L1 ENGLISH VOCALIC TRANSFER IN L2 JAPANESE

by

KENNETH JEFFREY KNIGHT

(Under the Direction of Don R. McCreary)

ABSTRACT

This study looks at four factors that cause transfer errors in the duration and quality of vowel sounds in Japanese as spoken by native English speaking learners. These factors are: 1) words contain a contrastive long vowel, 2) words contain vowels in hiatal position, 3) words are English loanwords, and 4) words are written in Romanization. 34 students at the University of Georgia completed elicited imitation and reading aloud tasks. Results show that roughly 5% of all responses contained vocalic errors. Error rates were highest for minimal pairs that contrast only in vowel length. Similarities in orthography, word origin, and differences in phonological rules were shown to be significant factors in L2 Japanese vowel pronunciation error. A brief survey of the most widely used Japanese textbooks in the US reveals a lack of explicit instruction in vowel length contrasts and Japanese loanword adaptation. Increased explicit instruction in these areas as well as limited use of Romanization may greatly reduce the risk of L2 Japanese vowel pronunciation error.

INDEX WORDS: Transfer; Interference; Japanese as a Foreign Language; English; Vowel; Duration; Second Language Acquisition

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DEDICATION

I dedicate this work to the memory of my Father, Kenneth David Knight, to whom I promised its conclusion. May his soul find eternal peace and joy!

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This work owes its existence to Dr. Don McCreary, who shaped my studies from the moment I entered the Linguistics program at the University of Georgia until the moment I sent him my final version of this dissertation. I am sorely and eternally indebted to him for all of his thoughts, comments and questions. His boundless knowledge of SLA and Japanese brightened the path during this process. Dr. Keith Langston also offered countless hours poring over my work and sending me invaluable suggestions related to phonology, SLA and content. In addition, Dr. Jonathan Evans selflessly gave of his time and wisdom in all of the exam preparation and offered wonderful advice throughout, even into the defense. Dr. Gary Baker's knowledge of phonetics and phonology as well as his keen interest in Japanese gave solidity to many of the early ideas expressed in pursuit of the perfect topic. I am forever grateful for all of the time and effort these men have offered me and my family in working to complete this life-changing work.

I cannot begin to describe the sacrifices my family has made during this endeavor. I am grateful to my wife, Hitomi, and my son, Andy, as well as my mother, Patricia, who all gave deeply so that this work may be completed. I owe you all a great deal and will continue to repay you as long as I live.

PREFACE

Japan and the United States each display great dialectal diversity. However, the media and education systems of both countries have played a large role in creating standard dialects respective to each country that are immediately understood and generally regarded as the primary dialect of business and formal interaction by the majority of the population and especially younger generations. In Japan this dialect is known as 共通語 (kyoutsuugo, 'common language'). This is the variety normally taught to foreign learners of Japanese both inside and outside of Japan. Modern Standard Japanese (SJ) is based on the speaking style of educated, middle-class residents of Tokyo. (Shibatani 1990:186) Vance refers to a relatively standard dialect of American English used in the United States (SAE) as "United States newscaster English." (2008:XVIII) These are the varieties of Japanese and English that are used in this study and are referred to merely as "Japanese" and "English." Japanese Romanization, when necessary, is given in the Hepburn system.[1]

[1] See Vance 2008a for specific arguments against using the kunrei system with loanwords.

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CHAPTER 1

INTRODUCTION

The Japanese language has received a great deal of attention by linguists since the beginning of the last century. Its unique phonotactic system and highly agglutinating nature make it a favorite for phonologists and syntacticians alike. Amid this backdrop of interest in the structure and sounds of the language, little emphasis has been placed on the acquisition of Japanese as a second language. The studies that have been done have focused primarily on methods of classroom instruction and learner literacy. However, Japanese is widely regarded as a language in which it is difficult to gain fluency as an adult learner and one basic aspect of fluency is pronunciation. A lack of awareness of pronunciation among students as well as a lack of educator training in pronunciation will result in continued poor pronunciation, often resulting in incomprehensibility. This study aims to shed light on one aspect of pronunciation in second language Japanese learning, vowel sounds, so that both learners and educators may be better aware of the role of phonology in second language (L2) Japanese and areas in which pronunciation error is most likely to occur.

Purpose of This Study

This study seeks to identify factors which cause native speakers of English learning Japanese as a foreign language (JFL) to apply English phonetic or phonological rules related to

the duration and height of vowels when speaking Japanese. Transfer of first language (L1) forms into a second language (L2) when learning or using the L2 is a widely studied phenomenon. The research conducted in this study aims to identify whether L2 Japanese phonological rules related to contrastive vowel length, phonotactic rules regarding vowels occurring in hiatus, orthography, and loanword usage play a significant role in frequently observed transfer-related errors in vowel quantity.

Expected Results

In this study native English speaking non-native speaker (NNS) learners of Japanese are recorded repeating short phrases that they hear on headphones and reading short phrases aloud from a computer screen. Phonological differences in the English and Japanese languages, as well as the usage of English loanwords and Romanization, which is identical to the script used to write English, are expected to result in transfer from L1 English in L2 Japanese production. Japanese phonemically contrasts long and short vowels in a way that English does not, which will likely cause vowel length errors. Vowels that usually only occur as diphthongs in English occur in hiatus in Japanese. Vowels occurring in hiatus are expected to result in errors due to transfer of English phonotactic rules. Further transfer is expected based on the general difficulty in adapting English loanwords into Japanese due to a lack of implicit learner awareness of the rules of Japanese loanword adaptation (LWA). Japanese written in Romanization, which makes use of the same script as the English language, is also expected to increase the likelihood of errors due to transfer of material from English.

Japanese and English Vowel Sounds

The Japanese language has far fewer vowels in its phonemic inventory than the English language. Native English speakers must limit the vowels they use when speaking Japanese. Differences in vowel inventories appear not only in the number of vowels, but also in the quality of vowels present. Vance (2008b) describes ten distinct and contrastive vowels in Standard American English. Figure 1.1 shows a reproduction of his vowel-area diagram of the vowels of SAE (2008b:10). In contrast Standard Japanese has only five distinct short vowels, which Vance illustrates as in Figure 1.2 (2008b:54).

Figure 1.1 The Vowels of American English (Vance 2008b)

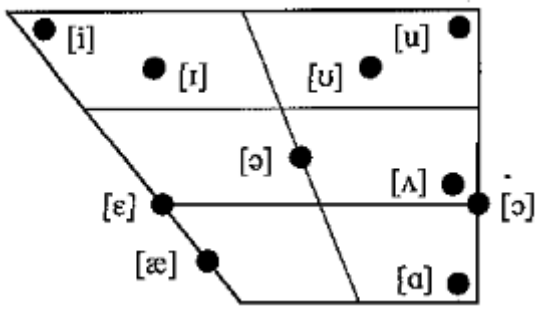
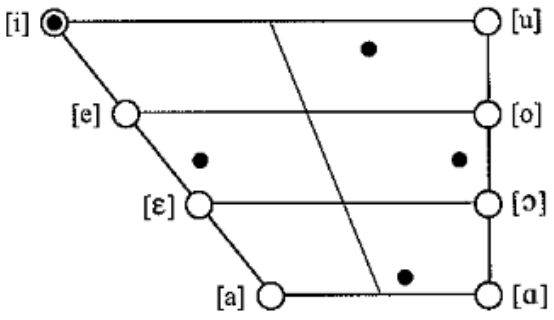


Figure 1.2 The Vowels of Standard Japanese (Vance 2008b)



Japanese vowels (•) in vowel space delimited by cardinal vowels (○)

Vance explains that the Japanese unrounded high front vowel [i] is identical to the cardinal vowel [i] and essentially the same as English [i]. The Japanese unrounded mid front vowel [e] is pronounced slightly lower than IPA [e] and thus Vance describes this as [e̞]. In this study we will transcribe this simply as [e]. The Japanese low back vowel [a] is positioned between [a] and [ɑ]. Vance transcribes this phonetically as [ɑ̟]. In this study this vowel will be transcribed as [a]. The Japanese "weakly rounded" mid back vowel [o] is positioned lower than IPA [o] and may be transcribed as [o̞]. We will transcribe this as [o] in this study. The Japanese high back vowel [u] displays lip compression, which is often described as unroundedness and thus conveniently transcribed as [ɯ] (2008:53-5). The current study also maintains this orthographic convention.

Japanese Vowels in Hiatus

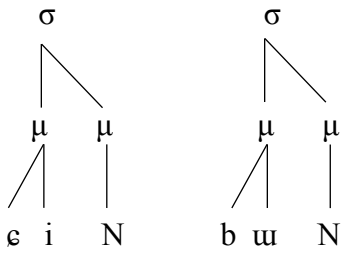
One large difference between the Japanese and English languages is the fact that vowels occur in hiatus (as two distinct segments) in Japanese, when these same vowels would often occur as diphthongs in English. This means that each vowel sound is fully pronounced in vowels occurring next to each other. In order to understand why these vowels occur in hiatus it is first important to understand the timing system of Japanese.

The moraic theory

In metrical phonology vowels are always weighted and segments in the coda position (of closed syllables) may also project a mora in certain languages. Therefore, only segments in the rime of a syllable are weight -bearing. Onsets are not counted as having syllable weight on their own and simply form part of the mora created by the vowel sound that follows them. Syllable weight and moraic structure are to a certain extent language specific (Hayes, 1989:255). In Japanese these include vowels and the moraic nasal (/N/) as well as the first member of a

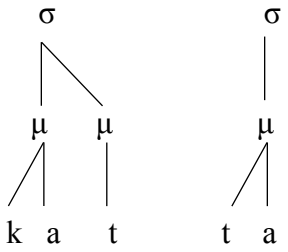
geminate obstruent. Shibatani reveals that moraic theory, as applied to the Japanese language, results in the idea of a mora as a "unit that can be represented by one letter of kana[2] and functions as the rhythmic unit in the composition of Japanese poems, e.g. waka and haiku" (1990:158). As mentioned above, Japanese only contains one non-vocalic phoneme /N/ which is always counted as a mora. This segment only appears at the end of a syllable and is homorganic with a following obstruent. Thus the word [ɕiN.bɯN] 'newspaper' contains two syllables, but four moras, as is shown in figure 1.3 below.

Figure 1.3 Moras and syllables in the word [ɕiN.bɯN] 'newspaper'



In addition to the moraic nasal, geminates may form heavy syllables. The first member of a geminate consonant acts as a mora, as is shown in Figure 1.4 below, to form a heavy syllable. This geminate is also viewed by some linguists as an ambimoraic long consonant.

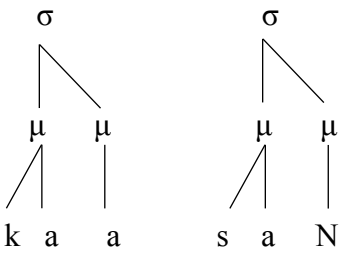
Figure 1.4 Moras and syllables in the word [kat.ta] 'bought'



[2] See the section below on Japanese Orthography for a detailed description of kana.

A long vowel also obtains as two moras, as is described in Figure 1.5. This is sometimes alternately described as a vowel that carries the weight of two moras. Phonemically, however, it is seen as two distinct vowels, which is further discussed below.

Figure 1.5 Moras and syllables in the word [kaa.saN] 'mom'



Moras and the Pitch-accent system

The Japanese language relies on a system of high and low pitch assigned across a lexical word (including any necessary grammatical particle). Hattori (1951) describes this pitch assignment in terms of lexically accented and unaccented words. The "accent" is a marker for the place at which tonal inflection occurs. The high tone is considered the "accented" tone and the low tone the default tone. In lexically accented words the accented mora is lexically designated. Shibatani lists three main patterns of pitch assignment for unaccented words: an Eastern, a Western and a Central pattern (1990:177-184). Shibatani sums up McCawley's 1968 definition of the Eastern (Standard Japanese) method of pitch accent assignment as follows:

a. Assign high pitch to all moras.

b. Assign low pitch to all moras following the accent (when there is a lexical accent).

c. Assign low pitch to the first mora if the second mora is high pitched. (1990:179)

The complicated pitch-accent system relies on the moraic nature of the Japanese language.

Accentuation of moras may affect the meaning of a word. This pattern even obtains across word boundaries as the tone of the postpositional particle may also be affected, as in the example below:

L H L	L H H
[ha.na ga] ‘flower NOM’	[ha.na ga] ‘nose NOM’ (Shibatani 1990:179)[3]

In this example we note that the word for ‘flower’ carries lexical accent, whereas the word for ‘nose’ does not. McCawley’s rules, as listed above, clearly show how tone is assigned in each case. Long vowels appear phonemically as two moras. Tone changes may occur across a single long vowel acting as two moras.

LH	HL
[i:] ‘say’	[i:] ‘good’

Changes in tone also occur across mora boundaries in words in which vowels appear in hiatus:

L H H	H L L
[ka.e.ɾɯ] ‘to change’	[ka.e.ɾɯ] ‘to return home’

In this way minimal pairs are often contrasted only by pitch. It is therefore essential to delineate vowel boundaries, even in words with long vowels. For this reason each vowel sound of the Japanese language is, phonemically (and in careful speech), distinct from any surrounding vowel sound. This means that phonemically all vowels are distinct (monophthongal) segments and that diphthongization does not occur.[4] There are a large number of common Japanese words containing vowels occurring in hiatus; for example, [aoi] ‘blue’, [hai] ‘yes’, [ɯe] ‘up[above’, [ie] ‘house’, and [i:e] ‘no’.

