency levels and learners' native languages.

Spelling special morae accurately is not just a problem of non-native speakers. Japanese children who just started learning *kana* writing often make errors in spelling special morae, especially errors of missing geminate consonants. Unlike L2 learners, however, native Japanese children do not make errors inserting special morae. Otomo and Hirayama (2007) investigated the writing errors of special morae made by 24 Japanese children with language difficulties and examined the relationship between their writing accuracy and their performance on phonological awareness tasks. In order to see the subjects' writing accuracy, they conducted a dictation task. In this task, the subjects heard and transcribed three sentences that included special morae (geminate consonants, long vowels, a moraic nasal /n/, and palatalized consonants).

The results showed that the most frequent error was the omission of geminate consonants, and errors of long vowels, palatalized consonants, and nasal consonant followed in this order. All of the errors were omission of special morae. The children who participated in the study did not make errors by inserting unnecessary long vowels or double consonants, which is often seen in JFL learners' speech and writing. The average accuracy rate of geminate consonants was 60.4 percent while other three accuracy rates were more than 90 percent. Otomo and Hirayama (2007) concluded that it was hard for Japanese children to detect a geminate consonant because the only sign of the presence of

the double consonants is the duration of a silent pause between the preceding vowel and the following consonant.

The inability to divide a word into mora units makes it difficult to detect special morae. Some Japanese dialects, however, do not have the sense of mora units yet are still able to pronounce special morae properly. Shibata (1962) distinguishes two types of Japanese dialects: "mora dialects" and "syllabeme dialects"[3] (cited in Shibatani, 1990). While the former, such as the Tokyo dialect, uses mora as a minimal rhythmic unit, the latter uses a syllable as a minimal rhythmic unit. For example, *honya* "bookstore" is a three-mora-unit word /ho.n.ya/ in "mora dialects" but it is a two-syllable-unit word /hon-ya/ in "syllabeme dialects."

A study showed that children from a non-mora dialect area did not recognize special morae as separate units but were able to pronounce them properly. Arashi (2003) investigated Japanese children aged five to six years from a "syllabeme dialect" area. She examined how these children pronounce and divide words with special morae. The subjects showed more influence from their dialect in the word segmentation task than the pronunciation task. This implies that native speakers are able to acquire special morae phonologically even without being aware of the presence of special morae. In many cases, special morae were not segmented as one unit, e.g., *tiizu* /či:-zu/ "cheese" instead of /či.i.zu/, and none of the subjects recognized a geminate consonant as one unit. On the other hand, when the subjects pronounced these words, they pronounced special morae relatively long enough to count it as one mora. Also, there was no case where a special mora was separated as one unit but was pronounced too short to perceive as one unit.

[3] Certain dialects in northern Tohoku region and southern Kyushu region are "Syllabeme dialects" (Shibata, 1962).

Overall, previous studies that investigated the acquisition of Japanese duration contrasts by Japanese children suggest that the problem they have is the inability to accurately segment special morae. It is because of the lack of phonological awareness rather than the inability to perceive and produce the duration contrasts phonologically. In addition to that, the acquisition of Japanese *kana* writing and the awareness of mora units seem to be closely related to each other. On the other hand, the problem of non-native speakers is their inability to perceive and produce the phonological differences between short and long consonants or vowels. Given that Japanese native speakers already acquired the duration contrasts phonologically when they learned how to transcribe them in *kana*, the problems that native and non-native speakers have regarding the acquisition of special morae are quite different. It seems that the process of acquiring special morae for L2 learners is very different from that of native speakers.

2.1.3. Three Types of Romanization in Japanese

Japanese has four different orthographies: *hiragana*, *katakana*, *kanji*, and *romaji*. The first two are phonetic scripts. *Kanji* are borrowed Chinese characters. *Romaji* is the romanization of Japanese. *Romaji* has several different systems of spelling, but three major ones are the *Hepburn* system, the *Kunrei* (official) system, and the *Nippon* (Japanese style) system. The oldest among these is the *Hepburn* system. The first Protestant medical missionary in Japan, Dr. J. C. Hepburn devised this system, and he used it in his pioneer Japanese-English dictionary published in 1867. Then during the 1920s, Japanese scholars created the *Nippon* system (Elles, 1952). In 1937, the government adopted the *Kunrei* system, which was a revision of the *Nippon* system in order to conform to several points that were being debated from the older *Nippon* system

(Reischauer, 1940; Elles, 1952). Table 4 is a chart of the *Kunrei* system (The Agency for Cultural Affairs, n.d.). Although the *Kunrei* system is the official romanization standard in Japan, the use of the *Hepburn* system is also common and widespread in general public usage such as information signs and one's name on a passport.

Table 4 *The Kunrei Romanization System*

a	i	u	e	o	Glides		
ka	ki	ku	ke	ko	kya	kyu	kyo
sa	si	su	se	so	sya	syu	syo
ta	ti	tu	te	to	tya	tyu	tyo
na	ni	nu	ne	no	nya	nyu	nyo
ha	hi	hu	he	ho	hya	hyu	hyo
ma	mi	mu	me	mo	mya	myu	myo
ya	(i)	yu	(e)	yo			
ra	ri	ru	re	ro	rya	ryu	ryo
wa	(i)	(u)	(e)	wo(o)			
ga	gi	gu	ge	go	gya	gyu	gyo
za	zi	zu	ze	zo	zya	zyu	zyo
da	di(zi)	du(zu)	de	do	(zya)	(zyu)	(zyo)
ba	bi	bu	be	bo	bya	byu	byo
pa	pi	pu	pe	po	pya	pyu	pyo

Note. Parentheses indicate overlapping *romaji* spellings

These romanization systems have different focuses in their spelling. Table 5 illustrates the different spelling styles among the thee romanization systems. Reischauer (1940) explains that the main difference between the *Hepburn* system and the other two systems is that the former is a good broad phonetic transcription, whereas the latter are good phonemic orthographies. He also clarified the nature of this difference with the T series of Japanese *kana* syllables, which are [ta], [tʃi], [tsu], [te] and [to]. The *Hepburn*

system spells [tʃi] and [tsu] as *chi* and *tsu* in accordance with the phonetic transcription. On the other hand, since the *Kunrei* and *Nippon* systems employ the Japanese phonemic system as a base, romanized [tʃi] and [tsu] in these systems are spelled *ti* and *tu*. This may not be confusing for Japanese speakers but this style of romanization could cause serious confusion for someone who is not familiar with Japanese phonetics.

Table 5 *The Differences Among the Kunrei, Nippon, and Hepburn Styles*

Kunrei	*Nippon*	*Hepburn*
si	si	shi
ti	ti	chi
tu	tu	tsu
hu	hu	fu
zi	zi	ji
zi(di)	zi(di)	ji
zu	du	zu

Kunrei	*Nippon*	*Hepburn*
sya	sya	sha
syu	syu	shu
syo	syo	sho
tya	tya	cha
tyu	tyu	chu
tyo	tyo	cho
zya	zya	ja
zyu	zyu	ju
zyo	zyo	jo
zya	dya	ja
zyu	dyu	ju
zyo	dyo	jo

2.1.4. Romanization of Japanese and Japanese Input in Word Processing

As I mentioned earlier, several romanization systems exist but these are not strictly distinguished and as a result, people tend to mix different romanization styles within a word. Although the *Kunrei* system is the official romanization system in Japan, the *Hepburn* system is very popular since this system's phonetic representation is closer to English. The *Kunrei* style romanization appears in the fourth grader's Japanese curriculum. However, the time spent for learning *romaji* is not enough to be able to read and write like other Japanese transcriptions: *hiragana, katakana*, and *kanji*. Moreover, children will have few opportunities to see romanized Japanese script after that (Yamada and Leong, 2005). Other than reading signs or writing their names, Japanese people hardly ever read or write romanized Japanese scripts in their daily lives. The amount of exposure to creating or reading a paragraph in *romaji* is a somewhat limited experience for most people. Due to these factors, Japanese people tend to combine different styles together and the way they romanize Japanese is very inconsistent.

As the use of computers has spread, *romaji* has become a major transcription method for Japanese word processing systems. Cother (2009) investigated the ability of 261 Japanese college students to transliterate a sentence with *kanji* and *hiragana* into *romaji*, hypothesizing that the use of word processing may have facilitated students' capability of romanization. He counted the number of responses that followed recognized romanization systems, as well as those which can be used for inputting Japanese characters into computers. The subjects provided a wide variety of versions of romanization. For example, among the total of 251 responses, there were 52 different versions of romanization for the word *syottyū* /ʃo.t.tʃu.u/ "frequently." Therefore, it

appears that even as the use of romanization as an input method for word processing increases, the increased exposure has not created a universally used system of romanization amongst native Japanese speakers.

Some words had a very low accuracy rate and a low percentage of usable *romaji* for Japanese input into the computer. For example, only about 40 percent of the answers correctly romanized the words *syottyū* /syo.t.tyu.u/ "frequently" and *mugizyōtyū* /mu.gi.zyo.u.tyu.u/ "distilled spirit made from barley" in terms of the spelling that can be used to input Japanese. Also, the preference of romanization systems was not consistent. In fact, there was no single subject who used one particular version of romanization system for the entire sentence. Overall, many subjects did not use recognized romanization systems consistently or did not transliterate *kanji* and *hiragana* into *romaji* that could accurately input the Japanese words into the computer. Cother (2009) claims the following as some of the reasons of the poor performance in this experiment: the insufficient instruction of *romaji* in school and the development of word-processing systems that allow various forms of input of Japanese into electronic text. However, the direction of the task in Cother's (2009) study did not state whether the subjects should use *romaji* that is one of the three romanization systems or *romaji* that is specifically used to input Japanese to computers. The subjects' answers could have changed if the instructions for the task were more specific. Therefore, the results of this study are not enough to conclude that the subjects were unable to spell romaji for Japanese word processing.

This study also revealed the problems of the inconsistent relationship between the romanization systems and the Japanese input system. The *romaji* that is usable to input

Japanese on the computer is not always the correct form of *romaji* that follows the romanization systems. For example, about 96.5 percent of the responses for *hutuka* /ɸutˢuka/ "two days" were usable forms for Japanese word processing. However, only 54.3 percent of them were the correct *romaji* spelling. This discrepancy occurs because the word-processing system works at the mora unit level. Therefore, even if two or more romanization systems were mixed in a word, (e.g., /fu.tu.ka/ is a mix of the *Hepburn* /fu/ and the *Kunrei* and *Nippon* system /tu/) the word-processing system can recognize each letter; thus, the correct character will appear on the screen.

On the contrary, the correct *romaji* spelling is not necessarily usable for inputting Japanese text. For instance, as a particle, "は" is pronounced [wa] in a sentence but the standard pronunciation of this letter is [ha]. The *Hepburn* and the *Kunrei* system employ /wa/ for the particle "は" whereas the *Nippon* system uses /ha/. Both are correct romanization but only /ha/ can input the letter "は." In his experiment (Cother, 2009), only 72.48 percent of the subjects chose /ha/ for the task, though for this task, it is perfectly correct to use /wa/ in romanized Japanese.

The transcription of long vowels in *romaji* also differs in the Japanese input system. Both the *Hepburn* and *Kunrei* systems taught in school use diacritics to represent long vowels. For example, instead of writing double vowels /oo/, a single vowel with either a macron /ō/ or circumflex /ô/ on top of the vowel represents a long vowel. Interestingly, about 66.7 percent of the subjects in Cother's (2009) study did not use these diacritics at all. Three reasons for this result are possible: first, the influence of the Japanese loan words in English such as "tofu" and "judo" which ignore the presence of long vowels; second, the unfamiliarity of diacritics because of little exposure to *romaji*

scripts; and lastly, the influence of the word processing systems (Cother, 2009). Since word processing programs do not use diacritics to input long vowels, those who were used to typing Japanese on computers might have had a tendency of not using diacritics.

Overall, the relation between romanization of Japanese and inputting Japanese with *romaji* to computers are not absolutely compatible. Given that Japanese people rarely use *romaji* in writing, as long as the input of Japanese turns out properly, it will not be a problem whether they follow one of the romanization systems consistently or not.

2.1.5. The Influence of Computer Use on L2 Japanese Writing

Despite the increase of computer use in Japanese language learning, studies that examined L2 Japanese writing using computers are still limited. Various studies on L2 English and other European languages showed positive effects of computer use in L2 writing such as the speed of word-processing and the length and the quality of improvement of L2 writing compared to handwriting (Pennington, 1996; Warschauer, 1995, 1996). Unlike English and other European alphabetic languages, Japanese is a logographic language and the word-processing method is very different from that of alphabetic languages.

The process of Japanese word-processing is quite complex and has several steps. In order to type in the *kanji* /a.i/ "love," you need to input /a.i/ in *romaji* by hitting /a/ and /i/. The input will appear in *hiragana* on the computer at first, and then you hit the Space bar to get possible *kanji* conversion for /a.i/. Japanese has many homonyms, so you need to choose the *kanji* that is appropriate for the meaning. For example, you will get twenty conversion suggestions for the word *ai*. Once you select the kanji you want, hit the Enter key to complete the input. With this in mind, the benefit that alphabetic languages get

from computer-writing such as shortening the writing speed, does not apply to logographic languages like Japanese.

Due to the uniqueness of Japanese word-processing, the benefit that L2 Japanese learners get from the use of computer based writing is different. Chikamatsu (1998) conducted a survey regarding L2 Japanese students' attitudes and the impressions of computer word-processing. It revealed that the students had positive feelings about using computers in terms of the use of *kanji*, better grammar achievement, the easiness of writing, and the better development of thoughts and ideas. However, unlike responses heard from alphabetic languages users, Japanese learners did not feel that the computer use helped them write faster, longer, or better.

The complex steps in Japanese word-processing do not help shorten the writing speed but the *kana-kanji* conversion function helps learners to write more accurately in terms of *kanji* and grammar usage. Also, the effect of computer use on writing depends on language proficiency levels. Chikamatsu (2003) investigated the effect of computer use on Japanese L2 writing in order to test the following hypotheses: 1) does computer use affect the speed and length of L2 writing? 2) Does computer use affect the quality of writing? 3) Does the degree of effect of computer use on L2 writing depend on the learners' proficiency levels? Twenty L2 learners of Japanese completed two tasks: a word test and an essay test. These tests were conducted in handwritten and computer-written forms. The word test asked subjects to translate English words into Japanese using as many kanji as possible. In the essay test, subjects had 15 minutes to write an essay based on a given topic.

The results indicated that there were significant positive effects on kanji writing, and especially the middle-skilled[4] group took advantage of the computer use. However, no significant difference was found between handwritten and computer-written essays in terms of length and speed. The quality of the writing improved in regard to the more correct usage of kanji, but at the sentence level, computer use did not improve the quality of the essays. Chikamatsu (2003) points out the difficulty of the Japanese phonetic input method and that acquiring this method takes more time for L2 learners than L1 Japanese typists. In other words, improving the phonetic input skill is the key to take advantage of computer use in L2 Japanese writing.

2.2. Hypotheses

The present study examined the following hypotheses.

1) JFL learners make typing errors because they are unable to perceive Japanese duration contrast and thus cannot spell words accurately.
2) JFL learners make typing errors because they are unable to use appropriate *romaji* to input Japanese words correctly to computers.

[4] The subjects were divided into three groups: high-skilled, middle-skilled, and low-skilled based on their scores of word tests and essay tests (Chikamatsu, 2003).

Chapter 3. Methodology

3.1. Tasks

The experiment consisted of three tasks: the "mora unit counting task," the "romanization task," and the "*hiragana* transcription task." For each task, participants listened to an audio file, which included instructions for each task, and sixty Japanese words. All three tasks used the exact same set of Japanese words as the stimuli, so the results can be compared across the three tasks. For each task, the word order was randomized by assigning random numbers using Excel's RAND function.

3.1.1. Task 1: Mora Unit Counting Task

This task examined whether the subjects were able to break down a Japanese word into mora units. Participants listened to the sixty words in the audio file and drew circles that represent the number of mora units of each word on an answer sheet. For example, when they hear a word *taikou* /taiko:/ "rivalry," they are supposed to draw four circles on the sheet because the word consists of four mora units /ta.i.ko.u/. Similarly, when they hear the word *taiko* /taiko/ "drums," they should draw three circles since the word has three morae /ta.i.ko/.

3.1.2. Task 2: Romanization Task

This task investigated subjects' capability of transcribing what they heard in Roman alphabet or *romaji*, and also to examine if the romanization is appropriate for Japanese word processing. As mentioned in chapter one, there are two ways to input Japanese to computers; one is the *romaji* input method and the other is the *kana* input

method. Given that typing in *romaji* is the more popular way to input Japanese characters, accurate input in *romaji* is the key to type in Japanese correctly. In this task, participants listened to the audio file and wrote down what they heard in *romaji*. The instructions stated to "use the *romaji* transcription as if you were inputting Japanese to a computer." For example, the transcriptions of a city name *Osaka* /o:saka/ in *romaji* are "oosaka," or "ōsaka." Participants were instructed to use the first style which uses double vowels. Although the second transcription is perfectly fine as romaji spelling, this spelling does not work for the Japanese word processing. In the present study, no explicit instruction was given to use a specific romanizaton system consistently.

3.1.3. Task 3: *Hiragana* Transcription Task

The purpose of this task was to check whether the subjects were able to perceive the words accurately. This task is very similar to Task 2: the romanization task. The difference is that participants write what they heard in *hiragana* instead of *romaji*. This task provides information about how participants actually perceived what they heard. Task 2 by itself does not necessarily show how participants perceived the stimuli. For instance, an answer "osaka" for task 2, where the correct answer is "oosaka," has two interpretations. One is that the subject did not hear the long vowel, and the other is that s/he has a problem with romanization. If the same subject answered *おさか** /o.sa.ka/ in the *hiragana* transcription task, the interpretation would be the first one. That is, the subject had problem with perceiving the long vowel. On the other hand, if his/her answer was *おおさか* /o:saka/ "Osaka," the interpretation of Task 2's answer would be the second one. That is, the perception of the long vowel is fine but the romanization of a long vowel is incorrect.

3.2. Stimuli

The sixty word stimuli included two types of minimal pairs, twelve pairs for each type, and twelve distracters to avoid letting the subjects notice what was being tested. Words with and without a long vowel, e.g., *goukei* /go.o.ke.e/ "total," and *gokei* /go.ke.e/ "word form" were the first kind of minimal pairs. The second kind of minimal pairs were also distinguished from each other by the presence of a long vowel but this type included a glide as well, e.g., *isyou* /i.ʃo.o/ "costume," and *isyo* /i.ʃo/ "testament." Each type of minimal pair included words with a long vowel in the middle of the word and words with a long vowel at the end of the word. The distracters were chosen based on the number of mora units the words contained. Since the minimal pairs were four-, three-, and two-mora words, the distracters included one-, five-, and six-mora words to add some variety.

The selection of the word stimuli followed two criteria. First, the stimuli were words with which the subjects of L2 learners were less familiar in order to minimize the influence of individuals' vocabulary knowledge. I excluded words in "*Nakama 1*" (Makino *et al*., 1998; Hatasa *et al*., 2009) and "*Nakama 2*" (Hatasa *et al*., 2000), which are the textbooks for the first- and second-year Japanese courses at the University of Kansas. Using words that the subjects are familiar with will not test learners' pure capability of perceiving duration contrasts because if they knew how to spell the stimuli, the spelling knowledge will affect their perception. It could also cause less careful listening and premature judgment.

The second criterion was pitch accent. Previous studies have shown that there is a relationship between the difficulties of perception of duration contrasts and accent patterns (Minagawa, 1995; Muroi, 1995). "Accent" in this case is where the pitch drops.

For example, the accent pattern of the word *ziko* /ji.ko/ "an accident" is high (H) low (L), that is, the accent is on the first mora. On the other hand, *taiko* /ta.i.ko/ "drums" is LHH. Since there is no pitch fall, this word is not accented. Minagawa (1995) and Muroi (1995) claimed that when a long vowel appears where the pitch changes, i.e., low pitch to high pitch or vice versa, it is easier for learners to perceive the duration contrasts than where the pitch does not change. For example, it is assumed that detecting a long vowel in the word *kouka* /ko.o.ka/ HLL "effect" is easier than in the word *zikou* /zi.ko.o/ HLL "item" because in the former, the long vowel appears where the pitch changes. To avoid the influence of the accent pattern on the task completion, all of the minimal pairs, except two pairs, shared the same non-accented pattern, which is the pitch at the first mora is low and the rest is high. The two exceptions were high pitch at the first mora and the rest was low. The pitch patterns of the two pairs, *ishou* vs. *isho* and *zikou* vs. *ziko,* were both HLL vs. HL. I included these two pairs because I could not find two minimal pairs that have long vowels at the end of the words. The list of the stimuli is provided in Appendix A.

A female native speaker of Japanese, who is from the Jōetsu area in Niigata,[5] recorded the word stimuli at a normal speech rate. Each word was first recorded as a string of words using software called "Audacity," and then the sound file was cut and reorganized in order. A male native speaker of English, who is from the mid-west, recorded the instructions and the question numbers. All sixty words and the instructions were combined into one large audio file for each task. One string of words was put together in the following order: question number → word A → 2.5 seconds pause →

[5] The accent in this area is categorized into the Tokyo dialect (Iwai, 1975).

word A, again → nine seconds pause → question number → the next word B. This cycle was repeated for each word. All three tasks and a questionnaire were put together using online survey software called "Survey Gizmo."

3.3. Questionnaire

In order to collect participants' background information, the experiment included a questionnaire. The questionnaire asked for information such as language background, typing experience in Japanese, and frequency of use of Japanese typing. The full questionnaire is provided in Appendix B. One of the purposes of this questionnaire was to reveal possible within-group variability. For example, the amount of experience in typing in Japanese may have some influence on one's typing skill. Those who practice typing frequently in their daily lives might do better in the experiment than those who do not, even within the same proficiency level.

3.4. Participants

Participants were native speakers of English, who were taking Japanese language courses at the University of Kansas during the data collection period. In order to see the effect of the proficiency level, I selected subjects randomly from two different levels: the beginner level and the intermediate level. The beginner group (BG) represented learners who were taking the second semester of the Japanese course. The intermediate group (IG) represented those who were taking either the fourth or sixth semester of the Japanese courses. At the University of Kansas, the first- and the second-year Japanese students receive 80 hours of instruction per semester, and the third-year Japanese students receive 40 hours of instruction per semester. Each group consisted of 21 subjects; thus, a total of

42 students participated in this study. In the second-year Japanese course, students receive instruction on typing as a part of class activity. That is, the IG had learned how to type in Japanese in class. Although the BG had not received formal instructions on Japanese typing yet, all of the subjects in the BG answered in the questionnaire that they have used Japanese on computers before, and that they know how to type in Japanese on computers, so I included the BG in the present study. Whether the subjects received the instruction in class was taken into account in the data analysis.

In addition to the JFL learners, nine native speakers of Japanese participated in this study as a native speaker group. Two of them were graduate students at the University of Kansas, and the rest of them were Japanese college students who were at the University of Kansas for a one-month exchange program during the data collection period. Data from one of the native speakers, however, was excluded from the analysis because her score on the mora counting task was an outlier. Her accuracy rate on that task was 62 percent, whereas the other native speakers' were all 100 percent. I assume that she performed poorly because she did not understand the notation system used to represent mora units. Despite her low score in the mora counting task, she scored 100 percent in the other two tasks: the romanization task and the *hiragana* transcription task. Therefore, she did not have problems with the perception of Japanese language.

3.5. Procedure

The experiment was conducted individually at a computer lab at the University of Kansas. Each participant listened to the audio files for the three tasks on a computer using headphones. At the beginning of each task, the subjects listened to the instructions, including two examples that showed how to answer the questions. The instructions also

appeared on the computer screen. All of the answers were written down on the given answer sheets. Participants were able to take a short break between tasks. After the end of the third task, *hiragana* transcription task, participants answered the questionnaire on the same computer. Each task took approximately 15 minutes and the whole experiment, including questionnaire, took about 55 minutes if done without taking a break.