[3] All pitch-accent examples are from the Tokyo dialect.
[4] Vowel quality may be altered due to devoicing or fast speech. For more see Vance 2008b.

Japanese Vowel Duration

Vowel duration can be viewed in various ways: light syllables may be contrasted with heavy syllables; singletons may be contrasted with geminates; and short vowels may be compared with long vowels. English is quantity sensitive; however, quantity and quality are more closely related than in Japanese, which seems to rely only on durational distinctions to define quantity[5]. In English vowels vary in intrinsic duration and duration may depend on context (House, 1961; Chomsky and Halle, 1968; Hillenbrand et al., 2000). English includes phonological processes for the lengthening of vowels that precede voiced obstruents (e.g. the length of [æ] in 'sag' and 'sack') as well as lengthening of vowels in stressed syllables. However, unlike in English, segmental duration is phonemically contrastive in the Japanese language and directly indicates word meaning (Hirata, 2004; Hirata and Tsukada, 2009; Idemaru and Guion, 2008; Idemaru and Guion-Anderson, 2010; Shibatani, 1990; Vance, 1987, 2008). In this way gemination of obstruents can create minimal pairs:

[kit:e] 'cut (imperative)' [kite] 'come (imperative)'

Vowel length is similarly contrastive, as shown by the following examples:[6]

[kite]	'come (imperative)'	[ki:te]	'listen (imperative)'
[ka]	'mosquito'	[ka:]	'mother'
[ki]	'tree'	[ki:] (hantoo)	'Kii (peninsula)'
[kɯ]	'ward'	[kɯ:]	'eat'
[kesɯ]	'(to) delete[erase'	[ke:sɯ]	'case'
[ko]	'child'	[ko:]	'in this way'

[5] See the Literature Review below for more on the lack of reliance on quality in defining Japanese vowel length.
[6] Japanese short and long vowels differ only in length, not in quality (Vance 2008b:56).

Long lists of possible sets of minimal pairs or near minimal pairs are possible. Here is one list of near minimal pairs based on the phonemes /kite/:

[kit:e]	‘cut (imperative)’	切って
[ki t:e]	‘tree QUOT’	木って
[kite]	‘come (imperative)’	来て
[ki:te]	‘listen (imperative)’	聞いて
[ki:t:e]	‘Kii (area) QUOT’	紀伊って
[kite:]	‘regulations’	規定

It has been shown that Japanese long vowels are phonetically not realized as geminate vowels, which implies a doubling of the length of the vowel, but are in fact simply longer than short vowels. Vance reveals that Japanese long vowels often have an average length of roughly 1.5 times that of short vowels (1987:63). For this reason it is preferable to refer to the Japanese vowel length contrast in terms of long and short vowels, although, as the phonemically-representative kana writing system as well as the pitch-accent system clearly demonstrate, these are phonemically viewed as multiple segments by native Japanese speakers. Kindaichi proposed the additional phoneme [R] to represent the moraic nature of the long vowel (1950:62). However, for our purposes we will simply use the length mark [:], as used in IPA transcription, to simplify reading for those not familiar with the Japanese system of transcription.

Japanese Orthography

The Japanese language relies on four writing systems to represent the sounds of the language. The oldest written records of the Japanese language date back to the eighth century and include the kojiki (Record of Ancient Matters), written completely in characters (known as "kanji") borrowed from the various Chinese languages that Japanese people came into contact with at the time (Shibatani 1990:125). It is difficult to establish how these characters were read, but over time they have been standardized, added to and simplified, such that they form a set of characters that offer a semantic representation of Japanese words (or portions of words) and phonetic clues towards the reading of a word. In the Heian period these characters were simplified into two independent systems phonetically representing the sounds of the language: "hiragana", which is used to write words of native Japanese origin, and "katakana", which is used to write more recent loanwords. Most recently systems of Romanization have been introduced; the most popular of these being the Hepburn system.[7] These systems are used in conjunction with each other and "though the domains of their use are fairly distinct …sometimes all these four ways of writing can be found in one sentence" (Shibatani 1990:129). An example of this might be:

博之さん	は	アメリカ**人**の*OL*	と	**付き合**っています。[8]
Hiroyuki-Mr./Ms.	TOP	American office worker	with	is dating.

Hiroyuki is dating an American girl who works in an office.

[7] This is the system used for all Romanized examples in this study.
[8] Kanji are written in bold letters; katakana are underlined; Romanization is italicized; all others are hiragana.

Note that the word OL ("office lady") is written in Romanization. This is typical of acronyms composed of loanwords. Romanization is also used throughout Japan on public signs and buildings as well as in the education system in teaching foreign languages to native Japanese speakers and in teaching Japanese as a second language. Although commonly taught in schools, native Japanese speakers generally have some difficulty applying Romanization to their own language and identify it as a tool for the study and pronunciation of foreign languages.

Loanwords in Japanese

The Japanese language has imported large numbers of loanwords, especially from English, over the last century. The vast majority of these have been technology-related; however, the commitment to providing young people the opportunity to learn English at increasingly early ages and increase their ostensible value in the workplace has led to an ability among high school graduates to recognize hundreds of English words of all kinds. Almost all of these words are presented in a classroom setting by non-native English speaking Japanese instructors whose pronunciation is based almost entirely on the katakana representations of the English words included in the curriculum. Teacher and student reliance on katakana, the writing system used to represent foreign words, has led to a fundamental inability to reproduce English words as they are pronounced by native English speakers. As they are understood by a large section of the population these words often remain semi-loanwords, utilized only for emphasis.

The mass increase in the study of English words among Japanese has led to the increase in "Japanese" words originating in English. A review of recent dictionaries of Japanese loanwords reveals that they may contain upwards of 15,000 entries. Each of these words has been phonologically adapted to meet the requirements of the Japanese phonological system.

Japanese does not contain all of the phonemes of English ([f], [l], [θ], [ð], etc.) and contains phonemes that do not exist in English ([ç], [ɛ], [ɸ], [ɽ], etc.). In adapting these foreign words, the phonetically closest phonemes occurring in the Japanese language replace English phonemes that do not occur in Japanese. Phonologically Japanese also does not allow any complex syllable onsets or codas. All syllables must end in a vowel or a homorganic moraic nasal, except in the case of gemination. Syllable types in Japanese include the following: V, CV, CVV, CVN, and CVQ.[9] In the case of complex onsets or codas, Japanese loanword adaptation (LWA) requires either the deletion or the insertion of a segment in order to adhere to Japanese rules regarding syllable structure. Paradis and LaCharite offer four principles that may guide the way in which segments are deleted or inserted:

a. The Preservation Principle requires segments in the source word (i.e. English loanword) to be maximally preserved. This principle favors segmental insertion over deletion. For example:

'ski' [ski] > [suki:] *[si:], *[ki:]

b. The Minimality Principle says that violations of TL phonological constraints should be repaired at the lowest level and with the least steps. For example, Japanese has no phoneme [θ], so [s] or [t] may be substituted for [θ] in English loanwords. Adapting [θ] > [s] requires fewer steps than [θ] > [t] as articulating [t] requires not only a shift in place of articulation from inter-dental to alveolar, but also requires a change from [+cont] to [-cont].

c. The Precedence Convention requires repair strategies to occur at the lowest phonological level

[9] Phoneme /Q/ represents the initial member of a geminate obstruent. Q is not really a phoneme -- it's merely a symbol conventionally used to represent any consonant that is the first part of a geminate cluster

to which the violated constraint refers. As Japanese does not have voiced labiodental phoneme [V], the violation is at the place node and thus another labial is chosen [β] as it also shares the [+voice] and [+cont] features.

d. The Threshold Principle states that if more than two changes are needed, a segment is deleted (Paradis and LaCharite, 1997:384-6). One example of this principle being applied to Japanese LWA is in the word 'pudding', adapted as [pɯɾɪɴ]. The final velar obstruent [ŋ] in 'pudding' is simply replaced with a moraic nasal, which requires fewer steps than inserting a voiced velar and an epenthetic vowel, which would likely produce [pɯɾingɯ], the syllables of which still conform to Japanese phonological rules.

CHAPTER 2

LITERATURE REVIEW

This review of literature begins by discussing theories regarding transfer. It then continues on to examine research on vowel duration in L1 English and L1 Japanese as well as in L2 English and L2 Japanese. Research on vowel features in second languages, including Japanese, is discussed next. This is followed by a discussion of research on transfer in L2 Japanese. Finally, studies on the effects of Romanization on L2 Japanese as well as research on loanword adaptation are examined. Very little research has been done on phonology as it relates to Japanese as a Foreign Language. What research has been done is discussed below.

Many of the concepts presented in this study have long histories of scholarship, most taking place during the latter half of the twentieth century. Here we present information on some of the most well-known of these studies. A great deal of research has been done on transfer as well as vowel duration and quality, however, very little work has been done on the study of Japanese as a Foreign Language. Transfer is the phenomenon that forms the core of the present study so we will begin with a look at transfer and how similarity plays a role in transfer.

Similarity and Transfer

Second language acquisition generally refers to any language acquisition after a first language has been learned. In language learning, knowledge gained in learning one language is often transferred to a new language. Han (2004) defines 'transfer' as a unidirectional influence

that the first language (L1) makes on the interlanguage (IL), which is the language of the learner attempting to acquire an L2. This transfer of knowledge or learning strategies is termed positive transfer if existing knowledge overlaps with material in the target language (TL) or negative transfer if existing L1 knowledge structures transferred do not resemble those of the TL and interfere with language learning. There are limitless examples of positive transfer, in which an identical item is transferred into the L2. Phonemes that exist in both the L1 and the TL are all susceptible to positive transfer and may not even be recognized as transferred material.[10] One example of negative transfer is in the case of L1 German learners of English who tend to negatively transfer German phonological rules related to final devoicing:

buzz [bas]

hand [hant]

Japanese learners of English also tend to epenthesize English words applying Japanese phonotactic rules:

McDonald's [makudonarudo]

In an early attempt to characterize transfer, the Behaviorists of the 1950's, including Robert Lado, proposed the Contrastive Analysis Hypothesis (CAH), which claimed that errors made in the L2 were completely due to L1 transfer and predicted that the errors an L2 learner would make were based solely on the differences in their NL and L2. In the 1970's Error Analysis considered actual learner errors and allowed for errors based on developmental influences, etc.; it did not look at those made from transfer. This weaker explanatory version of the CAH is still widely used to explain transfer without predicting specific errors that do not always occur in

[10] As we will see below, however, similar, but not identical, items in the L1 may undergo negative transfer.

actual learner production (Gass and Selinker, 2008:97). The current study also relies on Error Analysis to determine what factors might be causing reported errors in L2 vowel production.

One cause of transfer from the L1 to the L2 is thought to be similarity between material in the L1 and the L2. Often L2 learners cannot differentiate between existing L1 phonemes and new L2 phonemes. Nathan (2008) relates that "phonemes are mental categories of groups of sounds which native speakers treat as equivalent…(and) when a (second) language learner…hears a sound in a second language s[he perceives it as belonging to the category it is a member of in the first language." In order to describe the confusion resulting from phonemic miscategorization, Flege (Strange et al. 1992) proposed the Speech Learning Model (SLM), which claims that L2 sounds that are similar or equivalent to L1 sounds are more difficult to learn because the learner does not perceive or classify these sounds as different and therefore makes no new category of contrast (COC) for these new sounds, instead placing them in existing L1 sound categories. As a learner acquires an L2, existing L1 sound categories determine how the learner perceives L2 sounds. L2 sounds may be: 1) new, 2) similar, or 3) identical to L1 sounds. The degree of similarity or dissimilarity determines if a) new categories are established or b) equivalence classifications between L1 and L2 sounds are made.

The SLM predicts how L1 English speakers should perceive and categorize L2 Japanese vowels. L2 Japanese vowels perceived as similar or identical to L1 English vowels are predicted to be categorized as identical to their English counterparts and pronounced identically to English vowels. This prediction may be made in regards to vowel duration (long vowels vs. short vowels) and vowel quality (rounded vowels vs. unrounded vowels). For native English speakers it is often difficult to distinguish between vowel lengths and also between features that result in differences in vowel quality. The unroundedness of the Japanese high back vowel and pursing of

Japanese high front vowel often go unnoticed by native English speakers. This often results in a strong foreign accent by the beginning learner. Some examples in which similar vowel pronunciations cause a noticeable accent are:

'come' [kɯrɯ] > *[kuru] (rounded [u])

'day' [hi] > *[hi] (without lip pursing)

It is also difficult for learners to create new categories of contrast for vowel combinations that also occur in their L1. Japanese hiatal vowels are also often perceived as diphthongs, or vowel-glide combinations, as they would normally occur in English. This often results in errors of vowel quality and may also affect length. Some examples of common errors are:

'blue' [aoi] > *[aoj] *[a:i]

'love' [ai] > *[aj] *[a:]

The L2 length contrast, which does not exist in the L1, is also difficult to recognize as the learner must create a new category of contrast between short segments and long segments. Errors in vowel length are common among L1 English learners of L2 Japanese. Some examples are:

'good' [i:] > *[i]

'mother' [oka:san] > *[okasan]

Vowel Duration

Vowel length errors, such as those given above, are not uncommon in an L2 in which vowel length is contrastive. A number of the world's languages feature phonemic contrastive vowel length including Finnish (Abramson and Ren, 1990), Swedish and Thai (Hadding-Koch and Abramson, 1964; Abramson and Ren; 1990). The duration required to contrast vowels seems to depend upon the language. Abramson and Ren revealed that in the durationally

contrastive Thai vowel system long vowels are roughly 1.9 times the length of short vowels (1990). In phonological systems where duration is contrastive, quality is generally thought to play a minimal role in defining members of minimal pairs contrasted by duration (Elert 1964, Hadding-Koch and Abramson 1964). However, for some languages vowel quality is essential in establishing durational contrasts. Estonian vowel duration includes a three-way contrast and vowels are generally described as being short, long or overlong. A study by Meister et al on whether intrinsic "microdurational variations of high vs. low vowels do affect the perception of duration-based phonological oppositions in a quantity language" concluded that "the intrinsic duration of a vowel plays a significant role in the discrimination of Estonian short vs. long phonological category at boundary conditions" and that, furthermore, "intrinsic features are determined by physiological constraints of the human articulatory system and cannot be intentionally controlled by the speaker" (2011:1364-5). Thus vowel length and height are intrinsically related to one another and the constraints of the human articulatory system. It seems, though, that the more contrasts in duration required, the more articulatory methods are required to show these contrasts. Similarly, higher numbers of vowels contrasted in a language overall increases the likelihood of reliance on durational contrasts. Maddieson reports an exponential increase in the probability of length contrasts in languages that have more vowel quality contrasts. "No languages with 3 vowel qualities include length,… (but) 53.8% of languages with 10 or more vowel qualities have length" (1984:129). Maddieson only views durational contrasts as phonemic if all vowel qualities in a language do not participate in a length contrast. In the case of Japanese, Maddieson would view long vowels as a "juxtaposition of simple vowels rather than as a property of individual phonemes" (1984:128). This is in line with the native speaker view of vowels as each having the duration of one mora, with each mora being

an identical length of one “haku” or beat, as Kindaichi expressed in his bestselling book The Japanese Language (1957:107). For the purposes of this study we will simply refer to these sequences of identical segments as “long vowels” whose duration may be contrasted with singletons known as “short vowels”.