3.6. Data Analysis

Four different analyses were conducted. First, to see how well the learners groups did in each task, the three groups' accuracy rates in each task were compared using a one-way ANOVA. Secondly, to examine whether word types of the stimuli had influences on the score of the learner groups, the mean percentage of errors of the four word types were compared using *t*-tests. The word types were decided based on the presence of the glides and the long vowels: glide with LV, glide without LV, with LV, and without LV. In this analysis, first, the mean error percentages of the four word types in the romanization task were compared between the BG and the IG. Then, to see whether the presence of long vowels affected the performance of the subjects in the three tasks, the mean percentage of errors were compared between the "glide with LV" and the "glide without LV" types, and the "with LV" and the "without LV" types for each tasks. The third analysis investigated the common error types in the romanization task and the hiragana transcription task. The detail of the error type category will be explained in the next chapter. The percentage of the each error type was calculated for each word types. The errors by inserting or omitting long vowels were calculated by dividing the number of error by 126 (6 words multiplied by 21 subjects). The rest of the error types were calculated by dividing the number of error by 252 (12 words multiplied by 21 subjects).

After the data collection, it became apparent that the subjects made errors at places other than the targeted contrasts. When I chose the minimal pairs for the stimuli, I did not control the presence of long vowels in places other than the target contrast. For example, the contrast of the minimal pair: *oubou* /o.o.bo.o/ "high-handedness" vs. *oubo* /o.o.bo/ "application" is at the word final position. Therefore, my intention was to see whether the subjects were able to perceive the presence of the long vowel at the end of the word. However, there were also errors of omitting the long vowel at the word-initial position, e.g., perceiving /o.o.bo/ as /o.bo/. There were five minimal pairs that included long vowels at the non-targeted place for the stimuli with glides and three such minimal pairs for the stimuli without glides. Because of this, the number of long vowels within words differed between the stimuli with glides and the stimuli without glides. In order to keep the number equal, I only included the error of omitting long vowels at the targeted contrasts in the data analysis, and excluded the errors of omitting long vowels at the non-targeted position, except the overall accuracy rates comparison. For example, in case of the minimal pair *doukyou* /do.o.kyo.o/ vs. *doukyo* /do.o.kyo/, the long vowel /u/ at the word final is the targeted contrast and if the subjects omit this long vowel, it will be counted as an error. However, the omission of the long vowel /u/ at the word initial position, in this case, was not included in the analysis because it was not the targeted contrast.

The fourth analysis examined the correlation of the subjects' answers among the three tasks. For this analysis I focused on how each subjects answered the three tasks for each stimulus. For example, for the stimuli *isyou* "costume," the subject A answered all correctly in the three tasks, but the subject B answered correctly in the mora counting

task and not in the other two tasks. The combinations of correct and/or wrong answers of the three tasks were analyzed to determine what the most influential cause of the error is.

Chapter 4. Results

4.1. Overall Results

A one-way ANOVA was conducted to compare the scores of the three groups on each task. Table 6 summarizes the results of the F-tests. There were significant differences among the three groups' scores at the $p < .05$ level in all three tasks. Post hoc comparisons using the Tukey's HSD test indicated that the accuracy rate of the native speaker group (NG) was significantly different from that of the beginner group (BG) and the intermediate group (IG) in all tasks as well as the total of all three tasks. Table 7 shows the results of the post hoc test. Between BG and IG, there were significant differences in the romanization task and the total of the three tasks. However, BG's score did not significantly differ from IG's in the mora counting task or the *hiragana* transcription task.

Table 6 *Overall Results of One-Way ANOVA on Task 1, 2, 3, and the Total of All Tasks*

Task 1: Mora counting task	$F(2, 47) = 9.68$	$p < .001$
Task 2: Romanization task	$F(2, 47) = 29.34$	$p < .001$
Task 3: Hiragana transcription task	$F(2, 47) = 24.42$	$p < .001$
Total of the Three Tasks	$F(2, 47) = 27.67$	$p < .001$

Table 7 *Results of Multiple Comparisons Using Tukey's HSD*

Dependent Variable	(I) Level	(J) Level	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval (CI) Lower Bound	Upper Bound
Task1	Beginner	Intermediate	-3.67	3.24	.499	-11.51	4.17
		Native Speaker	-19.05*	4.36	.000	-29.60	-8.49
	Intermediate	Beginner	3.67	3.24	.499	-4.17	11.51
		Native Speaker	-15.38*	4.36	.003	-25.93	-4.83
Task2	Beginner	Intermediate	-15.05*	4.42	.004	-25.75	-4.34
		Native Speaker	-45.48*	5.96	.000	-59.89	-31.06
	Intermediate	Beginner	15.05*	4.42	.004	4.34	25.75
		Native Speaker	-30.43*	5.96	.000	-44.84	-16.02
Task3	Beginner	Intermediate	-6.33	3.87	.240	-15.69	3.03
		Native Speaker	-36.01*	5.21	.000	-48.61	-23.41
	Intermediate	Beginner	6.33	3.87	.240	-3.03	15.69
		Native Speaker	-29.68*	5.21	.000	-42.28	-17.08
Total Score	Beginner	Intermediate	-8.14*	3.34	.048	-16.22	-.06
		Native Speaker	-33.41*	4.50	.000	-44.29	-22.53
	Intermediate	Beginner	8.14*	3.34	.048	.06	16.22
		Native Speaker	-25.27*	4.50	.000	-36.15	-14.39

*. The mean difference is significant at the 0.05 level.

Although there was a significant difference between native speakers and the JFL learners in the mora counting task, the learners' score in this task was the highest among the three tasks. The results indicate that the mora counting task was easier than the other transcription tasks for the learner groups. Since the scores of BG and IG did not differ significantly, the ability to perceive mora units does not seem to improve greatly along with the advancement of their proficiency level.

Table 8 *Descriptive Statistics of the Score of Task 1: Mora Counting Task*

				95% CI for Mean	
Group	N	Mean	SD	Lower	Upper
Beginner	21	80.95	10.99	75.95	85.96
Intermediate	21	84.62	11.75	79.27	89.97
Native Speaker	8	100.00	.00	-	-

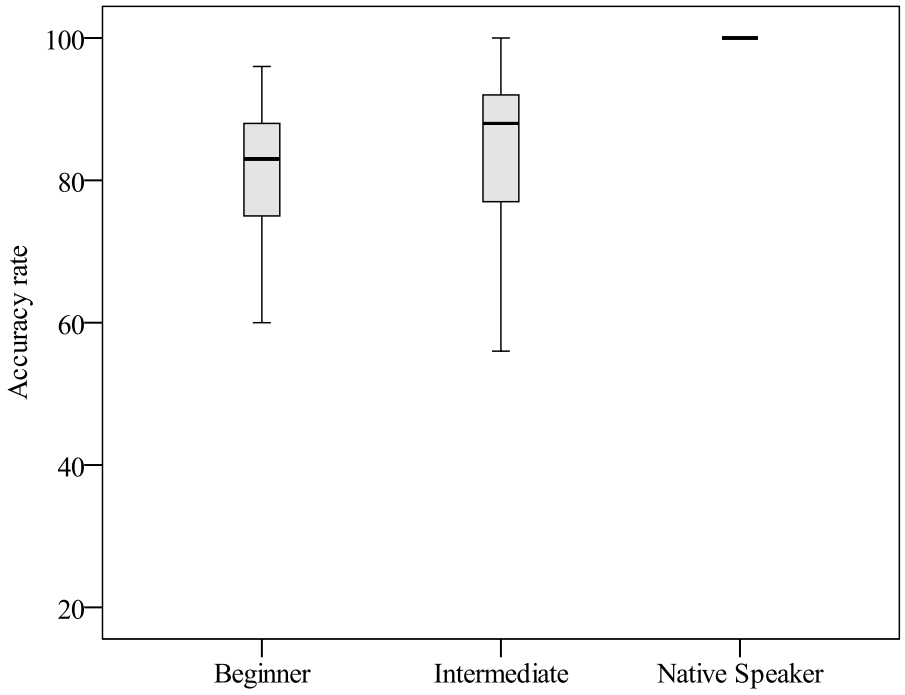

Figure 1 *The Score of Task 1: Mora Counting Task*

The romanization task showed significant differences between the BG and the IG. Given that the BG had not received formal instruction about the Japanese input method or romanization systems in their Japanese courses, the difference between these groups could mainly be caused by the difference in the amount of experience they have in typing Japanese using *romaji*.

Table 9 *Descriptive Statistics of the Score of Task 2: Romanization Task*

				95% CI for Mean	
Group	N	Mean	SD	Lower	Upper
Beginner	21	52.52	17.00	44.78	60.26
Intermediate	21	67.57	13.80	61.29	73.85
Native Speaker	8	98.00	3.02	95.47	100.53

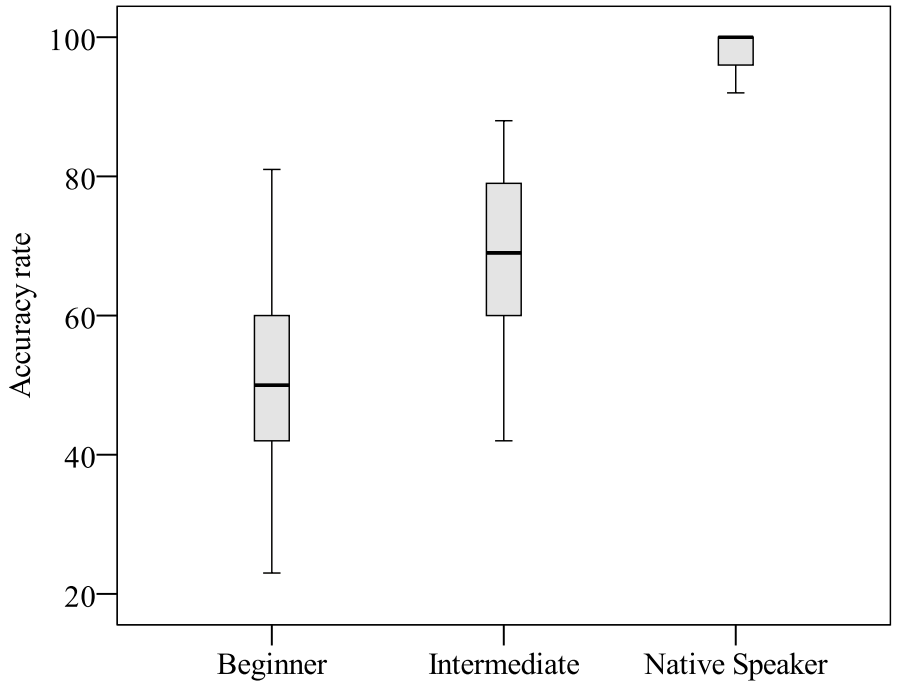

Figure 2 *The Score of Task 2: Romanization Task*

Similar to the mora counting task, the *hiragana* transcription task did not show a notable difference between the BG and the IG. Comparing the results of tasks 2 and 3, there was a big gap within the BG's scores on tasks 2 and 3, whereas the gap within the IG was much smaller. In other words, the poor performance of BG in the romanization task was because of their lack of romanization skills rather than the issue of perceiving the phonetic elements.

Table 10 *Descriptive Statistics of the Score of Task 3: Hiragana Transcription Task*

				95% CI for Mean	
Group	N	Mean	SD	Lower	Upper
Beginner	21	63.24	12.94	57.35	69.09
Intermediate	21	69.57	14.19	63.11	76.03
Native Speaker	8	99.25	1.04	98.38	100.12

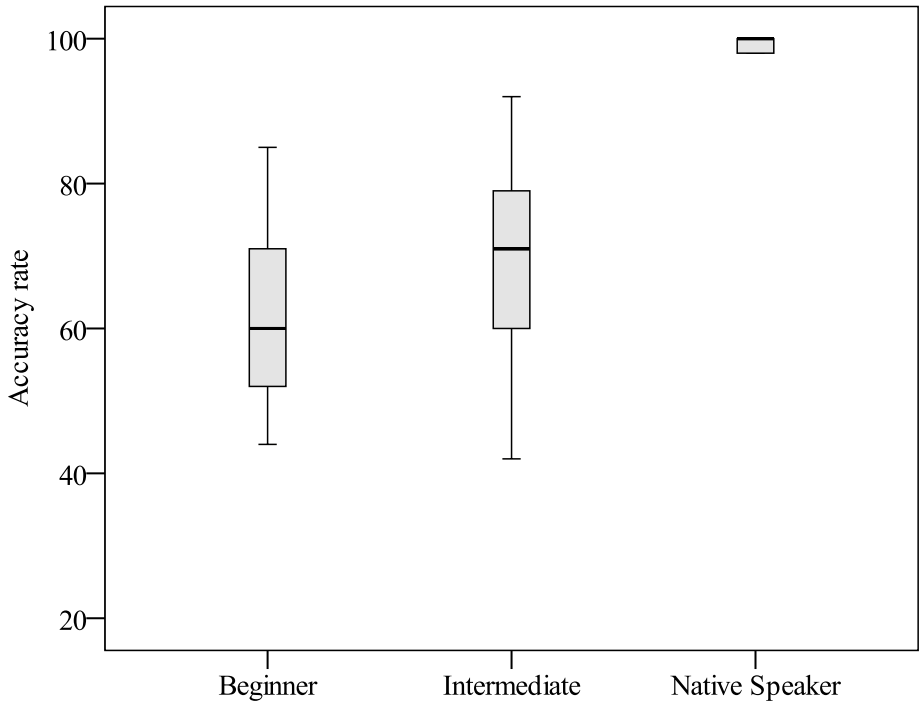

Figure 3 *The Score of Task 3: Hiragana Transcription Task*

Table 11 *Descriptive Statistics of the Total Score of All Three Tasks*

Group	N	Mean	SD	95% CI for Mean	
				Lower	Upper
Beginner	21	65.71	12.01	60.25	71.18
Intermediate	21	73.86	11.42	68.66	79.06
Native Speaker	8	99.13	1.13	98.18	100.07

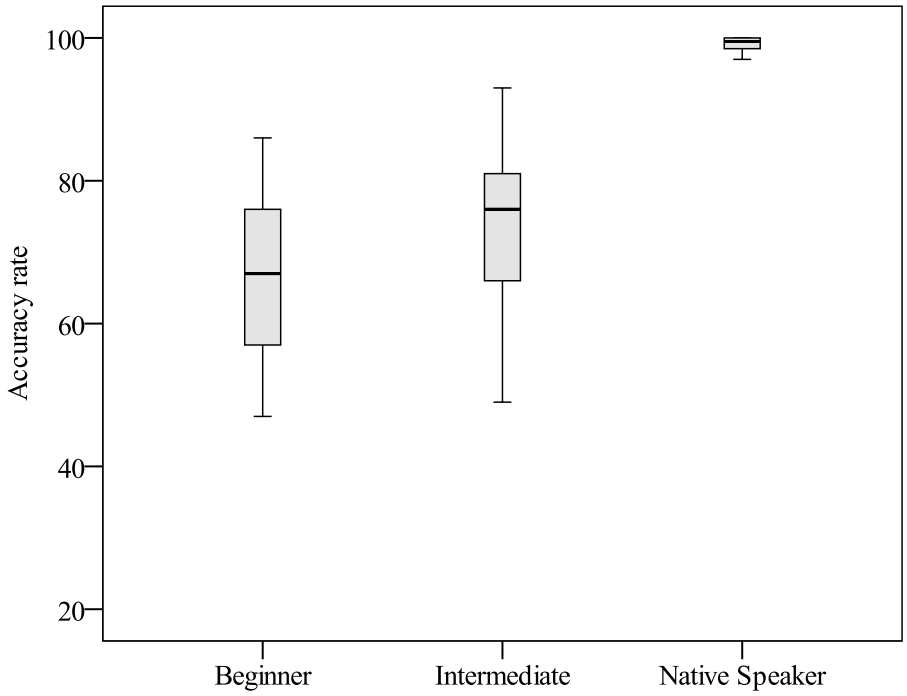

Figure 4 *The Total Score of All Three Tasks*

4.2. Task Performance and Word Types

Since the performance of the BG and the IG in the romanization task differed significantly, independent samples *t*-tests were conducted to see whether word types had an influence on this difference. Table 12 summarizes the results of the *t*-tests. The mean percentage of errors of the words with glides was greatly different between the BG and the IG. However, there was no difference in the words without glides.

Table 12 *Independent Sample T-Test: The Mean Percentage of Errors in the Romanization Task*

Word types	T	Sig.	Mean Difference (BG-IG)	95% CI of the Difference	
				Lower	Upper
Glide with LV (BG) Glide with LV (IG)	5.31	.000	30.56*	18.63	42.49
Glide without LV (BG) Glide without LV (IG)	2.26	.034	13.49*	1.10	25.88
With LV (BG) With LV (IG)	1.22	.236	10.71	-7.52	28.95
Without LV (BG) Without LV (IG)	.51	.613	4.76	-14.49	24.02

*. The mean difference is significant at the 0.05 level.

Figures 5 and 6 show the mean percentage of errors in each word type in each task. The BG's performance was influenced by the presence of long vowels in all tasks except one case. In the *hiragana* transcription task, the presence of long vowels in the words with glides did not make any difference in the scores. Except this case, the BG made more errors when the stimuli included long vowels than when they did not include long vowels, and the differences were statistically significant at the $p < .05$ level as Table

13 shows. On the other hand, the presence of LVs did not affect the score of the IG in any of the three tasks.

Table 13 *The Influence of the Presence of LVs in the Score of the BG*

Tasks	Glide ± LV	± LV
Mora counting	$t(22) = 2.98$, $p = .007$	$t(22) = 2.69$, $p = .013$
Romanization	$t(22) = 4.46$, $p < .001$	$t(22) = 2.32$, $p = .030$
Hiragana transcription	$t(22) = 1.91$, $p = .070$	$t(22) = 2.67$, $p = .014$

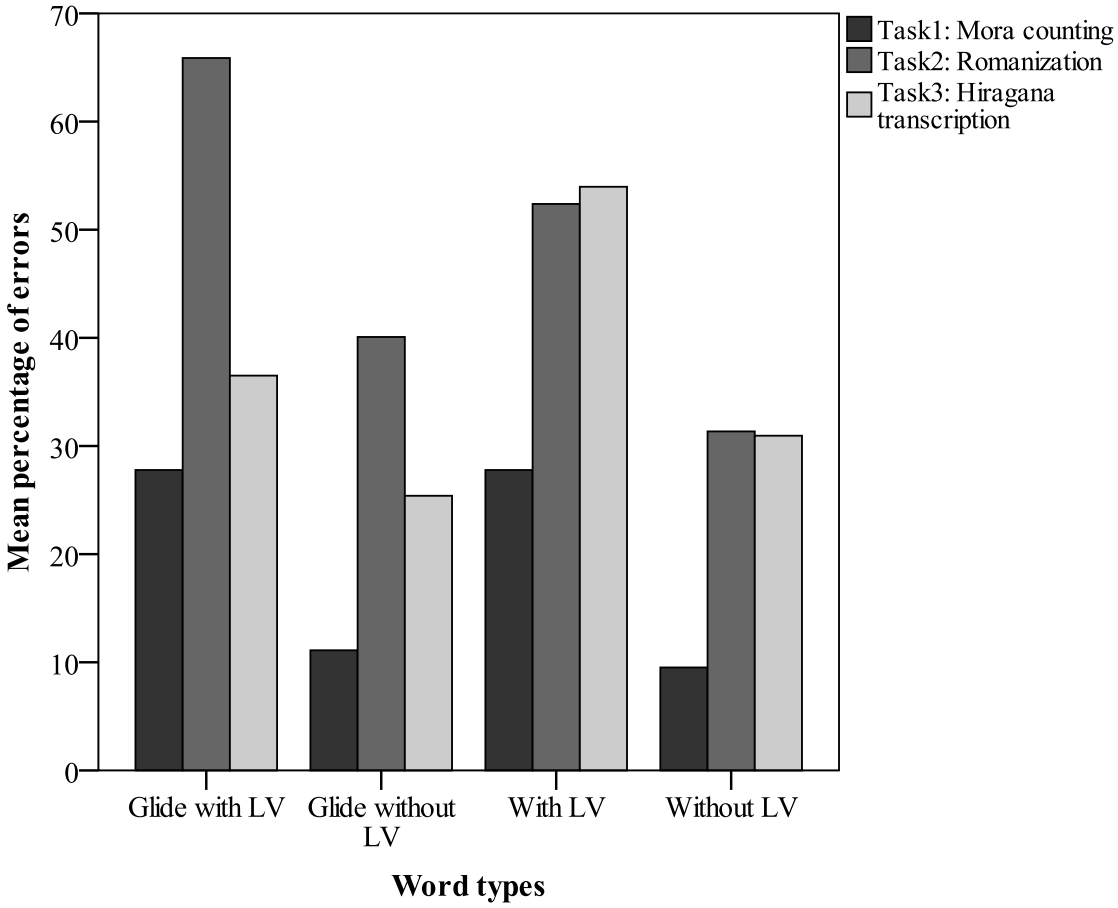

Figure 5 *The Mean Percentage of Errors in Each Word Type (BG)*

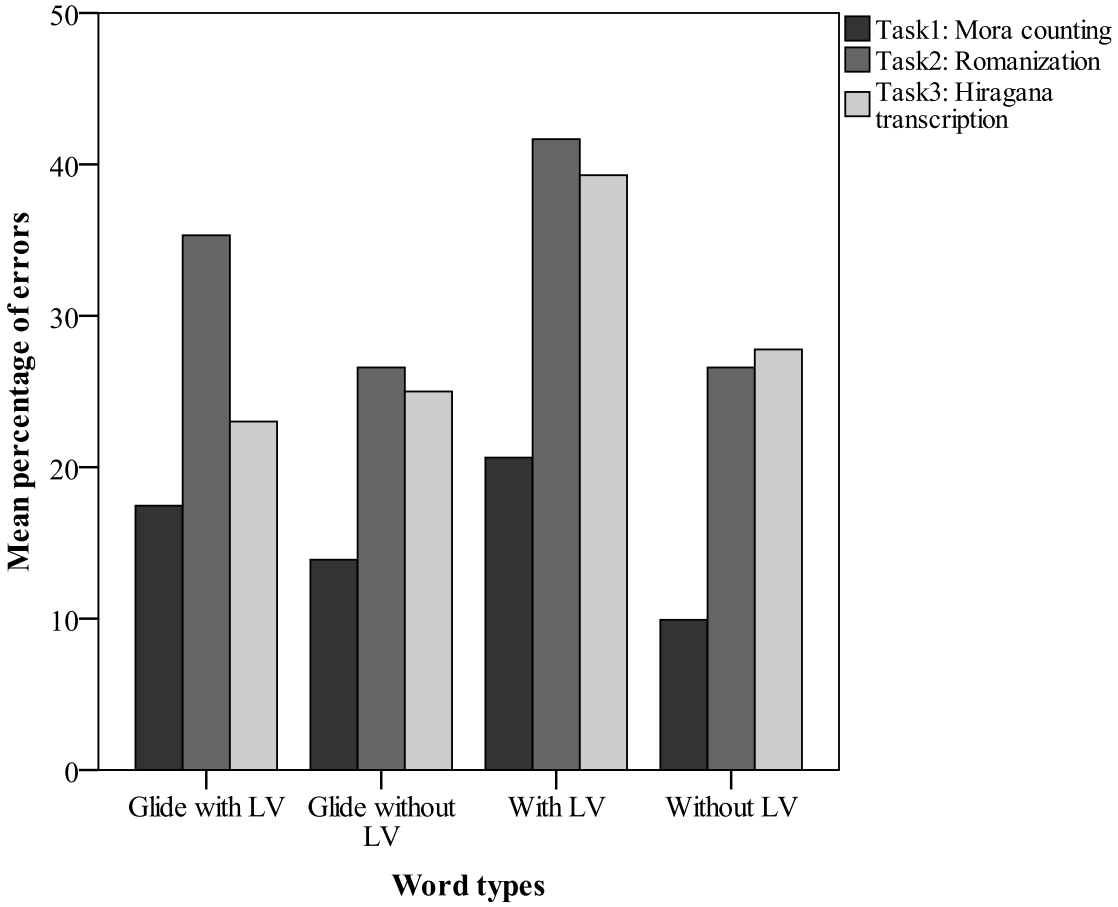

Figure 6 *The Mean Percentage of Errors in Each Word Type (IG)*

4.3. Error Types

In order to examine what kinds of errors the JFL learners made, I divided errors into seven categories. The criteria of the error types are summarized in Table 14. Types one, two, three, and four were further distinguished by the place of the occurrence as the type eight and nine. Type six includes errors of wrong vowel transcriptions and wrong *romaji* spelling, which is not appropriate for inputting Japanese into computers. For example, the wrong answer in the romanization task, *taiko,* which is supposed to be *taikou* "rivalry," is the combination of type one and nine; that is, omitting a necessary long vowel at the word-final position. If the wrong answer was *taikoo,* the error is type six: wrong spelling.