The duration of Japanese short vowels

Each vowel has an intrinsic length due to the articulatory realities of human physiology. These lengths are fairly regular across languages based on vowel height, but differ slightly for each phoneme in specific languages. Okada (1969) cites spectrographic evidence to show that [a] has the longest and [u] the shortest duration of all short Japanese vowels. Yoshida confirms these findings in a study on pitch and duration, finding that “in terms of duration, this gives us the following order: [a] (72msec) is the longest, followed by [o] (62 msec), then [e] (61msec), [i] (60 msec), and finally [u] (55 msec)” (2004:3). Yoshida lists her own findings along with those of others as follows: (2004:4)

Homma’s o>e>a>i>u

Okada’s a>o>e>i>u

Yoshida’s a>o>e>i>u

The length of short vowels bears upon long vowel duration as well in that the shortest of these vowels [i] and [u] will necessarily have shorter long vowel variants. In the current study the varying lengths of short vowels has little effect on the results as we are comparing the lengths of short and long vowels, as produced by NS and NNS, and identifying an allowable margin of contrast in length. The figures above, however, do offer some indication of the average length of short vowels in Japanese.

The duration of Japanese long vowels

Vowels can only be distinguished as long in relation to other vowels. Japanese speakers categorize long vowels as twice as long as corresponding short vowels. This seems to have been the established norm in twentieth century linguistic thought concerning Japanese long vowels. A well-known early study by Han (1962) found that the ratio of short vowel and long vowel duration is about 1:2.5. Vance and other later researchers, however, disagree, as noted above. The unclear methodology and lack of specific data make Han's estimated vowel duration ratios questionable. She lists them as 1:2.0 for [i] and [i:], 1:2.5 for [bo] and [bo:], and 1:3.0 for [se] and [se:]. It is also difficult to remove pitch from any discussion of vowel duration. Though duration creates a distinction on the segmental level and pitch creates a distinction on the suprasegmental level, more recently, researchers like Hirata and Kozasa have looked at the relationship between duration and tonal accentuation. Minimal pairs containing both accented and unaccented pairs of words with long and short vowels reveal that long vowels are consistently longer than short vowels and that the ratio between long vowels and short vowels is slightly higher for unaccented vowels (1:2.51) than for accented vowels (1:2.22) (Hirata, 2004). Kozasa looks at pitch, duration and rate of speech. She finds that:

> When a long vowel is not accented, speakers lengthen the duration of the vowel to ensure that the vowel is long, since speakers rely solely on durational cues. However, when they produce an accented vowel, pitch cues are more stable than durational cues, as they are not affected by speech rates (Kozasa, 2004:4).

Kozasa (2004) finds that long vowels are longest in relation to short vowels when unaccented and pronounced in slow speech. She offers the following set of results from two experiments done on four native speakers of the Tokyo dialect: (2004:216)

(11) Mean duration and ratio of vowels

		long vowel (ms)	short vowel (ms)	ratio(long : short)
fast speech	accented	119.194	72.104	1.65 : 1.00
	unaccented	117.285	60.820	1.93 : 1.00
slow speech	accented	176.988	100.167	1.77 : 1.00
	unaccented	201.718	83.205	2.42 : 1.00

Akaba, while testing Kozasa's findings in her master's thesis, found that long vowels are on average "2.7 times longer than short vowels" and that long vowels are "significantly longer when accented" (2008:50). Behne et al hypothesized that Japanese speakers use spectral cues to identify vowel length, however, their research showed that duration is the only real cue used to contrast vowel length (1999:859). The results showed no indication that Japanese speakers use spectral cues to distinguish vowel length. Further studies by Arai et al confirm that not only is duration the only cue used to identify long vowels" the quantity of the inherently longer low Japanese vowels, [a:] and [a]" were also identified using duration only and no spectral cues (1999:10). These studies all point to a lack of agreement on a specific ratio of duration for long to short vowels, however, all indicate that long vowels should be at least one and a half times the length of short vowels. This rough figure is the premise for comparing vowel length in this study.

English NS vowel duration

As English speakers apply durational contrasts to Japanese it should also be remembered that English is a quantity sensitive language. The degree of sensitivity, however, seems to be even less than that of speakers of other languages in the same Germanic family. A 2011 study by Van der Feest and Swingley tested native-speaker identification of English and Dutch monosyllabic words varying in vowel duration "to determine whether Dutch listeners would use

vowel duration to a greater degree than English listeners." (2) Dutch listeners were found to be more strongly affected by subtle changes in vowel duration than their English counterparts. This indicates less reliance on vowel duration as an acoustic cue in English than in Dutch, though both rely on somewhat similar systems of assigning stress to syllables, which results in longer vowel length, rather than having phonemic differences in lengths of vowels with the same quality.

Children and L1 vowel duration

Some researchers have looked at when durational contrasts are understood by children. Researchers want to know if all children are able to contrast long and short vowels and at what age this contrast becomes phonemic. L1 acquisition gives a clearer view of the way a first language and its phonology are interpreted in the mind of the native speaker. Mugitani et al research length discrimination in infants from both English and Japanese language backgrounds and find that English 18-month olds and Japanese 10-month olds seem to be able to discriminate vowel change from both short to long and long to short duration, while 18-month-old Japanese background infants can only discriminate changes from long to short vowels. The authors assume that the emerging native Japanese phonology creates an asymmetric ability to gauge shortening, but not lengthening in older Japanese infants, whereas younger Japanese infants, just like English background infants, rely solely on simple acoustic cues in discrimination. "These facts help us to understand the developmental trajectory for vowel length perception from a language independent acoustic level to a language-specific phonemic level" (2009:244). Japanese children at this age have such limited vocabularies that it is unlikely that they could differentiate between phonemes to discriminate lexical items, however, this sudden asymmetric

detection ability, which once again become symmetrical in adulthood, reveals a movement towards phonemic vowel length contrast that does not happen for native English speaking children (Mugitani et al, 2009:245). The phonemic nature of Japanese long and short vowel contrast is more easily seen in this way through the phonology of a child learner. The next question, then, is at what point NNS learners of a language that has a phonemic vowel length contrast acquire this contrast and to what extent.

L2 Japanese vowel duration

Motohashi-Saigo and Hardison tested 40 native speakers of American English learning Japanese who had undergone one of three types of web-based auditory training: audio-visual, audio, or none. The visual training included waveforms that represent the auditory information heard. Learners were given training involving singleton consonants, geminate consonants and long vowels. Perception of geminate consonants (particularly [s]) improved the most. Erroneous perception of geminate consonants as long vowels, which had been the most common pretest error, however, improved least of all in the posttest (Motohashi-Saigo and Hardison, 2009:38). This reveals a larger degree of difficulty for native speakers of English in differentiating vowel lengths than consonant lengths, even mistaking geminate consonants as long vowels. This difficulty in perceiving long vowels undoubtedly adds to the difficulty of producing them.

L2 English vowel duration

Interestingly, native Japanese speaking English teachers in Japan tend to rely on quantity distinctions to teach differences in vowel quality. Desaki reports that English teachers in Japan

focus on quantity differences when teaching Japanese speakers to differentiate between [i] and [ɪ]. In testing English NS and Japanese NNS listener ability to differentiate the two phonemes using audio samples of minimal pairs from Peter Ladefoged's website he finds that Japanese respondents "tend to be too dependent on the quantity in the perception of the two vowel sounds [i:] and [ɪ]." (3) This is surely a result of the phonemic nature of vowel length contrasts in Japanese and is, of course, seen as less important to English NS, who would consider height and length as intrinsically connected.

L2 Vowel Quality

Vowel quality is another point of error for English NS learning Japanese. The larger number of vowels in English and the fact that many Japanese vowels do not have formant frequencies identical to any English counterpart, but are usually between two English vowels, makes the likelihood of quality errors very high. This difficulty based on difference in vowel heights, however, is not confined to learners of the English and Japanese languages. Learners of other languages have additional difficulties.

Boersma and Escudero describe Dutch learners of Spanish as having the advantage of being able to reuse five vowel categories from their native language in pronouncing words in L2 Spanish, with no category split or category creation necessary. However, it is determined that Dutch speakers use duration as a stronger means of determining vowel height than spectral cues. This means that these categories do not completely overlap and that as the Spanish vowels are identical in height to vowels of longer duration in Dutch, Dutch learners of Spanish will misperceive these vowels as being of a different height or length and still must learn new means of contrasting vowels that already exist in their L1s (2008:273-276).

Quality is difficult for Japanese learners of English due to lenition placed on unstressed syllables in English. Kondo et al found that Japanese learners of English had difficulty specifically in pronouncing reduced vowels in reading aloud. These difficulties, however, do not have a significant impact on comprehensibility (2011:78). Kewley-Por et al also studied Japanese speakers of English and found that Japanese pronounced vowels [i] and [e], which exist in the vowel inventories of both languages, were fully intelligible (>98%) to English speakers, however, [ɛ] and [ʌ] were far less intelligible at 81% and 23% respectively (1996:453).

L2 Japanese Transfer

Although there has been a large amount of research done on English phonological acquisition by native speakers of Japanese, there has been little done on the acquisition of Japanese phonology by adult native English speaking learners. Takako Toda's research (2003) has focused on the acquisition of timing duration. She has tested L2 Japanese learners at the college level in Australia to find difficulties in both perceiving and producing geminate segments in Japanese. She noted that word duration in words of two and three moras were undifferentiated in learner Japanese, often with shorter mora words being produced with longer duration than longer mora words (112). Wilson et al. similarly studied geminate consonants and the ability of non-native speakers (NNS) to perceive them in different contexts and at different speeds. Researchers like Kimiko Tsukada (2009) look at vowel acquisition, but only of the acquisition of English vowel tense/lax contrasts by Japanese NS. Japanese does not contrast vowel tension. There seem to have been no studies done on vowel height errors made by English NS attempting to acquire Japanese vowels. The present study offers some data on such errors.

Romanization

The present study also looks at the effects of Roman letters on the pronunciation of Japanese vowels. Several researchers, most notably Vance, have looked at the differences in the systems of Romanization employed in Japanese. The Japanese language currently employs two systems of Romanization: the Hepburn and the Kunrei systems. Of the two systems, the Kunrei system is probably the most accurate representation of the Japanese language as it applies one Roman letter for each phoneme and allows allophones to be written using the same letter. Figure 2.1 below illustrates the Romanization of several allophones of [s] using both the Kunrei and Hepburn systems. Vance (2008) reveals that the choice of system of Romanization has linguistic repercussions as the set of accepted phonemes and allophones varies. While the Kunrei system is most commonly used by Japanese linguists, the usage of English norms in representing palatalization makes the Hepburn system more popular for English speakers. A study by Vance, however, reveals the shortcomings of the Kunrei system as he proves that it is unable to represent sounds more recently employed in the Japanese language due to the influence of loanwords (Vance, 2008:87-8).

Figure 2.1 Allophones of [s] in the Various Japanese Romanizations

	Kunrei	Hepburn	Meaning
[saka]	saka	saka	'hill'
[ɕiN.bɯN]	**si**nbun	**shi**nbun	'newspaper'
[sɯmomo]	sumomo	sumomo	'Japanese plum'
[se:fɯkɯ]	s**ee**fuku	s**ei**fuku	'uniform'
[soba]	soba	soba	'near'

Vocalic sequences are represented differently in each system of Romanization. The Kunrei system offers a phonemic representation in which long vowels are simply written as a doubling of the same vowel. The Hepburn system references the somewhat complicated kana "spelling" of a word in representing long vowels. As a general rule, kana spelling utilizes the letter い ([i]) to lengthen front vowels い ([i]) and え ([e]) and the letter う ([u]) to lengthen back vowels う ([u]) and お ([o]). There are exceptions to this rule, however, which have no impact on pronunciation, but do affect spelling. The word for 'uniform' is a clear example of the difference in representation of long vowels between these two systems of Romanization:

Kana		Kunrei	Hepburn	Meaning
せいふく	[se:fɯkɯ]	**see**fuku	**sei**fuku	'uniform'
おねえさん	[one:saN]	o**nee**san	o**nee**san	'older sister'

The word for 'older sister', however, happens to be represented in the same way in both systems because it is unconventional in its kana spelling. The Hepburn system's reliance on kana spelling gives the impression of diphthongization to English speakers who are accustomed to pronouncing vocalic sequences written as 'ei' and 'ou' as diphthongs in words like: eight, Eiffel tower, heir, outhouse, pound, etc. Spelling conventions related to long vowels often lead native English speakers to misread Japanese written in Roman letters.