Table 14 *Error Categories*

Types	Classifications	Labels in Figures 7 - 10
1	omitting a necessary long vowel	Omit LV
2	inserting an unnecessary long vowel	Insert LV
3	omitting a necessary long vowel after a glide	Omit LV
4	inserting an unnecessary long vowel after a glide	Insert LV
5	inserting an unnecessary double consonant	Insert GC
6	wrong spelling (i - e, u - o, sh - shy and ch - chy)	Wrong spelling
7	Other	Other
8	the error occurred at the word-initial position.	(WI)
9	the error occurred at the word-final position	(WF)

Figures 7 and 8 illustrate the analysis of error types in the results of the BG. The figures represent the ratio of each error type that has occurred in each word type. The data does not include the percentage of the case where the answers of the three tasks were all correct. The results revealed that omitting long vowels are the most common errors that the BG made. The ratio of the omission of long vowels after glides at the word-initial position was especially large in the romanization task, and more than half of the answers had this type of error. However, in the *hiragana* transcription task, the ratio of this type of error decreased greatly. This drastic difference between the results of the *romaji* and *hiragana* transcription tasks in the stimuli of glides with LVs was not as apparent as the difference in the stimuli of LVs without glides.

Another notable difference between the two tasks is the error of wrong spelling for the stimuli with glides. The ratio of the errors by wrong spelling in the romanization task was quite high, but this type of error almost disappeared in the *hiragana* transcription task. In the romanization task, most of the errors were spelling errors of "shya*," "shyo*," and "chyo*" which are supposed to be spelled without "y." Word processing programs will recognize "shya" as "s" and "hya," so the input will appear on a computer screen as "s ひゃ" instead of "しゃ." This kind of error is unique for the romanization task; and the notable decrease of wrong spelling errors in the hiragana transcription task can be explained by this. On the other hand, for the stimuli without glides, the ratio of wrong spelling errors in both tasks did not differ as significantly as they did with the stimuli which had glides.

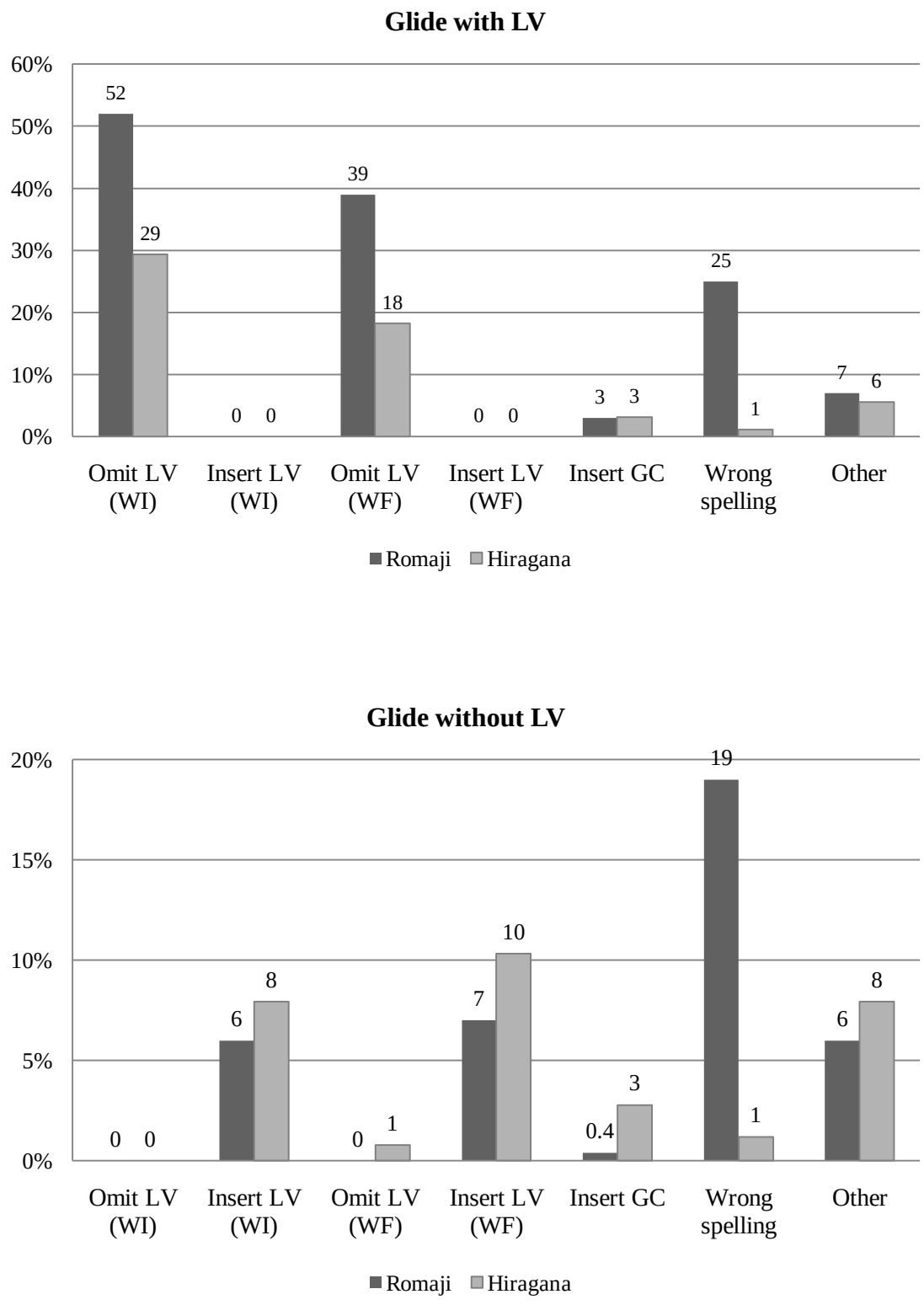

Figure 7 *The Percentage of Each Error Type in Stimuli with Glides (BG)*

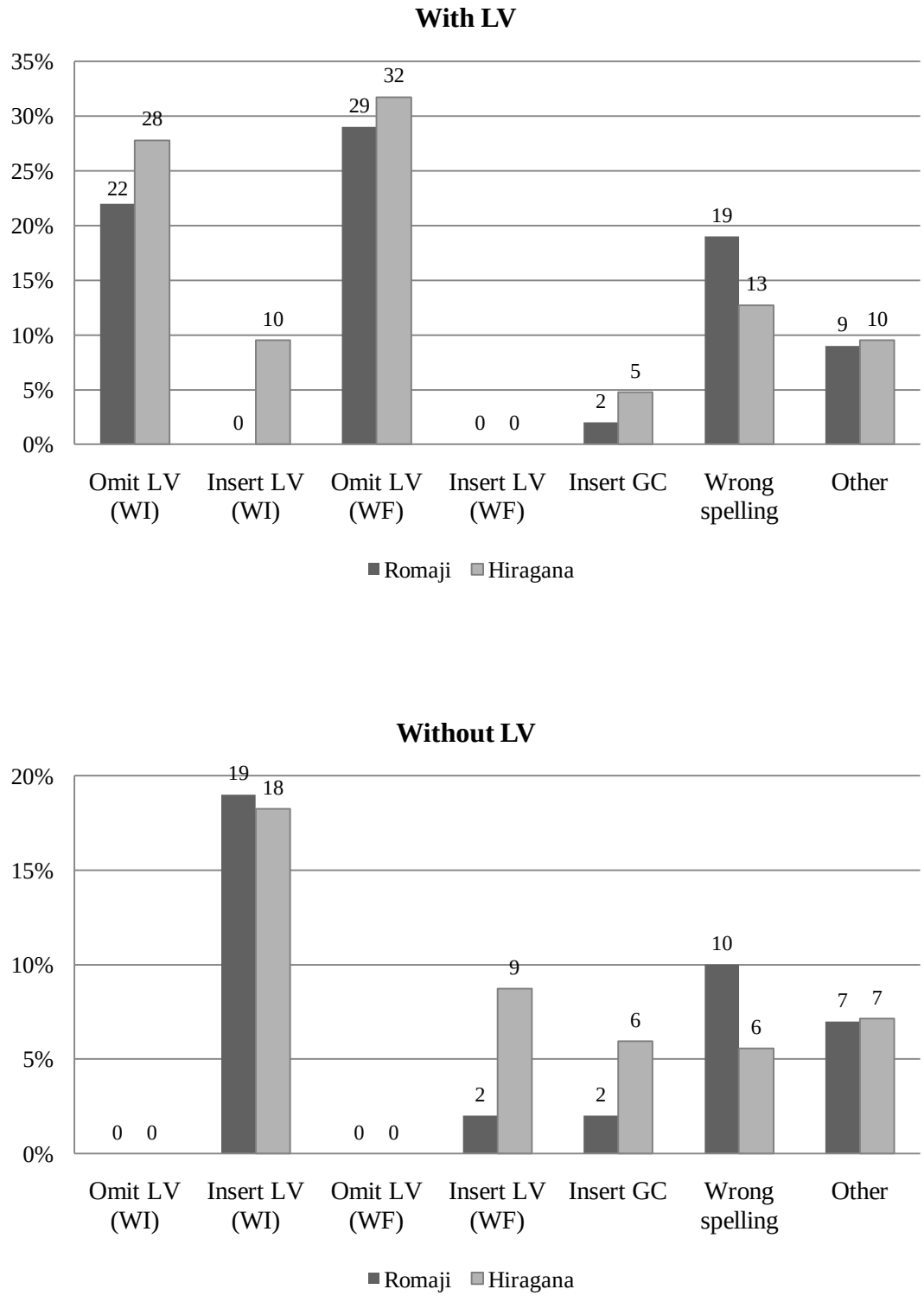

Figure 8 *The Percentage of Each Error Type in Stimuli without Glides (BG)*

The IG showed similar results in a high tendency to omit long vowels, though the ratio was much lower than that of the BG (see Figures 9 and 10). Compared to the BG, the percentage of omitting long vowels at the word-final position decreased remarkably in the stimuli with long vowels. However, there was less difference between the BG and the IG in the percentage of the errors by omitting long vowels at the word-initial position. In other words, the ability to perceive and transcribe long vowels improves faster at the word-final position than the word-initial position.

The IG's spelling errors in the romanization task decreased notably compared to the BG. This tendency was true for all word types. Interestingly, in the stimuli with glides, the ratios of spelling errors had large gaps between the romanization task and the *hiragana* transcription task, but such gaps did not appear in the stimuli without glides. These results imply that the IG has better romanization skills than the BG, but transcribing vowels correctly is still problematic for the IG. In other words, it takes less time to develop romanization skills than to acquire the ability to discern vowel pronunciation and its transcription.

In most error categories, the IG showed a smaller error ratio than the BG. However, the IG made more errors by inserting geminate consonants than the BG. When words included glides but not long vowels, the ratio of errors of inserting geminate consonants was the highest among the all error types. It was an interesting outcome of this study, and I did not expect this result.

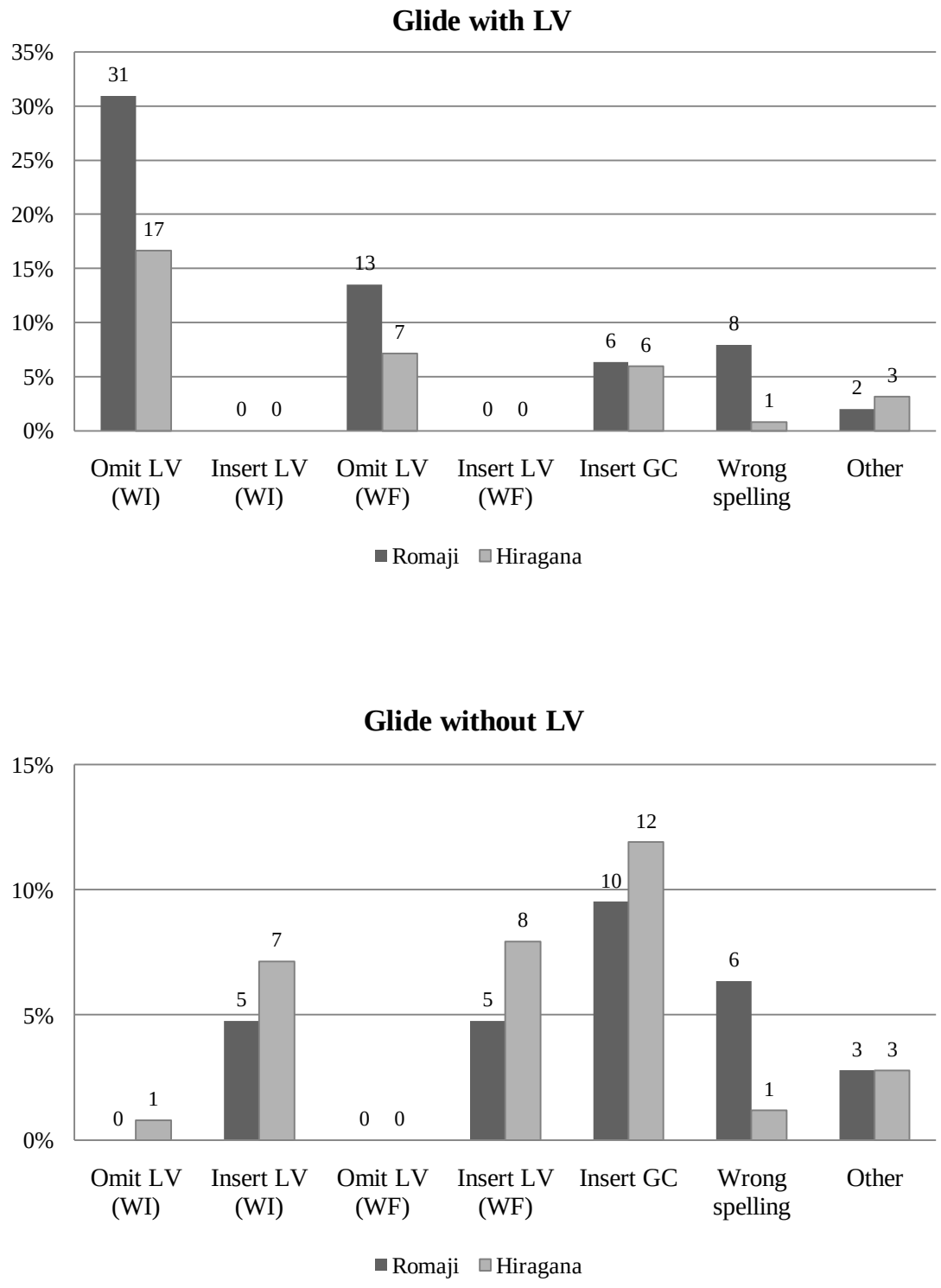

Figure 9 *The Percentage of Each Error Type in Stimuli with Glides (IG)*

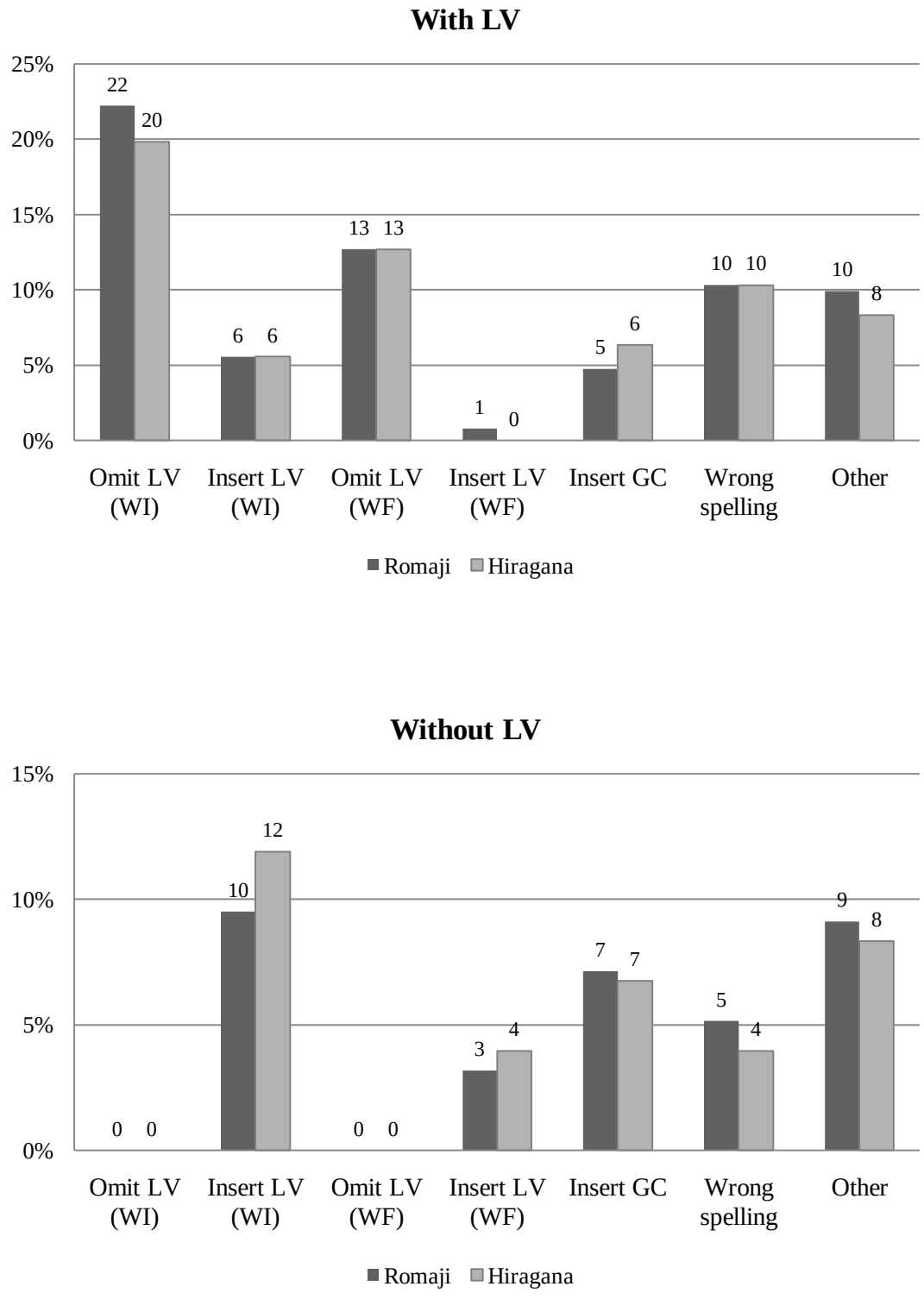

Figure 10 *The Percentage of Each Error Type in Stimuli without Glides (IG)*

4.4. The Correlation Among the Three Tasks

In this section, I combined the results of the three tasks, and examined how the subjects' performances in each task correlate with the others. Possible combinations of the answers for each stimulus in the three tasks are the following.

A. the answers for all three tasks were incorrect.
B. the answer for the romanization task was incorrect but for the *hiragana* transcription task was correct.
C. the answer for the mora counting task was correct but the other two transcription tasks were incorrect.
D. the answer for the romanization task was correct but the hiragana transcription task was incorrect.
E. the answer for the mora counting task was incorrect but the transcription tasks were both correct.

In terms of the main effect that caused errors, I interpreted the case of combination A as a problem of perceiving mora units or the duration contrasts. It is because the inability to perceive duration contrasts caused the wrong recognition of a word, and thus the subjects could not transcribe the word in *romaji* or *hiragana*. The case of the combination B and C is considered to be a problem of romanization. In the case of the combination B, the subjects were able to transcribe in *hiragana* but not *romaji*, that is, the word recognition was correct but there was a problem with romanization. Similarly, the combination C indicates that the subjects were able to perceive the mora units correctly but they had trouble with transcribing. In terms of the effect on typing errors, this combination is also a problem of romanization. I interpreted the combinations

D and E as cases that do not have a direct effect on typing errors, since the answers for the romanization task were correct.

Figure 11 illustrates the ratio of each combination within each word type in the BG. The graphs do not include the percentage of answers that were correct in all three tasks. The axis of the graph corresponds to the combinations of the answers in the three tasks stated above. For the BG, they showed a problem of the perception of the duration contrasts for the stimuli with long vowels, but for the stimuli without long vowels, this was a minor problem. On the other hand, the problem of romanizaion had an effect on all of the word type stimuli, and the results of the present study indicate that the problem of romanization was the major cause of the errors.

As for the IG, the overall percentage of the each combination decreased due to the increase of the combination of all correct answers in the three tasks (see Figure 12). However, the tendency of the ratio of each combination is quite similar to that of the BG. Furthermore, although the ratio of the cases in which romanization is the problem is higher than the cases where the problem is the perception of the duration contrasts, the number of errors caused by the romanization problem decreased much more in the IG compared to the BG.