Usage of Romanization in L2 Japanese learning is a contentious topic, which is discussed in detail in the Pedagogical Implications chapter below. It is the primary method of introducing the language to beginners, with entire textbook series like Jorden and Noda's "Japanese: The Spoken Language" being written entirely in Kunrei Romanization, and the first several chapters of the popular Genki and Yookoso series offering vocabulary and dialogue transcriptions in Hepburn Romanization. Okuyama investigates the efficacy of using Romanization to teach

beginning L2 Japanese learners in a study performed on 40 students at two universities in Arizona involving computer-assisted language learning (CALL). Vocabulary items given in hiragana and including pictures and an audio track were supplemented with Hepburn Romanization for one group of learners. She reveals that Romanization had no measurable effect on student retention of vocabulary words and that the hiragana provided were sufficient visual representations for the students. Her biggest finding was the advantage of using audio recordings (Okuyama, 2007:375).

Studies on Loanword Adaptation

Romanization is not the only means by which English NS learners of Japanese are exposed to material originating in the English language. Loanwords from English are also extremely common and provide an endless source of words of familiar origin to the English speaker. Identifying and adapting English words into the Japanese language causes errors for many English NS leaners of Japanese. As of yet there is no consensus on the processes involved in Japanese loanword adaptation, and even less information available for the L2 learner. There is, however, a large body of literature on Japanese loanword adaptation in general (Kay, 1995; Kubozono, 2006; Smith, 2006) as well as the roles of phonetic perception and phonemic production in Japanese LWA (Peperkamp & Dupoux, 2003; Smith, 2006), prosody and accentuation in loanwords (Katayama, 1995; Kubozono, 1996, 2002, 2006; Sibata, 1994). Aside from studies on Japanese NS loan adaptation, Irwin notes that the sense among Japanese people that the Japanese language has succumbed to loanwords is "all-pervasive" and that rising use of loans in the government and media are often criticized domestically (2011:193). Despite the large numbers of studies focused on native speaker recognition of loanwords and frequency of

use (Irwin, 2011:193), there have been none, it seems, researching learner acquisition of loanwords in L2 Japanese. Research on the acquisition of loanword adaptation techniques in an L2 offers a view into the degree of L2 phonological acquisition. The lack of studies in this area is unfortunate.

Worldwide LWA phenomena have been studied in even greater detail than that of Japanese. One difference languages reveal is in the choice of vowel used in epenthesis applied during LWA. Hume and Bromberg posit that articulatory simplicity, lack of cue quality (lower probability that the sound will be confused with another element), lower degree of contrast, lower degree of social value, and higher frequency of usage in the language make a vowel a preferred candidate for epenthetic application (2005:4-5). English generally relies on its shortest vowel, the schwa, for epenthesis. Consider pluralization of English words that end in sibilants: sixes, faxes, masses, etc. The plural morpheme [-s] cannot be differentiated from the preceding sibilant and thus an epenthetic vowel is required between these sibilants. Loanwords with complex onsets that are illicit in English also require an epenthetic vowel, which is generally the schwa. Japanese most often relies on the two vowels in its phonemic inventory with the shortest duration, [i] and [u]; which are most susceptible to devoicing. Devoiced vowels allow for segmental sequences that may be perceptually closest to illicit forms like obstruent clusters. Consider the English loanword ‘Christmas’:

English [kɹɪs.məs] > Japanese [kɯ̥.ɾi.sɯ̥.ma.sɯ̥]

The obstruents in the complex onset of the English loanword must be separated by epenthetic vowels in the Japanese word. The fact that [ɯ] is devoiceable makes it the perfect candidate for creating a loanword that most resembles the original English word phonetically, as it cannot perfectly mirror it phonemically due to the phonotactic rules of Japanese that disallow complex

onsets and most coda consonants. Knowledge of the default Japanese epenthetic vowels is often never explicitly offered to L2 Japanese learners, who may continue to rely on the English default (the schwa) as the shortest vowel available and thus the most likely. This shortness, when coupled with epenthesis of what would be an unstressed syllable in an English loanword, dramatically raises the probability for vowel transfer from L1 English.

CHAPTER 3

METHODOLOGY

Hypotheses

Native speakers of English learning Japanese as a foreign language often transfer English phonological and phonotactic rules when speaking Japanese. This transfer commonly results in errors in vowel length. Several specific Japanese phonological and phonotactic factors seem to be more conducive to the transfer of vowel-related phonological and phonetic rules for L1 English speakers. This study asserts that:

A. The lack of phonemic vowel length contrast in English causes increased errors in production of long vowels by native speakers of English when speaking Japanese.

B. The lack of vowels occurring in hiatus at the prosodic word level in English causes increased errors in vowel production by native speakers of English when speaking Japanese.

Material originating from or resembling that of the English language also causes transfer:

C. English-origin loanwords in Japanese cause increased errors in vowel length by native speakers of English when speaking Japanese.

D. Japanese written in Romanization causes increased errors in vowel length by native speakers of English when speaking Japanese.

Words with devoiced vowels and those which formed minimal pairs based solely on pitch-accent differences were also included in this study. The potential effects of gender and level of study will also be assessed for significance in the transfer of English vowel duration and quality.

Procedure 1: Elicited Imitation Tasks

Elicited imitation is most often used to assess learner acquisition of TL grammar. In an elicited imitation task a respondent is given a token auditorily and then asked to repeat it. When using elicited imitation to assess grammatical acquisition, it is important to "keep the (token) length at an appropriate level, generally one that exceeds short-term memory." (Mackey & Gass, 56) However, when applying this type of task to assess phonological acquisition the elicited imitation tasks used in this study were modified so that tokens were created to be easily remembered. It was important that respondents reproduced the specific target words included in each token so that vowel pronunciation in each specific environment could be recorded and analyzed. Elicited imitation tasks generally employ some means to avoid the effects of "echoic memory," in which a respondent echoes the sounds heard without comprehending meaning. (Mackey & Gass, 2006:56) In order to avoid echoic memory effects, each token used in this study was followed by a two second beep and then a five second pause in which the respondent repeated the token heard.

This study employed two elicited imitation tasks. One task elicited L2 learner reproduction of Japanese words and the other elicited reproduction of English loanwords in Japanese. The two tasks were performed in the same session so that participants were unaware of the focus of each task. The objective for the elicited imitation tasks was to record native English speaking L2 Japanese learners speaking sound patterns in words that were more likely to

induce transfer related errors in vowel length and vowel quality. For this reason it was necessary to develop a set of tokens that were likely to induce such commonly occurring errors. The tokens created also had to be remembered and repeated by NNS.

Elicited Imitation Tasks: Tokens

In order to ensure that every L2 Japanese learner was familiar with all of the words and grammatical structures used in the tokens, each token contained only words and grammatical constructions that L2 learners had been taught before the midpoint of the second semester of first-year Japanese. This allowed the task to specifically assess phonological acquisition rather than lexical or syntactic acquisition. In determining token length it was important to select phrases that offered adequate context to allow immediate identification of a token. Pre-testing, however, revealed that tokens longer than 10 moras in length proved too difficult even for short-term mental retention, resulting in major errors, including silence, during oral responses. For this reason, all tokens used in this task had a length of between 8 and 12 moras. All tokens were created with the help of a native speaker of standard Japanese and recorded by this same NS on PRAAT version 5344 using an Audio-technica AT-VD5 microphone with an S81290 Sound Blaster amplifier.

During the task, respondents were asked to use headphones to listen to 47 tokens, each of which was roughly 2-3 seconds long, and repeat the phrase when the beep following the token was heard. The tokens were played randomly using iTunes. All of the respondent repetitions were recorded on Audacity using the same Audio-technica AT-VD5 microphone with an S81290 Sound Blaster amplifier. Since tokens were played randomly in iTunes, the researcher was required to sit near the respondent and note on paper the order in which the tokens were played.

Elicited Imitation Tasks: Target Words

Each token contained a target word that was selected to test for expected L2 Japanese learner production errors in vowel duration or vowel quality. Additionally, the two elicited imitation tasks contained either target words of Japanese origin or loanwords of English origin. All target words were familiar to the respondents, since they were explicitly taught during previous vocabulary lessons using the textbook. These target words are detailed below. [11]

Elicited Imitation with Native Word Targets (n=34)

Tokens were designed to test NNS responses to four Japanese phonological contrasts that do not occur in English: vowel length (n=12); vowels occurring in hiatus in a word (n=8); minimal pair pitch-accent (n=5); and high-vowel devoicing (n=4). Each token contained a target word which displayed one of the contrasts listed above. Carrier phrases were selected to include only words that were well known to participants. Target words with long vowels or in which a minimal pair based on contrastive vowel length were expected to result in L2 learner production errors in vowel duration. Target words in which high-vowel devoicing often occurs, pitch-accent contrasts create minimal pairs, and vowels occur in hiatus (rather than in diphthongs as they would generally be in English) were expected to result in L2 learner production errors in vowel height as well as in diphthongization, as visible in a spectrogram. Five (n=5) control tokens were also included to obscure the focus of these elicited imitation tasks. These tokens contain none of the specific factors being examined. Table 3.1 below lists the specific target words used in tokens in each respective environment.

[11] See Appendix I for a list of the full tokens used in elicited imitation tasks.

Table 3.1 Target words used in the elicited imitation task (native words)

Phonological environment	Tokens	Target words
A. contrastive vowel length	12	deshou ‘probably’ doumo ‘thanks’ hikouki ‘airplane’ iie ‘no’ iiko ‘good child’ imouto ‘younger sister’ juu ‘ten’ okaasan ‘mother’ oneesan ‘older sister’ ookii ‘big’ otousan ‘father’ tanoshii ‘fun’
B. vowels occur in hiatus	8	au ‘(to) meet‘ daisuki ’love‘ eiga ’movie‘ kirei ’pretty‘ raishuu ’next week‘ shiroi ’white‘ taihen ’difficult[tough‘ warui ’bad‘
C. contrastive pitch-accent	5	ame 'rain’ ame ‘candy’ hana ’flower’ hana ‘nose’ hashi ’bridge’[12]
D. high-vowel devoicing	4	enpitsu ’pencil’ kusuri ’medicine’ suteki ’lovely’ tanoshiku ’fun’

Elicited Imitation with English Loanword Targets (n=13)

Tokens containing loanwords were designed to test NNS responses to four Japanese phonological factors that differ from Standard English: a phonemically contrastive long vowel is present (n=4); vowel epenthesis occurs (n=4); vowel height of the loanwords differs significantly from the original English word (n=3); and vowels occur in hiatus (n=2). Target words in which a

[12] This contrasts with the well-known word for ‘chopsticks’, which is also ‘hashi’.

long vowel is present were expected to result in L2 learner production errors in vowel duration or quality errors due to the lack of phonemic contrast in vowel duration in English as well as diphthongization in the original borrowed word. The word 'notebook', for example, includes a diphthong in the first syllable, which is realized as a long vowel in the Japanese loanword [no:to]. The first syllable in 'curtain' contains a syllable-final rhoticism, which is also usually phonemically converted into the second segment of a long vowel in Japanese, thus we have [ka:ten]. Target words in which vowel epenthesis occurred in the loanword were expected to result in L2 learner production errors in vowel height due to differences in epenthetic vowel choice in English and Japanese as discussed above. Target words in which vowel quality in the loanword differed significantly from the original English were also expected to produce vowel quality errors. Vowels occurring in hiatus (rather than in diphthongs as they would generally in English) in loanwords were expected to result in vowel quality or diphthong errors. All of these errors in vowel height should be visible in a spectrogram. Table 3.2 below lists the specific target words used in tokens in each respective environment. These tokens were selected based on familiarity to the learner as well as on a singular characteristic (e.g. containing an epenthetic vowel), however, most all could be considered as having multiple characteristics which are challenging for L2 Japanese learners. Each target word was required to have at least one characteristic, but was not excluded due to having multiple characteristics. In this way the task was designed to offer multiple means of testing the same four phonological environments multiple times.

Table 3.2 Target words used in elicited imitation task 1B (loanwords)

Phonological environment	Tokens	Target words
A. long vowel present	4	kaaten 'curtain' koohii 'coffee' saafin 'surfing' nooto 'note(book)'
B. epenthesis	4	mekishiko 'Mexico' aisukuriimu[13] 'ice cream' keeki 'cake' pinku 'pink'
C. vowel quality differs significantly from English	3	shatsu 'shirt' basu 'bus' oosutoraria 'Australia'
D. vowels occurring in hiatus	2	sueeden 'Sweden' wain 'wine'

Procedure 2: Reading Aloud Tasks

The second task for the respondents was a reading aloud task. Reading aloud allows L2 learners to speak the language at their own pace and with reduced anxiety. Since reading is the primary method applied in the teaching and learning of Japanese as a foreign or second language, it can be used to gauge the effects of transfer on reading tasks. Transfer in reading may be induced by encountering English loanwords as well Romanization, which uses the Roman letters of English. In this reading task, L2 learners of Japanese were given stimuli that were likely to induce errors in vowel length and vowel quality based on the origin of the target word and the orthography of the token.