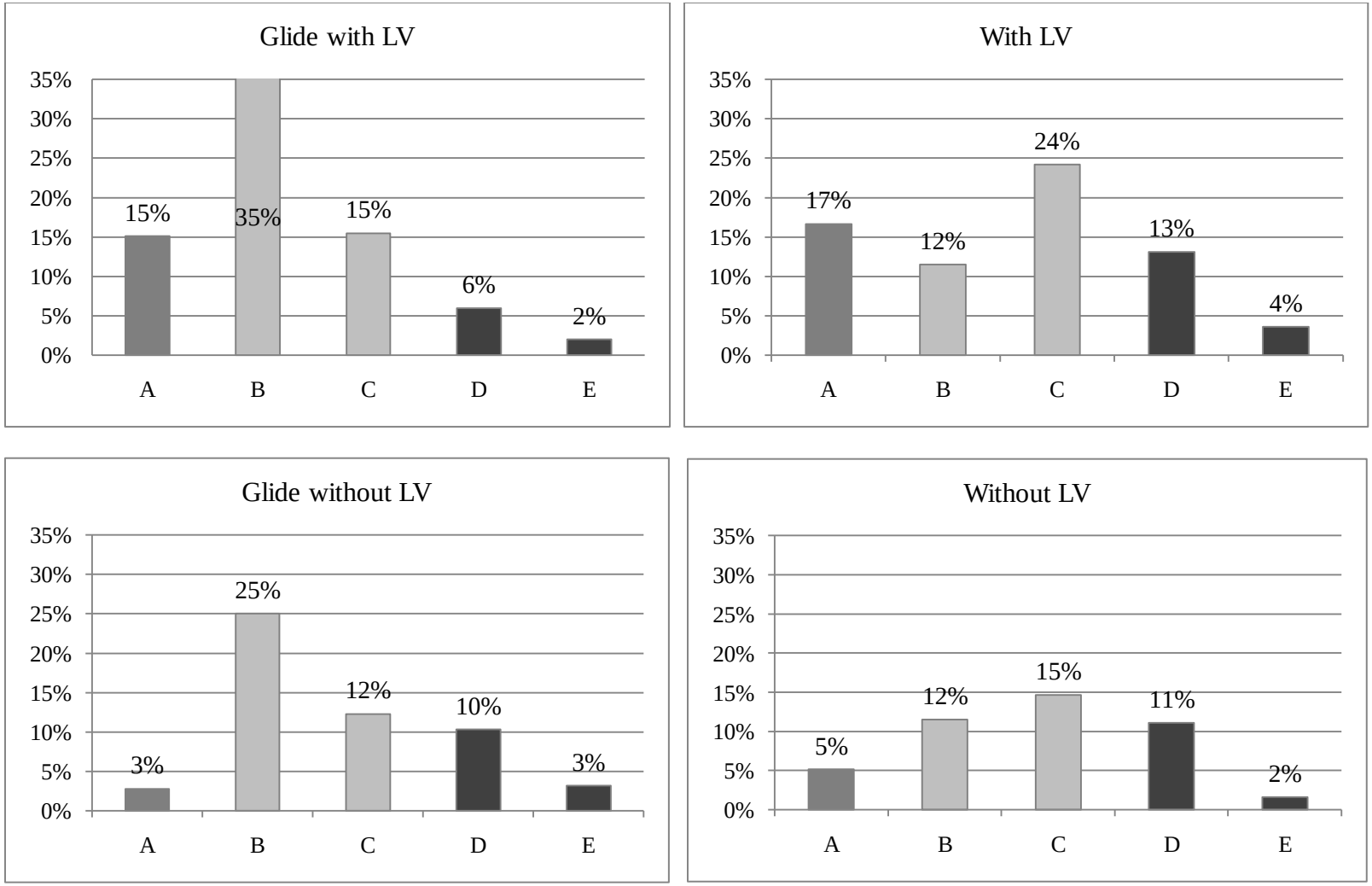

Figure 11 *The Percentage of Each Combination of the Three Tasks (BG)*

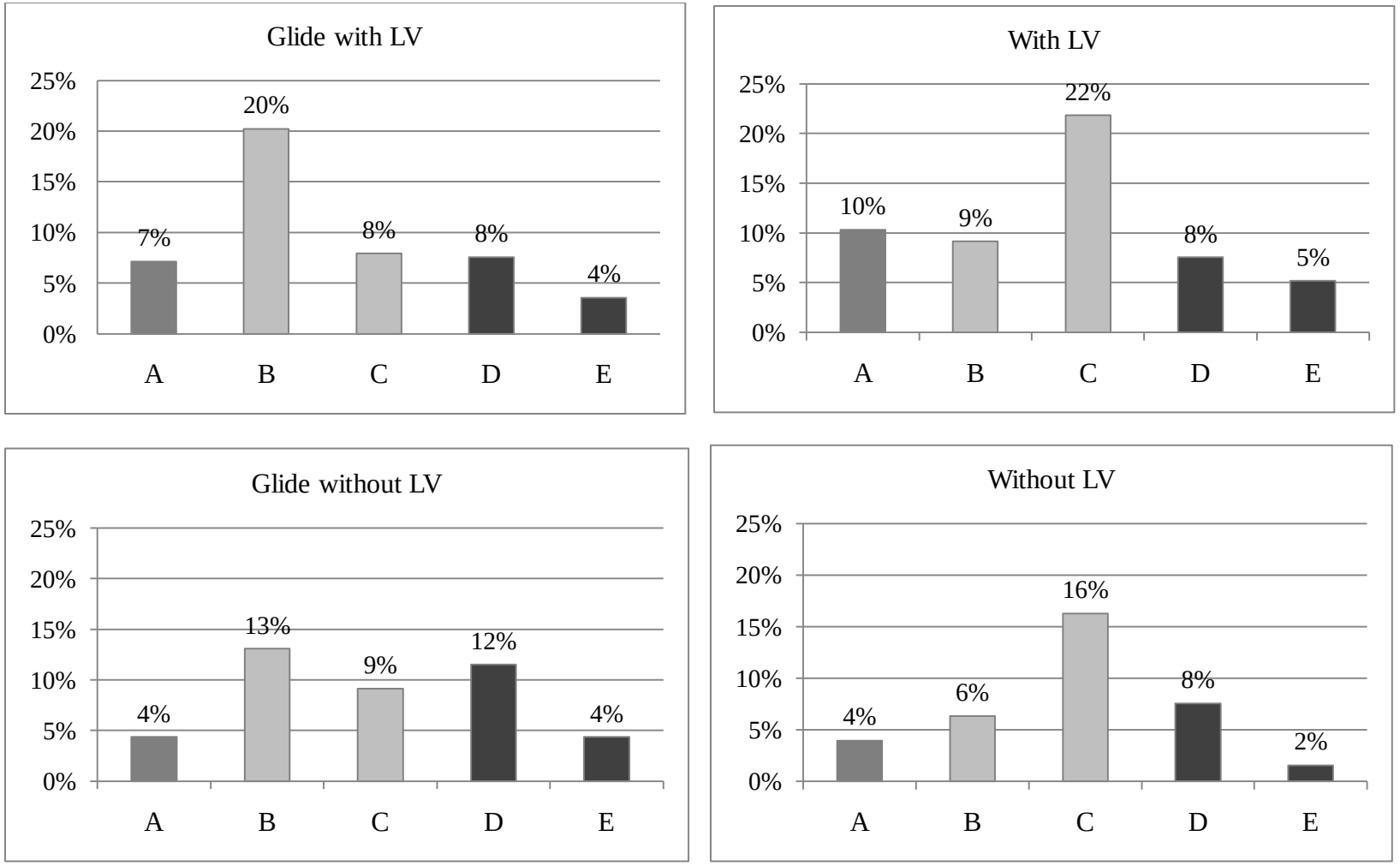

Figure 12 *The Percentage of Each Combination of the Three Tasks (IG)*

Chapter 5. Discussion and Conclusion

5.1. General Discussion

The first hypothesis "JFL learners make typing errors because they are unable to perceive Japanese duration contrasts" is true in limited cases. As mentioned in the previous chapter, when the subjects answered incorrectly in all three tasks, the problem is the perception of the duration contrasts. When the subjects got wrong answers in all three tasks, the problem tended to be the omission of long vowels. It implies that the failure to perceive a long vowel as double vowels or two morae caused the incorrect transcriptions. Therefore, the correlation between the perception of the duration contrasts and the typing errors seems to apply mostly for words with long vowels.

Although the subjects' capability of perceiving the duration contrasts seems to affect the accuracy of transcribing words with long vowels, the results showed that this would not be the most problematic issue with typing errors. Actually, in many cases, the accuracy of the perception of long vowels did not matter greatly to the *romaji* or *hiragana* transcription. That is, whether or not the subjects are able to perceive mora units does not necessarily correlate to the accuracy of the answers in the other two tasks. If mora is the biggest issue, correct perception of mora units will solve the problem of typing errors. In other words, based on this logic, as long as the perception of the duration contrasts is accurate, learners will be able to type Japanese words correctly. However, the results showed that this is not the case. Even when the subjects were able to segment a word into mora units, they were unable to transcribe the word in *romaji* or *hiragana* correctly. There were also cases where the mora counting task was incorrect,

but either or both of the transcription tasks were correct. These results suggest that the capability of perceiving the duration contrasts does not necessarily mean that one can romanize the word or transcribe it in *hiragana* correctly.

The results of these tasks also revealed the difficulty of acquiring the duration contrast for JFL learners. The accuracy rates of the mora counting task between BG and IG were not significantly different. In other words, the ability to perceive the duration contrasts does not improve greatly even with the advance of the subjects' proficiency level. Since it is difficult to improve one's mora perception skill, and also the perception of the duration contrasts does not seem to be the most influential cause of typing errors, developing one's perception of the duration contrasts is neither the fastest nor the most effective way to reduce typing errors in Japanese.

The second hypothesis "JFL learners make typing errors because they are unable to romanize Japanese words correctly" was true in all word types tested in the present study. This is the case where the subjects did not have problems with the mora counting task and/or the *hiragana* transcription task but had problems with the romanization task. There were two major error types in the answers of the romanization task. One was the omission of long vowels and the other was the spelling errors of *romaji*. First, as mentioned earlier, the omission of long vowels could occur because the learners do not recognize a long vowel as two mora units. However, there were cases where the subjects had correctly perceived a long vowel as two morae units, or they were able to transcribe long vowels in *hiragana*, but when the subjects transcribed the same words in *romaji* they omit long vowels. Therefore, the omission of long vowels in *romaji* does not necessary mean that the learners are not aware of the presence of the long vowel.

The influence of the ambiguity of romanizing long vowels in Japanese may be the cause of the omission of long vowels in *romaji*. Romanizing long vowels generally uses a circumflex "^" or a macron "¯" on top of the vowel that will be lengthened when it is pronounced, e.g., /kibô/ or /kibō/ "hopes," although it is written /kibou/ in *hiragana*. The present study specifically tested the *romaji* spelling that can input Japanese properly to computers, and thus it has to be the same as the spelling in *hiragana*. The difference between proper romanization and the romanization particularly for inputting Japanese to computers may have confused subjects who do not use the Japanese input method on computers frequently, though it is hard to conclude just by the results of the present study. Also, especially for proper nouns and Japanese loan words, the long vowels in Japanese are often ignored in alphabet notation. For example, the word *tofu* is /tōhu/ in *romaji* and /touhu/ in *hiragana*. The exclusion of the long vowel in English language electronic and print media could result in the conditioning of the JFL learners to believe that the long vowel is not particularly necessary. This might be a cause of omitting long vowels in romanization as well.

The romanization task was the only task in which the scores of the BG and the IG showed statistically significant difference. This result indicates that skills on romanizing Japanese improve as the learners' proficiency level advances. The questionnaire asked the frequency of the use of the Japanese input system on computers. Eighty percent of the IG said they used it a few times a week or almost every day, while over sixty percent of the BG said they used the system a few times a month or a few times a year. Therefore, the amount of experience using the Japanese input method also seems to correlate with the score difference between two groups.

In the romanization task, each learner group showed particular error types. Commonly seen errors in the BG were spelling errors of /shu/, /sho/, /cho/ (the *Hepburn* system) and long vowels. Many subjects in the BG wrote /shyo/, /shyu/ and /chyo/ although /y/ is not necessary. Because other glides such as /kya/ and /nya/ need /y/, I assume that beginners confused these two types and mixed them. These kinds of errors disappeared in the IG. It is probably because learners have studied from many error corrections they have experienced. The more opportunities learners have to type in Japanese, the more chances there are to encounter errors and mistakes.

As for spelling errors involving long vowels, some subjects spelled the long vowels but with incorrect letters. Frequently, the pronunciation of long vowels differs from the standard pronunciation of the letter. For example, the /u/ in *oubo* /o:bo/ "application" is a part of a long vowel, and although it is written /u/ in *hiragana*, it is pronounced as [o]. Similarly, the /i/ in *gokei* /goke:/ "word form" is pronounced as [e] though it is written /i/ in *hiragana*. It seems that learners tend to spell the way it sounds. The number of errors related to the transcription of vowels did not decrease as much as spelling errors of /shy*/ and /chy*/ did from beginner to intermediate. Some kind of instruction will be necessary to avoid these kinds of errors, even for learners who type in Japanese regularly.

5.2. Pedagogical Implications

The analysis of error types and the tendencies of each learner group suggest some ideas for effective instruction on how to input Japanese to computers. First of all, it will be more efficient to first learn about errors in romanization than duration contrasts to reduce typing errors. Secondly, instructors can prevent learners from making easily

avoidable errors by introducing common spelling errors in *romaji* such as "shyu*"and "chyo*." Instructors might explain the irregularity of the sound and the spelling of long vowels when such words are introduced in textbooks or in class, but this should be explained again when learners start typing Japanese on computers. Being aware of this irregularity will help learners correct errors by themselves.

Introducing common errors at the early stage of instruction in Japanese typing could effectively make learners aware and avoid those errors. Apparently, learners build their own strategy to avoid typing errors through their typing experience, but it takes time. I have asked some JFL learners from intermediate and advanced Japanese courses a question: what do you do if the converted kanji is not what you intend to type in? Most of the learners reported that they would try adding or dropping special morae such as long vowels and geminate consonants because usually that is the problem. Their responses imply that learners recognize the tendency of their typing errors, and they develop their own correction strategy. If they had received such information when they learned how to input Japanese to computers, they would be more sensitive about errors and would have been able to avoid various errors from a much earlier time. Typing practice of words that include elements that cause typing errors may facilitate the learners' improvement of Japanese typing skills.

5.3. Conclusion

Previous studies have claimed that JFL learners have difficulty with perceiving Japanese duration contrasts, and thus the present study examined whether or not this issue affects learners' skill of typing in Japanese. The present study, however, revealed that JFL learners have more problems with romanizing Japanese, and that this is an influential

cause of Japanese typing errors. It also investigated the relationship between learners' capability of romanizing Japanese and their typing errors. The three tasks: the mora counting task, the romanization task, and the *hiragana* transcription task explored the JFL learners' ability to perceive Japanese duration contrasts and their ability to use appropriate *romaji* for inputting Japanese to computers. The results suggest that the presence of a correlation between the problem of perceiving the duration contrasts and accurate Japanese input occurs when words include long vowels. The results also indicate that the difficulty of perceiving the duration contrast does not differ greatly between the BG and the IG.

On the other hand, there was a close relationship between romanization capability and accurate Japanese typing. This tendency was observed regardless of the presence of long vowels. Moreover, the results showed that the romanization problem decreased according to the increase of the experience of one's language study. In other words, the romanization problem affects a variety of word types, and it is easier to improve compared to the perceptional problem. Not many studies have examined the issue of romanization by JFL learners, but the present study clearly indicates that improving romanization skill is a faster and more efficient way to avoid Japanese typing errors. The results of the romanization task revealed some common mistakes and mostly these mistakes are avoidable by remembering the spelling system. Therefore, it is worth spending some time on those common mistakes in romanization in the introduction of the Japanese input method in class.

The present study investigated only the very beginning of the process of Japanese typing. Both perception and the romanization are processes in the learners' brain. In the

present study, the analysis of the results assumed that learners will type in exactly the same thing as they answered to the romanization task. Additional research is necessary to examine what factors will affect the process of physically typing letters on the keyboard, and also the learners' ability to correct errors by looking at the input on the computer screen. The present study compared different groups of learners, but in order to examine the true development of learners' ability, longitudinal study of one subject group would be more appropriate. Further investigation of typing errors will contribute to maximizing the benefit of computer use in Japanese learning.

REFERENCES

Arashi, Y. (2003). Articulation and awareness of syllabic morae in case of young children in hukaura. *Ryukoku International Center Research Bulletin, 12*, 3-11.

Chikamatsu, N. (1998). Development of communication skills through Japanese e-mail exchange. In Y. Watt (Ed.), *Proceedings of the 10th Conference of the Central Association of Teachers of Japanese* (pp. 119-25). Bloomington, IN: Indiana University.

Chikamatsu, N. (2003). The Effects of Computer Use on L2 Japanese Writing. *Foreign Language Annals*, 36(1): 114-127.

Cother, S. (2009). The Romaji capability of university students – a preliminary study. *Kagoshima studies in English literature,* 18: 41 -65

Eells, W. C. (1952). Language reform in Japan. *The Modern Language Journal*, 36(5), 210-213.

Enomoto, K. (1992). Interlanguage phonology: the perceptual development of duration contrasts by English-speaking learners of Japanese. *Edinburgh Working Papers in Applied Linguistics*, 3, 25-36.

Hatasa, Y. A., Makino, S., & Hatasa, K. (2000). *Nakama 2: Japanese communication, culture, context*. Boston: Houghton Mifflin Company.

Hatasa, Y. A., Hatasa, K., & Makino, S. (2009). *Nakama: Introductory Japanese-communication, culture, context*. Boston, MA: Houghton Mifflin Harcourt Pub.

Iwai, R. (1975). *方言と標準語*[Dialects and Standard Japanese]. (H. Oishi, & Y. Uemura, Eds.). Tokyo: Chikuma Shobō.

Kubozono, H. (1985). Speech errors and syllable structure. *Linguistics and Philology* 6, 220-243.

Kubozono, H. (1989). The mora and syllable structure in Japanese: Evidence from speech errors. *Language & Speech*, *32*(3), 249-278. Retrieved from Communication & Mass Media Complete database.

Kubozono, H. (1995). 語形成と音韻構造 [Word formation and phonological structure]. Tokyo: Kuroshio

Makino, S., Hatasa, Y. A., & Hatasa, K. (1998). *Nakama 1: Japanese communication, culture, context*. Boston: Houghton Mifflin.

Minagawa, Y. (1995). 日本語学習者における長音知覚の諸要因―英語・韓国語話者の場合― [Factors for the perception of long vowels by learners of Japanese: the case of English and Korean native speakers]. *平成7年度日本音声学会全国大会予稿集* [Proceedings of the 9th conference of the Phonetic Society of Japan], 52-57.

Minagawa, Y. (1997) 長音・短音の識別におけるアクセント型と子音種の要因―韓国・タイ・中国・英・西語母語話者の場合 [The influence of accent patterns and consonant types in the discrimination of Japanese short-long contrasts: the case of Korean, Thai, Chinese, English and Spanish native speakers]. *平成9年度日本教育学会春季大会予稿集* [Proceedings of the 56th conference of the Japanese Educational Research Association], 123-128.

Muroi, K. (1995). Problems of Perception and Production of Japanese Morae: The Case of Native English Speakers. *Sophia Linguistica,* 38, 41-60.

Oguma, R. (2000). Perception of Japanese Long Vowels and Short Vowels by English – Speaking Learners. *Japanese Language Education around the Globe*. 10, 43-55.

Oguma, R. (2006). Acquisition process of Japanese long vowels and short vowels by learners-observed in the vernacular style speech. *Sophia Linguistica : Working Papers in Linguistics, 54*, 193-205.

Otomo, K., & Hirayama, M. (2007). Relationships between writing of special moras and phonological awareness in Japanese children: An examination employing phonological awareness tasks. *Center for the Research and Support of Educational Practice:Bulletin, 3*, 93-99.

Pennington, M. (1996). *Computer and the non-native writer: A natural partnership*. Cresskill, NJ: Hampton Press.

Reischauer, E. O. (1940). Rōmaji or Rōmazi. *Journal of the American Oriental Society*, 60(1), 82-89

ローマ字のつづり方 [How to spell in *romaji*]. (n.d.). The Agency for Cultural Affairs. Retrieved April 29, 2010, from http://www.bunka.go.jp/kokugo/main.asp?fl =list&id=1000003935&clc=10000000

ローマ字入力派は 9 割、カナ入力派は 1 割―タイピングに関する調査 [The *romaji* input method users account for 90 percent and the kana input method users account for ten percent: a survey on typing]. (June 11, 2008). In japan.internet.com. Retrieved April 29, 2010, from http://japan.internet.com/ research/20090611/1.html

Shibata, T. (1962). On'in. In Kokugo Gakkai (ed.) *Hoogengaku Gaisetsu*. Tokyo: Musashino-shoin.

Shibatani, M. (1990). *The Language of Japan*. Cambridge; New York: Cambridge University Press.

Toda, T. (1998a). Perceptual Categorizationn of the Durational Contrasts by Japanese Learners. *Studies in language and literature. Language*, 33, 65-82.

Toda, T. (1998b). The mora and interlanguage syllable structure. *Journal of Japanese Language Teaching*, *13*, 23-45.

Toda, T. (2003). Acquisition of special morae in Japanese as a second language. *Onsei Kenkyu*, *7*(2), 72-83.

Tsujimura, N. (2007). *An introduction to Japanese linguistics*. Blackwell Textbooks in Linguistics. Malden, MA: Blackwell Pub.

Warschauer, M. (1995). *Computer-mediated collaborative learning: Theory and practice* (NFLRC Research Notes No. 17). Honolulu: University of Hawaii, Second Language Teaching and Curriculum Center.

Warschauer, M. (1996). *Motivational aspects of using computers for writing and communication* (NFLRC Net Work No. 1). Honolulu: University of Hawaii, Second Language Teaching and Curriculum Center.

Yamada, J., & Leong, C. K. (2005). Differential reading, naming and transcribing speeds of Japanese romaji and hiragana. *Reading and Writing*, 18(4): 303-23.

APPENDIX A

Word List

Hiragana	*Romaji*	Meaning	Mora units	*Hiragana*	*Romaji*	Meaning	Mora units
With Glides							
いしょう	ishou	costume	3	いしょ	isho	testament	2
かいしょう	kaishou	cancellation	4	かいしょ	kaisho	block style	3
どうきょう	doukyou	the same town	4	どうきょ	doukyo	living together	3
じょしゅう	joshuu	a female prisoner	3	じょしゅ	jyoshu	assistant	2
きょうじゅう	kyoujuu	relative importance	4	きょうじゅ	kyouju	professor	3
きゅうしゅう	kyuushuu	absorption	4	きゅうしゅ	kyuushu	pitches	3
じょうそう	jousou	upper layer	4	じょそう	josou	runup	3
きょうがく	kyougaku	astonishment	4	きょがく	kyogaku	huge amount	3
ちょうめい	choumei	town name	4	ちょめい	chomei	famous	3
しゅうとく	shuutoku	acquisition	4	しゅとく	shutoku	accession	3
しゅうかく	shuukaku	harvest	4	しゅかく	shukaku	nominative	3
しゅうせき	shuuseki	accumulation	4	しゅせき	shuseki	chief	3
Without Glides							
じこう	jikou	item	4	じこ	jiko	accident	3
おうぼう	oubou	high-handedness	3	おうぼ	oubo	application	2
すくう	sukuu	to rescue	4	すく	suku	to become empty	3
しきい	shikii	doorsill	3	しき	shiki	ceremony	2
いえい	iei	photograph of a deceased person	4	いえ	ie	house	3

Word List (continued)

Hiragana	Romaji	Meaning	Mora units	Hiragana	Romaji	Meaning	Mora units
たいこう	taikou	rivalry	4	たいこ	taiko	drum	3
せいだい	seidai	big	3	せだい	sedai	generation	2
こおり	koori	ice	4	こり	kori	stiffness	3
せいそう	seisou	cleaning	3	せそう	sesou	social conditions	2
おおう	oou	to cover	3	おう	ou	to chase	2
ごうけい	goukei	total	4	ごけい	gokei	word form	3
とうこう	toukou	posting	3	とこう	tokou	voyage	2
Distracters							
さ	sa	difference	1				
わ	wa	harmony	1				
いちじてき	ichijiteki	temporary	5				
やきざかな	yakizakana	grilled fish	5				
えいようし	eiyoushi	nutritionist	5				
きばくざい	kibakuzai	triggering explosive	5				
だいだいいろ	daidaiiro	orange color	6				
こうけつあつ	kouketsuatu	high blood pressure	6				
くびかざり	kubikazari	necklace	5				
くるまえび	kurumaebi	tiger prawn	5				
まちあいしつ	machiaishitsu	waiting room	6				
はつめいか	hatsumeika	inventor	5				

APPENDIX B

Background Questionnaire

1) Gender: Male Female

2) Age: – 19 20 – 24 25 – 29 30 – 34 35 – 39 40 –

3) Native language: English Other _____

4) Language(s) that you know other than your native language.

5) Proficiency level of the language(s): beginner intermediate advanced

6) How long have you been studying Japanese?

7) Which Japanese language courses have you taken at KU?

   JPN 104 108 204 208 306 310 504 508 562 564 598 690

8) Have you lived in Japan? Yes No

   If yes, when and for how long?

9) Have you used Japanese language in the following activities? (select all that apply):

   Writing essays in Japanese E-mail Online Chat Internet Search

   Facebook/Mixi Blog Consulting online dictionaries

10) Do you know how to type Japanese characters on a computer? Yes No

11) How comfortable are you to type in Japanese on a computer?

   very uncomfortable uncomfortable neutral comfortable very comfortable

12) If yes, how did you learn how to type Japanese characters on a computer?

   Class instruction Self-taught Other _____

13) How often do you write in Japanese on a computer?

   Never Almost every day A few times a week A few times a month

   A few times a year

14) Which one did you think was easier as a task, transcribing in *hiragana* or in *romaji*?