Four types of reading aloud tasks were used to identify pronunciation errors in vowel duration and vowel quality. The first task tested for production errors in reading native Japanese words written in native kana (hiragana) script. The second task tested for production errors in reading English loanwords written in kana (katakana) script. The third task tested for production

[13] This target word also contains a long vowel.

errors in reading native Japanese words written in Roman letters. The fourth task tested for production errors when reading English loanwords aloud when written in Roman letters. The four tasks are summarized as follows in table 3.3.

Table 3.3 Reading aloud task types

Task	Target words	Script
2A	Native Japanese	Japanese kana
2B	Native Japanese	Roman letters
2C	English loanwords	Japanese kana
2D	English loanwords	Roman letters

Sixty (n=60) tokens were created in total, thirty written in native kana script and 30 written in Roman letters. Ten (n=10) of the tokens were control tokens to obscure the focus of the overall reading aloud task. Each respondent was required to read 30 tokens aloud, half of which were in kana and half of which were in Romanization. In this way all respondents orally produced the same number of tokens with the same content, either in kana or Romanization. The task was administered so that an equal number of respondents gave responses to each token in kana (n=17) and Romanization (n=17).

Before the task was implemented, respondents were told that they would see a short phrase on the computer screen. They were asked to read the phrase aloud into a microphone at their own pace. All phrases were displayed on a computer screen using Microsoft Power Point. The Power Point slides were randomized using a randomizing macro. Since the slides were randomized, the researcher, sitting near the respondent, was required to physically note on paper

the specific order in which tokens appeared. All responses were recorded on Audacity using a Audio-technica AT-VD5 microphone with a S81290 Sound Blaster amplifier.

Reading Aloud Task: Reading Native Japanese Target Words in Kana and in Roman Letters (n=19)

Japanese tokens were designed to test NNS responses to four Japanese phonological contrasts that do not occur inEnglish: phonemically long vowels (n=5); vowels occurring in hiatus that generally occur as diphthongs in English (n=5); lexical pitch-accent contrasts (n=5); and high-vowel devoicing (n=4). Target words with long vowels were expected to result in L2 learner production errors in vowel duration. Target words in which vowels occur in hiatus (rather than in diphthongs as they would generally in English) were expected to result in L2 learner production errors in vowel height as well as in diphthongization. Target words in which pitch-accent contrasts occurred were also expected to produce vowel height errors as learners attempt to apply English vowel quality contrasts to pitch-accent distinctions that do not occur in English. Target words in which high-vowel devoicing was common were expected to result in vowel height errors as English speakers attempt to apply the English process of lenition to shortened Japanese vowel sounds. All of these errors in vowel height should be visible in a spectrogram. Table 3.4 below lists the specific target words used in tokens in each respective environment. The same tokens were presented in both native Japanese kana and Roman letters so, that the effects of orthographic variation could be measured. Target words used in these two reading aloud tasks by phonological environment are given in Table 3.4 below.

Table 3.4 Target words used in reading aloud tasks using native words

Phonological environment	Tokens	Target words
A. long vowel present	5	ooku 'many' hontou 'really' obaasan 'grandmother' tsuukin 'commute' oneesan 'older sister'
B. vowels occur in hiatus	5	aoi 'blue' ie 'house' tsuita 'arrived' ue 'up' miemasen 'can't see'
C. contrastive pitch-accent	5	ame 'rain' ame 'candy' hashi 'chopsticks' hashi 'bridge' hana 'flower'[14]
D. high-vowel devoicing	4	shikata 'way of doing' shitai 'want to (do)' suki 'like' tsukareta 'tired'

Reading Aloud Task: Reading English Loanwords in Kana and Roman Letters (n=5)

Tokens were designed to test NNS responses to three Japanese phonological contrasts that do not occur in Standard English: [ɯ] and [i] vowel epenthesis (n=3); high-vowel devoicing (n=1); and minimal pair long vowel contrasts (n=1). Target words in which a long vowel is present were expected to result in L2 learner production errors in vowel duration. Target words in which vowel epenthesis and high-vowel devoicing occur were expected to result in L2 learner production errors in vowel height due to the lack of high vowel devoicing and general reliance on schwa epenthesis in English. The same English loanword tokens were presented in both kana and Romanization so that the effects of orthographic variation could be measured. Target words used in these two tasks are given in Table 3.5 below.

[14] This contrasts with 'hana' meaning 'nose'.

Table 3.5 Target words used in reading aloud tasks using loanwords

Phonological environment	Tokens	Target words
A. vowel epenthesis occurs	3	kurisumasu 'Christmas' makudonarudo 'McDonald's (restaurant) tenisu 'tennis'
B. high-vowel devoicing	1	supootsu 'sports'
C. long vowel present	1	konpyuutaa 'computer'

Subjects

Thirty-four (n=34) students from a large public university were recruited to participate in the elicited imitation and reading-aloud tasks. All respondents were native speakers of American English. The average age of respondents at the time of the study was 20 years 6 months old. The population included nineteen (n=19) males and fifteen (n=15) females. All NNS respondents were studying Japanese as a foreign language at various levels, from beginner (first year) to intermediate (second year) to advanced (third and fourth years). Each level of Japanese study included nine months of formal classroom study. First-year Japanese (beginner) classes formally met for four hours every week and Japanese classes at higher levels of study met for three hours per week.

The average amount of time all L2 Japanese learner respondents had spent in Japan was six months. Two L2 Japanese learners had lived in Japan for longer periods of time as children (11 and 4 years respectively). The average time the remaining L2 Japanese learners had spent in Japan was less than one month, with several traveling for a period of a few weeks at most. Table 3.6 below describes the number, gender, mean age, time spent formally studying in the classroom, and time spent in Japan for the respondents divided by level of Japanese class taken at the time of the study.

Table 3.6 Respondent information

Japanese class	N=	Male	Female	Mean age	Class time	Mean time in Japan
year 1, semester 2	13	9	4	19	0.5 years	> 1 week
year 2, semester 2	10	5	5	20	1.42 years	> 1 week
year 3, semester 2	7	4	3	21	2.17 years	2.17 years
year 4, semester 2	2	1	1	21	3 years	0.75 years
native speaker	2	0	2	21	N[A	18.5 years
TOTALS	34	19	15			

Respondents were not offered any incentive to participate in this study aside from the knowledge that their participation would further the study of L2 Japanese language acquisition. Roughly half of the students had been taught by the researcher at some point. This is often unavoidable when dealing with smaller volunteer populations.

Procedure 3: Native Speaker Acceptability Judgment

Perception study with NS Japanese

Error may be defined as language variation that is considered unacceptable by native speakers of a language. In order to assess error it is important that native speakers rate tokens that display errors. However, native speakers also vary in their assessment of magnitude of error. By asking a relatively large sample of native speakers to rate tokens for error, we are able to establish the types of variation from NS vowel pronunciation that are seen as more unacceptable than others. We can then compare NS error rankings to spectrograms showing NNS pronunciation deviation from recorded NS pronunciations of the same tokens to 1) identify specific types of phonological variation that are seen as illicit and 2) find any correlation

between the degree of variation from the norm and the degree to which a pronunciation is perceived as erroneous by NS. In this way, beyond simply identifying errors, we can establish the comparative magnitude of error as perceived by a set group of NS. This study asks whether the group of NS raters will rate NNS errors in the following ways:

A. Are vowel production errors in native words rated as more or less unacceptable than errors in loanwords?

B. Are production errors involving vowel quantity seen as more or less unacceptable than errors in vowel quality?

C. Are vowel production errors made while reading native Japanese kana more or less unacceptable than errors made while reading Romanization?

The answers to these questions may provide pedagogical implications related to the choice of orthography used in teaching Japanese to NNS and specific triggers for production errors made by native English speaking learners of Japanese.

NS Acceptability Judgment Task

Individual recordings of tokens for the elicited imitation and reading aloud tasks were extracted from each L2 learner respondent recording and encoded with numbers which included the token number (eg. 302) followed by the participant number, which included 1) the order in which the respondent signed up for the task, 2) the gender of the respondent as given on the questionnaire, and 3) the age of the respondent as per the same questionnaire. The elicited imitation tasks produced respondent recordings of 1,529 tokens. The reading aloud tasks produced respondent recordings of 991 tokens.

Local Japanese NS, who were not related to the NNS respondents in any way, were

enlisted to rate all of the 2,520 recordings obtained. Three NS raters were found and agreed to participate. Two were female (ages 25 and 35) and one male (age 41). All are native speakers of the Tokyo dialect of Japanese. They are labeled as: ayf25, hbm41, and sif35.

It is impractical to ask a Japanese NS to rate this large a number of tokens at one time due to the volume of recordings. In addition, the local NS raters that volunteered to help in this study could only offer a limited amount of time each day for completely unpaid services. For these reasons the local NS raters were employed in rating all 2,520 recordings from both the elicited imitation and reading aloud tasks during short periods over the course of two weeks. During this time the local NS raters were able to rate all token responses from both the elicited imitation and reading aloud tasks 1) as having or lacking vocalic pronunciation errors in a specific target word in the token and 2) by identifying the specific vowel mispronounced. 76 NNS respondent tokens from among 1,529 NNS respondent tokens in the elicited imitation tasks were identified as having vowel errors. 50 NNS respondent tokens from among 991 NNS respondent tokens in the reading aloud tasks were also identified as having vowel errors. No NS respondent tokens from either the elicited imitation tasks or reading aloud tasks were identified as having errors.

Procedure Used in NS Ratings

Raters were given a set of instructions and a link to online folders containing all respondent sound files and rating sheets. All materials were written in both Japanese and English. Each rater was asked to open each respective folder containing recordings of respondent tokens obtained from the elicited imitation task and from the reading aloud task, listen to the files and rate the files as per the rating sheet attached. The files were stored in the folders and listed on the rating sheet in a randomized order so that the same token would be less

likely to be heard consecutively multiple times. The rating sheet included a list of file numbers, tokens written in Standard Japanese and target words, which raters were to specifically listen for and rate. Raters were cautioned in the instructions that they were to rate no word except for the target word. The rating sheet asks three questions:

Question 1: Was there a target word error?

This question seeks to identify whether or not the NS perceives an error in the target word.

Question 2) Can you understand the target word?

It is important to understand whether an error in a target word makes that target word incomprehensible. Here we can gauge what types of errors make a word incomprehensible and what types of errors do not. The answer to this question may reveal such information as whether vowel length or vowel height is perceived as more illicit to the NS, which can have a direct effect on the efficacy of methods of teaching and learning L2 Japanese.

Question 3) (What is the specific) target word vowel error?

This question asks the NS rater to specifically identify the illicit vowel production in the target word. It is important to understand if NS perceive the same vowel as mispronounced and how many NS offer the same assessment. This may also present the researcher with evidence for L2 Japanese learner pronunciation difficulty with specific vowels and offer insights into which features of which specific vowels should be focused on when presenting Japanese language learning material. NS were asked to focus only on vowel errors, although consonant errors were often present.

A space for "additional notes" was also given. This is an area in which the NS rater could offer any other information that they may deem relevant, such as production errors in target words or the spellings of Japanese errors as perceived. NS rating sheets include not only

questions and a list of file numbers, but also sample answers to the questions given. Samples include possible ratings of tokens which are incomprehensible as well as those that are comprehensible and tokens with multiple occurrences of the same vowel.

NS raters were finally instructed to ask the researcher any questions they may have by e-mail or telephone and return their ratings sheets directly to the researcher by e-mail.

CHAPTER 4

RESULTS

NS ratings of the data collected indicate that the four factors under consideration all contribute to L1 English vowel transfer into L2 Japanese: 1) Phonemically long vowels (vowels with a length of two moras; hereinafter "long vowels") appear in Japanese words, 2) Japanese phonotactic rules regarding vowels occurring in hiatus that usually occur as diphthongs in English are applied, 3) Japanese written in Romanization is read aloud, and 4) English loanwords occur. Errors were also noted in words in which high vowel devoicing occurred. Interestingly, members of minimal pairs were also difficult for the NNS respondents. Data revealing errors in pronunciation of tokens that were selected to highlight these four factors is presented below and will be discussed in detail in Chapter 5.

In the tasks performed English NS were asked to repeat or read aloud L2 Japanese phrases with target words which generally prove difficult for NNS, including those with a contrastive long vowel as well as those which contain vowels occurring in hiatus. The results show a common inability to effectively contrast long and short vowels, resulting mainly in shortening of long vowels and lengthening of short vowels, as well as an inability to consistently produce vowels occurring in hiatus most commonly resulting in deletion of one vowel (most often the last vowel of the series).

Native Speaker Ratings

Three NS were employed to rate the entire sample of responses. Their ratings are given in their entirety in Appendices V and VI below. A combined total of 126 responses were identified as containing vowel errors in a target word. 5.33% of the 2,366 total NNS responses contained vowel errors in the target word as noted by Japanese NS raters. An average of 5.33% of all NNS elicited imitation responses and 6.72% of NNS reading aloud responses included vowel errors. In this chapter we will look at results from both the elicited imitation tasks as well as the reading aloud tasks and finally a combined set of results from both tasks. NS raters noted vowel errors (in both duration and height) in target words which highlight all four factors: 1) they contain long vowels, 2) they contain vowels occurring in hiatus, 3) they are loanwords, and 4) they are presented in Romanization.

Rating pitch-accent

Although tokens containing words that contrast only by pitch were included in the original design of the study, the results showed no significant correlation between pitch-accent and errors in vowel production. The fact that the NS raters were not trained linguists and might not be able to identify pitch, along with the basic differences in pitch-accent that are naturally found in various Japanese dialects (and may exist among the NS raters) removed any ability to include an objective NS rating of pitch-accent in the NNS responses.

NS Ratings of Elicited Imitation Task Results

The elicited imitation task produced 1,529 responses. Of these, Japanese NS raters noted 74 as having vowel errors in the target word. Although present in the data, no errors other than

vowel errors in the target word of each recorded token were assessed in this study. If we remove the 94 responses given by NS from the total 1,529 responses, we are left with 1,435 NNS responses. These 74 errors make up 5.3% of all NNS responses.

30 of the 47 target words (63.83%) used in the elicited imitation task were found to have caused errors in NNS responses. The list of target words in the elicited imitation task identified as incurring erroneous responses are listed below in Appendix III. These words are also listed by token type. Target word types that most often resulted in vowel errors were:

a) target words containing long vowels (47.3% of all errors),

b) target words containing hiatal vowels (35.14% of all errors)

c) loanwords (20.27% of all errors)

d) target words that are a member of a minimal pair (33.78% of all errors)

e) target words that contain a devoiced vowel (32.43% of all errors)

Errors Involving Long Vowels

35 errors were noted out of a total of 676 NNS responses in target words containing long vowels. These errors occurred in 13 of the 22 target words that contained long vowels. 5.52% of all responses to target words with long vowels resulted in errors. 9.35% of all responses to the 13 target words containing long vowels that did cause errors were errors. 5.16% of all responses to tokens not containing long vowels resulted in errors. Paired two-tailed T-tests measuring the difference between the mean error rates for tokens with long vowels and tokens without long vowels reveals a t-value of 0.8673. If we consider the alpha level at 0.05, this figure shows a significantly higher chance of error in words with long vowels than in those without long vowels. Interestingly, this chance of error increases when the word is a member of a minimal pair.

Errors Involving Long Vowels in Minimal Pairs

Although not a part of the initial hypotheses posited to describe vocalic transfer, minimal pair membership seems to be a significant factor in transfer based on the results of the data obtained. 25 errors were noted out of a total of 176 NNS responses in target words containing long vowels that occur in minimal pairs. These errors occurred in 4 of the 6 target words that contained long vowels occurring in minimal pairs. 13.99% of all responses to target words with long vowels that occur in minimal pairs resulted in errors. 20.98% of all responses to the 4 target words containing long vowels in minimal pairs that did cause errors were errors. 4.07% of all responses to tokens containing long vowels not in minimal pairs resulted in errors. Paired two-tailed T-tests measuring the difference between the mean error rates for tokens with long vowels in minimal pairs and tokens had no long vowels in minimal pairs reveals a t-value of 0.1571. This figure shows a significantly higher chance of error in words with long vowels in minimal pairs as compared to those without long vowels in minimal pairs.

Errors Involving Vowels in Hiatus

26 errors were noted out of a total of 369 NNS responses in target words containing vowels in hiatus. These errors occurred in 7 of the 12 target words that contained vowels in hiatus. 7.05% of all responses to target words with vowels that occur in hiatus resulted in errors. 7.42% of all responses to the 7 target words containing vowels in hiatus that did cause errors were errors. 5.68% of all responses to tokens not containing vowels in hiatus resulted in errors. Paired two-tailed T-tests measuring the difference between the mean error rates for tokens with vowels in hiatus and tokens without vowels in hiatus reveals a t-value of 0.5345. This shows a significantly higher chance of error in words with vowels in hiatus than those without.

Errors Involving Loanwords

13 errors were noted out of a total of 402 NNS responses in target words that were loanwords. These errors occurred in 7 of the 13 target words that that were loanwords. 3.73% of all responses to target words that were loanwords resulted in errors. 6.93% of all responses to the 7 target words that were loanwords that did cause errors were errors. 5.95% of all responses to tokens that were not loanwords resulted in errors. Paired two-tailed T-tests measuring the difference between the mean error rates for tokens that were loanwords and tokens that were not loanwords reveals a t-value of 0.2777. This figure shows a significantly higher chance of error in words that were loanwords as compared to those that were not loanwords.

Errors Involving Loanwords that Include Long Vowels

10 errors were noted out of a total of 247 NNS responses in target words that were loanwords with long vowels. These errors occurred in 4 of the 8 target words that that were loanwords with long vowels. 4.05% of all responses to target words that were loanwords with long vowels resulted in errors. 8.09% of all responses to the 4 target words that were loanwords with long vowels that did cause errors were errors. 3.23% of all responses to tokens that were loanwords without long vowels resulted in errors. Paired two-tailed T-tests measuring the difference between the mean error rates for tokens that were loanwords with long vowels and tokens that were loanwords without long vowels reveals a t-value of 0.7771. This figure shows a significantly higher chance of error in words that were loanwords with long vowels as compared to those that were loanwords without long vowels. Paired two-tailed T-tests measuring the difference between the mean error rates for tokens that were loanwords with long vowels and tokens that were loanwords reveals a t-value of 0.9114. This figure shows a significantly higher

chance of error in words that were loanwords with long vowels as compared to those that were loanwords. Paired two-tailed T-tests measuring the difference between the mean error rates for tokens that were loanwords with long vowels and tokens that were native Japanese words containing long vowels reveals a t-value of 0.6124. This figure shows a significantly higher chance of error in words that were loanwords with long vowels than Japanese words that had long vowels. Paired two-tailed T-tests measuring the difference between the mean error rates for tokens that were loanwords with long vowels and tokens that were neither loanwords nor contained long vowels reveals a t-value of 0.5871. This figure shows a significantly higher chance of error in words that were loanwords with long vowels than those that were not loanwords nor had long vowels.

Errors Involving Devoiced Vowels

7 errors were noted out of a total of 152 NNS responses in target words that contained devoiced vowels. These errors occurred in 3 of the 5 target words that that contained devoiced vowels. 4.61% of all responses to target words that contained devoiced vowels resulted in errors. 7.68% of all responses to the 3 target words that contained devoiced vowels that did cause errors were errors. 5.42% of all responses to tokens that did not contain devoiced vowels resulted in errors. Paired two-tailed T-tests measuring the difference between the mean error rates for tokens that contained devoiced vowels and tokens that did not contain devoiced vowels reveals a t-value of 0.7724. This figure shows a significantly higher chance of error in words that contained devoiced vowels as compared to those that did not contain devoiced vowels. The figures offered above are summarized in Table 4.1 below.

Table 4.1 Error rates and T-values by Target Word Type in the Elicited Imitation Tasks

Target word type	Mean error rate	T-value	P-value	T-test compared with:
Long vowels	**5.21%**	0.9826	$p < .01$	No long vowels
Long vowels in minimal pair	**12.84%**	0.2113	$p < .01$	No long vowels in minimal pairs
Vowels in hiatus	4.33%	0.5937		No vowels in hiatus
Loanwords	3.73%	0.3208		Not loanwords
Loanwords with long vowels	4.05%	0.6487		Loanwords without long vowels
		0.9114		All loanwords
		0.6872		Long vowels
		0.5256		Neither loanwords nor had long vowels
Devoiced vowels	**7.88%**	0.3284	$p < .01$	No devoiced vowels

Errors by Japanese Level of Respondent

Of the 74 errors reported in the Elicited Imitation Tasks, 41 of these (55.40%) were committed by 12 learners in the second semester of the first year of Japanese, 17 errors (22.97%) were committed by 7 learners in the second semester of the second year of Japanese, 15 (20.27%) were committed by 5 learners in the second semester of the third year of Japanese, and one (1.35%) was committed by one learner in the second semester of the fourth year of Japanese. This distribution is represented in Table 4.2 below.

Table 4.2 Errors by Japanese Level of Respondent in the Elicited Imitation Tasks

Japanese level	Total errors	Target word type	# of errors	% of total level errors
First year; second semester	41	**Long vowels**	20	**48.78%**
		Long vowels in minimal pair	6	14.63%
		Vowels in hiatus	16	**39.02%**
		Loanwords	6	14.63%
		Loanwords with long vowels	6	14.63%
		Devoiced vowels	11	**26.83%**
Second year; second semester	17	**Long vowels**	8	**47.06%**
		Long vowels in minimal pair	2	11.76%
		Vowels in hiatus	5	**29.41%**
		Loanwords	4	23.53%
		Loanwords with long vowels	2	11.76%
		Devoiced vowels	5	**29.41%**
Third year; second semester	15	**Long vowels**	7	**46.67%**
		Long vowels in minimal pair	3	20.00%
		Vowels in hiatus	5	**33.33%**
		Loanwords	5	**33.33%**
		Loanwords with long vowels	2	13.33%
		Devoiced vowels	7	**46.67%**
Fourth year; second semester	1	**Devoiced vowels**	1	**100%**

Errors by Gender

Male learners made up 58% of all respondents in the Elicited Imitation task and yet committed 83.33% of all errors. This may be due to the fact that 8 of the 12 first-year learners were male and that 28 of the 41 errors (68.29%) made by first-year learners were made by male respondents. Otherwise there was no indication that gender played a marked role in production errors. Table 4.3 offers a breakdown of errors by gender in the Elicited Imitation Tasks.

Table 4.3 Errors by Gender of Respondent in the Elicited Imitation Tasks

Gender	Respondents in task	Respondents w/ errors	Respondent error %	Total responses	Total errors	Error %
Male	18	15	83.33%	843	47	5.58%
Female	13	10	76.92%	592	27	4.56%

Male and female respondents made more errors in the same areas: 1) long vowels, 2) vowels in hiatus, and 3) devoiced vowels. Table 4.4 below details all errors by gender.

Table 4.4 Breakdown of Errors by Gender of Respondent in the Elicited Imitation Tasks

Gender	Target word type	# of errors	% of total level errors
Male	**Long vowels**	21	**44.68%**
	Long vowels in minimal pair	7	14.89%
	Vowels in hiatus	17	**36.17%**
	Loanwords	9	19.15%
	Loanwords with long vowels	6	12.77%
	Devoiced vowels	14	**29.79%**
Female	**Long vowels**	14	**51.85%**
	Long vowels in minimal pair	3	11.11%
	Vowels in hiatus	9	**33.33%**
	Loanwords	6	22.22%
	Loanwords with long vowels	4	14.81%
	Devoiced vowels	11	**40.74%**

NS Ratings of Reading Aloud Task Results

The reading aloud task produced 991 responses. Of these, Japanese NS raters noted 50 as having vowel errors in the target word. Once again, no errors other than vowel errors in the target word of each recorded token were noted. 5.05% of all target words recorded during the reading aloud task were deemed unacceptable due to vocalic error. Of the 991 responses, 60 were given by Japanese NS, who acted as controls. These 50 errors make up 5.37% of the 931

NNS responses. 23 of the 25 target words (92%) used in the reading aloud task were found to have caused errors in NNS responses. The list of target words in the reading aloud task identified as incurring vowel errors in their responses are listed below in Appendix IV. These words are also listed by token type. Target word types that most often resulted in vowel errors were:

a) target words containing long vowels (54% of all errors),

b) target words containing hiatal vowels (26% of all errors)

c) loanwords (28% of all errors)

d) target words that are a member of a minimal pair (18% of all errors)

e) target words that are written in Romanization (58% of all errors)

Errors Involving Long Vowels

27 errors were noted out of a total of 342 NNS responses in target words containing long vowels. These errors occurred in 17 of the 24 target words that contained long vowels. 7.75% of all responses to target words with long vowels resulted in errors. 10.94% of all responses to the 17 target words containing long vowels that did cause errors were errors. 5.77% of all responses to tokens not containing long vowels resulted in errors. Paired two-tailed T-tests measuring the difference between the mean error rates for tokens with long vowels and tokens without long vowels reveals a t-value of 0.2219. This figure shows a significantly higher chance of error in words with long vowels than in those without long vowels.

Errors Involving Long Vowels in Minimal Pairs

9 errors were noted out of a total of 78 NNS responses in target words containing long vowels that occur in minimal pairs. These errors occurred in 5 of the 6 target words that contained long vowels occurring in minimal pairs. 9.72% of all responses to target words with long vowels that occur in minimal pairs resulted in errors. 11.67% of all responses to the 5 target words containing long vowels in minimal pairs that did cause errors were errors. In contrast, only 6.31% of all responses to tokens containing long vowels not in minimal pairs resulted in errors. Paired two-tailed T-tests measuring the difference between the mean error rates for tokens with long vowels in minimal pairs and tokens had no long vowels in minimal pairs reveals a t-value of 0.1716. This figure shows a significantly higher chance of error in words with long vowels in minimal pairs as compared to those without long vowels in minimal pairs.

Errors Involving Vowels in Hiatus

13 errors were noted out of a total of 210 NNS responses in target words containing vowels in hiatus. These errors occurred in 10 of the 14 target words that contained vowels in hiatus. 5.75% of all responses to target words with vowels that occur in hiatus resulted in errors. 8.06% of all responses to the 10 target words containing vowels in hiatus that did cause errors were errors. 7.10% of all responses to tokens not containing vowels in hiatus resulted in errors. Paired two-tailed T-tests measuring the difference between the mean error rates for tokens with vowels in hiatus and tokens without vowels in hiatus reveals a t-value of 0.4593. This figure shows a significantly higher chance of error in words with vowels in hiatus as compared to those without vowels in hiatus.

Errors Involving Loanwords

14 errors were noted out of a total of 210 NNS responses in target words that were loanwords. These errors occurred in 11 of the 14 target words that that were loanwords. 6.75% of all responses to target words that were loanwords resulted in errors. 8.59% of all responses to the 11 target words that were loanwords that did cause errors were errors. 6.75% of all responses to tokens that were not loanwords resulted in errors. Paired two-tailed T-tests measuring the difference between the mean error rates for tokens that were loanwords and tokens that were not loanwords reveals a t-value of 0.9855. This figure shows a significantly higher chance of error in words that were loanwords as compared to those that were not loanwords.

Errors Involving Loanwords that Include Long Vowels

5 errors were noted out of a total of 42 NNS responses in target words that were loanwords with long vowels. These errors occurred in all 3 of the target words that that were loanwords with long vowels. 11.11% of all responses to target words that were loanwords with long vowels resulted in errors. Conversely, 6.75% of all responses to tokens that were loanwords without long vowels resulted in errors. Paired two-tailed T-tests measuring the difference between the mean error rates for tokens that were loanwords with long vowels and tokens that were loanwords without long vowels reveals a t-value of 0.1579. This figure shows a significantly higher chance of error in words that were loanwords with long vowels as compared to those that were loanwords without long vowels. Paired two-tailed T-tests measuring the difference between the mean error rates for tokens that were loanwords with long vowels and tokens that were loanwords reveals a t-value of 0.2510. This figure shows a significantly higher chance of error in words that were loanwords with long vowels as compared to those that were

loanwords. Paired two-tailed T-tests measuring the difference between the mean error rates for tokens that were loanwords with long vowels and tokens that contained long vowels reveals a t-value of 0.4106. This figure shows a significantly higher chance of error in words that were loanwords with long vowels than those that had long vowels. Paired two-tailed T-tests measuring the difference between the mean error rates for tokens that were loanwords with long vowels and tokens that were neither loanwords nor contained long vowels reveals a t-value of 0.1197. This figure shows a significantly higher chance of error in words that were loanwords with long vowels than those that were not loanwords nor had long vowels.

Errors Involving Romanization

29 errors were noted out of a total of 372 NNS responses in target words that were presented in Roman letters. These errors occurred in 20 of the 25 Romanized target words. 8.00% of all responses to target words written in Roman letters resulted in errors. 10.00% of all responses to the 20 Romanized target words that did cause errors were errors. 5.44% of all responses to tokens not written in Roman letters resulted in errors. Paired two-tailed T-tests measuring the difference between the mean error rates for tokens in Roman letters and tokens not in Roman letters reveals a t-value of 0.1137. This figure shows a significantly higher chance of error in words in Roman letters than those not in Roman letters. The figures offered above are summarized in Table 4.5 below.

Table 4.5 Error rates and T-values by Target Word Type in the Reading Aloud Tasks

Target word type	Mean error rate	T-value	P-value	T-test compared with:
Long vowels	7.75%	0.2219		No long vowels
Long vowels in minimal pair	**9.72%**	0.1716	$p < .01$	No long vowels in minimal pairs
Vowels in hiatus	5.75%	0.4594		No vowels in hiatus
Loanwords	6.75%	0.9856		Not loanwords
Loanwords with long vowels	**11.11%**	0.1579		Loanwords without long vowels
		0.2510	$p < .01$	All loanwords
		0.4107	$p < .01$	Long vowels
		0.1197		Neither loanwords nor had long vowels
Roman letters	**8.00%**	0.1137	$p < .01$	Not Roman letters

Errors by Japanese Level of Respondent

Of the 50 errors reported in the Reading Aloud Tasks, 30 of these (60%) were committed by 8 learners in the second semester of the first year of Japanese, 13 errors (26%) were committed by 7 learners in the second semester of the second year of Japanese, 6 errors (12%) were committed by 4 learners in the second semester of the third year of Japanese, and one (2%) was committed by one learner in the second semester of the fourth of Japanese. This distribution is represented in Table 4.6 below. Romanization was especially difficult for first-year learners, who committed errors nearly two-thirds of the time on tokens presented in Roman letters. We also find that third- and fourth-year respondents had as much difficulty with Roman letters, likely due to the fact that they no longer rely on Roman letters to learn new words and are confused by the representation of Japanese in the script that is used to write their L1.

Table 4.6 Errors by Japanese Level of Respondent in the Reading Aloud Tasks

Japanese level	Total errors	Target word type	# of errors	% of total level errors
First year; second semester	30	**Long vowels**	13	**43.33%**
		Long vowels in minimal pair	5	16.67%
		Vowels in hiatus	16	**53.33%**
		Loanwords	6	20.00%
		Loanwords with long vowels	0	0.00%
		Devoiced vowels	4	13.33%
		Romanization	19	**63.33%**
		Hiragana	9	**30.00%**
		Katakana	2	6.67%
Second year; second semester	13	Long vowels	2	15.38%
		Long vowels in minimal pair	1	7.69%
		Vowels in hiatus	4	**30.77%**
		Loanwords	6	**46.15%**
		Loanwords with long vowels	0	0.00%
		Devoiced vowels	3	23.08%
		Romanization	5	**38.46%**
		Hiragana	3	23.08%
		Katakana	5	**38.46%**
Third year; second semester	6	**Long vowels**	2	**33.33%**
		Long vowels in minimal pair	1	16.67%
		Vowels in hiatus	2	**33.33%**
		Loanwords	2	**33.33%**
		Loanwords with long vowels	0	0.00%
		Devoiced vowels	3	**50.00%**
		Romanization	4	**66.67%**
		Hiragana	1	16.67%
		Katakana	1	16.67%
Fourth year; second semester	1	**Long vowels**	1	**100%**
		Long vowels in minimal pair	0	0%
		Romanization	1	**100%**
		Kana	0	0%

We see similar patterns across all levels. Long vowels, Romanization, vowels in hiatus, and loanwords are challenging to most all levels of respondent.

Errors by Gender

Again, male respondents made up a larger percentage of lower level respondents (6 of the 8 first-year respondents) in the Reading Aloud tasks, which may have contributed to the fact that male learners committed 77.78% of all errors in these tasks. Overall, however, males only made 2% more errors than females in the task. This number is not a significant sign of additional difficulty for one gender over another. Both genders tended to make the same types of errors in similar amounts. It is remarkable, however, that a larger percentage of male respondents than female respondents were found to have made errors, however, again this could be simply a case of having more male respondents in lower levels than female respondents.

Table 4.7 Errors by Gender of Respondent in the Reading Aloud Tasks

Gender	Respondents in task	Respondents w/ errors	Respondent error %	Total responses	Total errors	Error %
Male	18	14	77.78%	541	34	6.28%
Female	13	6	46.15%	390	16	4.10%

Male and female respondents made more errors in the same areas: 1) Romanization, 2) long vowels, and 3) loanwords. Male speakers also tended to have more difficulty with vowels in hia-tus, which could be a measure of level, rather than gender. Table 4.8 below details all errors by gender.

Table 4.8 Breakdown of Errors by Gender of Respondent in the Reading Aloud Tasks

Gender	Target word type	# of errors	% of total level errors
Male	**Long vowels**	12	**35.29%**
	Long vowels in minimal pair	5	14.71%
	Vowels in hiatus	10	**29.41%**
	Loanwords	9	**26.47%**
	Loanwords with long vowels	0	0.00%
	Devoiced vowels	8	23.53%
	Romanization	21	**61.76%**
	Hiragana	9	**26.47%**
	Katakana	4	11.76%
Female	**Long vowels**	6	**37.50%**
	Long vowels in minimal pair	2	12.50%
	Vowels in hiatus	3	18.75%
	Loanwords	5	**31.25%**
	Loanwords with long vowels	0	0.00%
	Devoiced vowels	2	12.50%
	Romanization	8	**50.00%**
	Hiragana	4	25.00%
	Katakana	4	25.00%

Combined NS Rating Results

Errors Involving Long Vowels

62 errors were noted out of a total of 1,018 NNS responses in target words containing long vowels. These errors occurred in 29 of the 45 target words that contained long vowels. 6.59% of all responses to target words with long vowels in both the elicited imitation and reading aloud tasks resulted in errors. 10.23% of all responses to the 29 target words containing long vowels that did cause errors were errors. 5.58% of all responses to tokens not containing long vowels resulted in errors. Paired two-tailed T-tests measuring the difference between the mean error rates for tokens with long vowels and tokens without long vowels reveals a t-value of

0.4555. This reveals a significantly higher likelihood of making errors in words with long vowels than in those without long vowels.

Errors Involving Long Vowels in Minimal Pairs

25 errors were noted out of a total of 176 NNS responses in target words containing long vowels that occur in minimal pairs. These errors occurred in 9 of the 12 target words that contained long vowels occurring in minimal pairs. 11.86% of all responses to target words with long vowels that occur in minimal pairs resulted in errors. 15.81% of all responses to the 9 target words containing long vowels in minimal pairs that did cause errors were errors. 5.23% of all responses to tokens not containing long vowels in minimal pairs resulted in errors. Paired two-tailed T-tests measuring the difference between the mean error rates for tokens with long vowels in minimal pairs and tokens without long vowels in minimal pairs reveals a t-value of 0.0628. This figure shows a significantly higher chance of error in words with long vowels in minimal pairs as compared to those without long vowels in minimal pairs.

Errors Involving Vowels in Hiatus

29 errors were noted out of a total of 579 NNS responses in target words containing vowels in hiatus. These errors occurred in 17 of the 26 target words that contained vowels in hiatus. 5.10% of all responses to target words with vowels that occur in hiatus resulted in errors. 7.79% of all responses to the 17 target words containing vowels in hiatus that did cause errors were errors. 6.40% of all responses to tokens not containing vowels in hiatus resulted in errors. Paired two-tailed T-tests measuring the difference between the mean error rates for tokens with vowels in hiatus and tokens without vowels in hiatus reveals a t-value of 0.3154. This figure

shows a significantly lower chance of error in words with vowels in hiatus as compared to those without vowels in hiatus.

Errors Involving Loanwords

27 errors were noted out of a total of 612 NNS responses in target words that were loanwords. These errors occurred in 18 of the 27 target words that that were loanwords. 5.29% of all responses to target words that were loanwords resulted in errors. 7.94% of all responses to the 18 target words that were loanwords that did cause errors were errors. 6.34% of all responses to tokens that were not loanwords resulted in errors. Paired two-tailed T-tests measuring the difference between the mean error rates for tokens that were loanwords and tokens that were not loanwords reveals a t-value of 0.4203. This figure shows a significantly lower chance of error in words that were loanwords as compared to those that were not loanwords.

Errors Involving Loanwords that Include Long Vowels

15 errors were noted out of a total of 289 NNS responses in target words that were loanwords with long vowels. These errors occurred in 7 of the 11 target words that that were loanwords with long vowels. 5.97% of all responses to target words that were loanwords with long vowels resulted in errors. 9.39% of all responses to the 4 target words that were loanwords with long vowels that did cause errors were errors. 5.82% of all responses to tokens that were loanwords without long vowels resulted in errors. Paired two-tailed T-tests measuring the difference between the mean error rates for tokens that were loanwords with long vowels and tokens that were loanwords without long vowels reveals a t-value of 0.9477. This figure shows a significantly higher chance of error in words that were loanwords with long vowels as compared to those that were loanwords without long vowels. Paired two-tailed T-tests measuring the

difference between the mean error rates for tokens that were loanwords with long vowels and tokens that were loanwords reveals a t-value of 0.7696. This figure shows a significantly higher chance of error in words that were loanwords with long vowels as compared to those that were loanwords. Paired two-tailed T-tests measuring the difference between the mean error rates for tokens that were loanwords with long vowels and tokens that contained long vowels reveals a t-value of 0.7937. This figure shows a significantly higher chance of error in words that were loanwords with long vowels than those that had long vowels. Paired two-tailed T-tests measuring the difference between the mean error rates for tokens that were loanwords with long vowels and tokens that were neither loanwords nor contained long vowels reveals a t-value of 0.9807. This figure shows a significantly higher chance of error in words that were loanwords with long vowels than those that were not loanwords nor had long vowels.

Errors Involving Devoiced Vowels

As noted above, 7 errors were noted out of a total of 152 NNS responses in target words that contained devoiced vowels. These errors occurred in 3 of the 5 target words that that contained devoiced vowels. 4.61% of all responses to target words that contained devoiced vowels resulted in errors. 5.42% of all responses to tokens that did not contain devoiced vowels resulted in errors. Paired two-tailed T-tests measuring the difference between the mean error rates for tokens that contained devoiced vowels and tokens that did not contain devoiced vowels reveals a t-value of 0.7724. This figure shows a significantly higher chance of error in words that contained devoiced vowels as compared to those that did not contain devoiced vowels.

Errors Involving Romanization

As noted above, 29 errors were noted out of a total of 372 NNS responses in target words that were presented in Roman letters. These errors occurred in 20 of the 25 Romanized target words. 8.00% of all responses to target words written in Roman letters resulted in errors. 5.44% of all responses to tokens not written in Roman letters resulted in errors. Paired two-tailed T-tests measuring the difference between the mean error rates for tokens in Roman letters and tokens not in Roman letters reveals a t-value of 0.1139. This figure shows a significantly higher chance of error in words in Roman letters than those not in Roman letters. The combined figures for both the elicited imitation tasks and reading aloud tasks are summarized in Table 4.9 below, where each target word type from each task is ranked by probability of error. Details related to these findings will be discussed in detail in the Discussion chapter below.

Table 4.9 Target Word Types in Each Task Ranked by Mean Error Rate

Task	Target word type	Mean error rate	T-value	P-value	T-test compared with:
Elicited imitation	Long vowels in minimal pair	12.84%	0.2113	$p < .01$	No long vowels in minimal pairs
Reading aloud	Loanwords with long vowels	11.11%	0.1579		Loanwords without long vowels
Reading aloud	Loanwords with long vowels	11.11%	0.251	$p < .01$	All loanwords
Reading aloud	Loanwords with long vowels	11.11%	0.4107	$p < .01$	Long vowels
Reading aloud	Loanwords with long vowels	11.11%	0.1197		Neither loanwords nor had long vowels
Reading aloud	Long vowels in minimal pair	9.72%	0.1716	$p < .01$	No long vowels in minimal pairs
Reading aloud	Roman letters	8.00%	0.1137	$p < .01$	Not Roman letters
Elicited imitation	Devoiced vowels	7.88%	0.3284	$p < .01$	No devoiced vowels
Reading aloud	Long vowels	7.75%	0.2219		No long vowels
Reading aloud	Loanwords	6.75%	0.9856		Not loanwords
Reading aloud	Vowels in hiatus	5.75%	0.4594		No vowels in hiatus
Elicited imitation	Long vowels	5.21%	0.9826	$p < .01$	No long vowels
Elicited imitation	Vowels in hiatus	4.33%	0.5937		No vowels in hiatus
Elicited imitation	Loanwords with long vowels	4.05%	0.6487		Loanwords without long vowels
Elicited imitation	Loanwords with long vowels	4.05%	0.9114		All loanwords
Elicited imitation	Loanwords with long vowels	4.05%	0.6872		Long vowels
Elicited imitation	Loanwords with long vowels	4.05%	0.5256		Neither loanwords nor had long vowels
Elicited imitation	Loanwords	3.73%	0.3208		Not loanwords

In Table 4.10 below it is clear that learners across all levels have difficulty with long vowels, vowels in hiatus, loanwords, and devoiced vowels.

Table 4.10 Combined Errors by Japanese Level of Respondent

Japanese level	Total errors	Target word type	# of errors	% of total level errors
First year; second semester	71	**Long vowels**	33	**46.48%**
		Long vowels in minimal pair	11	15.49%
		Vowels in hiatus	32	**45.07%**
		Loanwords	12	16.90%
		Loanwords with long vowels	6	8.45%
		Devoiced vowels	15	21.13%
Second year; second semester	30	**Long vowels**	10	**33.33%**
		Long vowels in minimal pair	3	10.00%
		Vowels in hiatus	9	**30.00%**
		Loanwords	10	**33.33%**
		Loanwords with long vowels	2	6.67%
		Devoiced vowels	8	**26.67%**
Third year; second semester	21	**Long vowels**	9	**42.86%**
		Long vowels in minimal pair	4	19.05%
		Vowels in hiatus	7	**33.33%**
		Loanwords	7	**33.33%**
		Loanwords with long vowels	2	9.52%
		Devoiced vowels	10	**47.62%**
Fourth year; second semester	2	**Long vowels**	1	**50.00%**
		Devoiced vowels	1	**50.00%**

Examples in the Discussion chapter below

In the following Discussion chapter we will discuss and illustrate each type of error under each type of task. As mentioned above, no analysis of pitch-accent was possible due to a lack of NS rater awareness of error in pitch-accent in contrast to other suprasegmental characteristics and no discussion of errors by gender is offered as the data does not show any significant correlation between gender and error type of quantity. The examples given were all identified as errors by NS raters, although it is possible that some errors were not identified by the NS raters or that the researcher may have identified different errors. Several factors may have inhibited the NS raters in their ability to identify errors. All NS raters had some familiarity with the English language and had had some contact with English speakers of Japanese, although none were associated with the Japanese program or respondents. None of the NS raters was trained to identify vocalic errors. As a teacher of Japanese, the researcher may be more inclined to find fault in pronunciation that NS find allowable variation.

CHAPTER 5

DISCUSSION

Overall Results

NS raters noted a number of errors in both the elicited imitation and reading aloud tasks. This study posited that four factors help to increase the likelihood of vowel transfer: 1) Japanese phonological rules related to phonemic contrastive vowel length are applied, 2) Japanese phonotactic rules regarding vowels occurring in hiatus are applied, 3) Japanese written in Romanization is read aloud, and 4) English loanwords appear. Errors in both vowel duration and vowel height were found in respondent recordings of the tokens in both the elicited imitation and reading aloud tasks. These errors will be discussed in detail below.

Error rates in perspective

Japanese is a language with a relatively simple vowel structure. It contains only five vowels, four of which are very similar to those that exist in English; the other being differentiated from English [u] only by a lack of lip rounding. Japanese contains no diphthongs or vowel reduction. This simplicity has given the Japanese vowel system a reputation as one of the easiest vowel systems to acquire. The NNS error figures given in Chapter 4 above may appear relatively low, with the highest rate of error for any of these conditions being only 11.11% or less than twelve out of every hundred answers, and the lowest only 4.05%, or around four of

every hundred answers. However, it must be remembered that Japanese is fundamentally a relatively easy language to pronounce for non-native speakers. With this relative ease of mastery in mind and having had a minimum of six months experience hearing and pronouncing Japanese it is significant that vowel error rates at roughly 11% for words commonly heard and pronounced by students drilled in the language four times per week for the first two years of study.

Measuring Vowel Duration

In order to compare the duration of vowels produced by multiple speakers it is essential to establish a consistent method of measuring vowel duration. In establishing the onset of a vowel I have included all release bursts and aspiration of the preceding consonant as part of the vowel duration because the onset of the release burst represents the transition point from consonant closure into vowel. When examining the duration of a vowel following a fricative the point at which fricative turbulence dramatically lessens in the waveform and F2 and F3 become clearly visible in a spectrogram is the point from which vowel length is measured. A marked drop in intensity and loss of energy in F2 and F3 in the spectrogram as well as dramatic change in amplitude in the waveform signify the end of vocalic production.

While it is possible to determine the absolute length of a single isolated vowel in milliseconds, in determining whether a vowel is considered long or short we must compare multiple vowels within the same word or phrase. The ratio of the length of a long vowel to the length of a short vowel should fall within a range of acceptability for all NS. In this way a vowel can only be long or short in relation to those vowels around it.

Measuring Vowel Height

In assessing vowel quality it is important to first establish normative formant figures for the five Japanese vowel sounds. Table 5.1 below offers a set of the average formant frequencies for Japanese vowels as pronounced by eleven child and four adult native Japanese speakers. In this study we will only apply data obtained by adult speakers, as all study participants were adults.

Table 5.1 Average formant frequencies for Japanese vowels as pronounced by Japanese NS (Kasuya et al., 1968:359)

		F1	F2	F3
/i/	Child	393	3215	3860
	Boy	317	2622	3183
	Female	325	2725	3475
	Male	263	2263	3000
/e/	Child	659	2468	3574
	Boy	500	1900	2700
	Female	483	2317	2983
	Male	475	1738	2400
/A/	Child	1072	1609	3699
	Boy	805	1296	2936
	Female	483	1363	3050
	Male	475	1163	2713
/o/	Child	593	1077	3597
	Boy	475	868	3000
	Female	483	925	3000
	Male	550	838	2625
/ɯ/	Child	428	1537	3323
	Boy	339	1389	2596
	Female	375	1675	2688
	Male	363	1300	2350

Kent and Read also give average figures for vowel formants as spoken by 76 English NS based on a 1952 study by Peterson and Barney in Table 5.2 below. Again, only figures for adult speakers will be considered in this study. In comparing these average formant figures with the data obtained from recordings of English NS speaking Japanese we are able to establish whether the respondent is producing a vowel sound that is closer to the native Japanese vowel sound expected in the token or one that is closer to a native English vowel sound, indicating the possibility of some form of vocalic transfer from the N1.

Table 5.2 Average formant frequencies for English vowels as pronounced by English NS (Kent and Read, 1992: 95)

	Men			Women			Children		
Vowel	F1	F2	F3	F1	F2	F3	F1	F2	F3
[i]	270	2300	3000	300	2800	3300	370	3200	3700
[ɪ]	400	2000	2550	430	2500	3100	530	2750	3600
[ɛ]	530	1850	2500	600	2350	3000	700	2600	3550
[æ]	660	1700	2400	860	2050	2850	1000	2300	3300
[ɑ]	730	1100	2450	850	1200	2800	1030	1350	3200
[ɔ]	570	850	2400	590	900	2700	680	1050	3200
[ʊ]	440	1000	2250	470	1150	2700	560	1400	3300
[u]	300	850	2250	370	950	2650	430	1150	3250
[ʌ]	640	1200	2400	760	1400	2800	850	1600	3350
[ɜ]	490	1350	1700	500	1650	1950	560	1650	2150
Mean	500	1420	2400	575	1700	2800	670	1900	3250

Elicited Imitation Errors: Long Vowels

In the elicited imitation task the most numerous errors occurred in long vowel production. Many respondents had difficulty producing long vowels, often resulting in vowel shortening. When coupled with familiarity with words that only contrasted by vowel length the error rate rose dramatically.

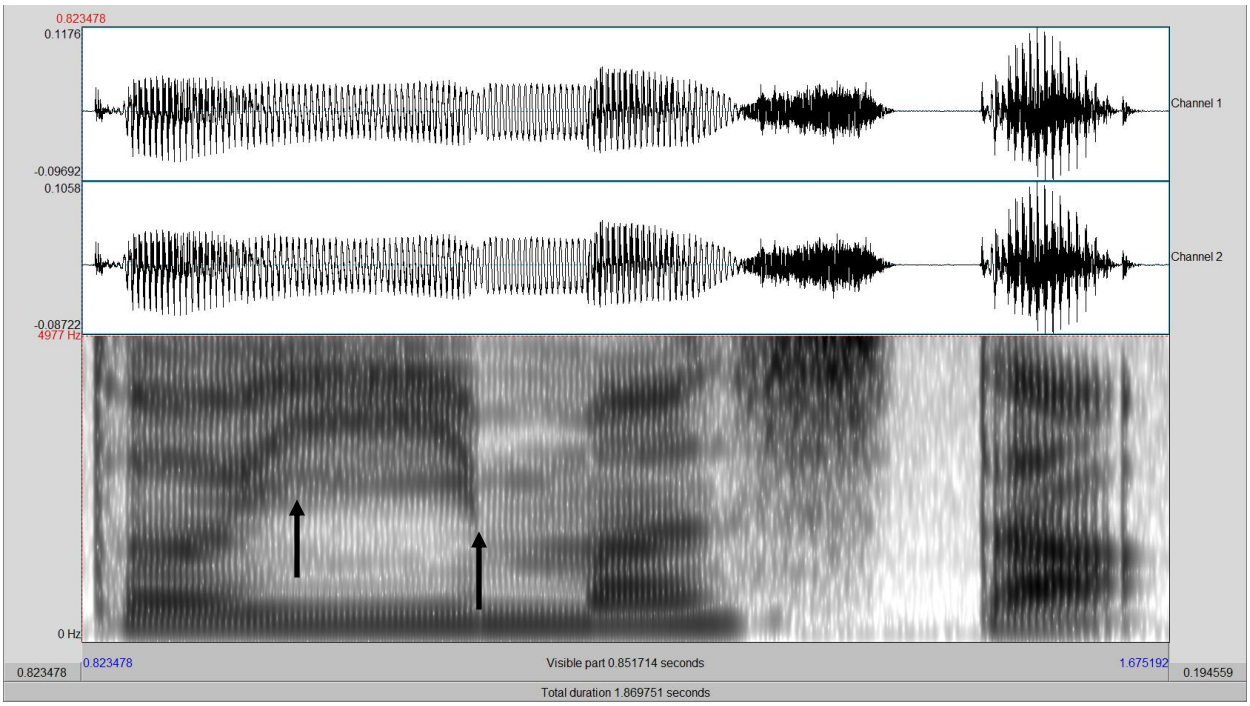
Minimal pairs

Japanese vowel length is phonemically contrastive, resulting in numerous minimal pairs differentiated only by vowel length. The most commonly occurring errors were in minimal pairs differentiated by vowel duration contrasts, confirming that the difference in phonemic contrast between long and short vowels seen in Japanese is difficult for native English speakers. Typical examples include familial terms like [obasaɴ] 'aunt/older woman' and [oba:saɴ] 'grandmother[elderly woman'. In the elicited imitation task vowels in words with long vowels were mispronounced 5.21% overall; however, when these sorts of words form a minimal pair based solely on contrastive vowel length this error rate climbs to 12.84%. The inability to contrast vowels by length most often resulted in vowel shortening. The reason minimal pairs contrasted only by vowel duration were more problematic is unclear, however, it should be remembered that many familial terms and words learned early in the study of Japanese as well as those often used have corresponding minimal pair members. This commonality of usage does not make them more numerous, but simply more salient to both native and non-native speakers alike, who work to ensure that the listener is able to understand which member of the minimal pair is being said.

Some vowels seem to be more difficult than others and seem to produce more errors. The intrinsic shortness of [i] may have made it more difficult to identify and produce when a long vowel. Long vowel [i:] was especially problematic when encountered as one member of minimal pair: [i:.ma.ɕi.ta] ('said') and [i.ma.ɕi.ta] ('was [present].'). Errors were made 11 times when pronouncing members of minimal pairs containing [i:], whereas only one non-minimal pair target word that contained [i:] was mispronounced. Aside from context, the contrast in length of

initial vowel [i] is the only means of differentiating these two lexemes and is, thus, integral to listener comprehension. One token heard was '"doumo" to iimashita' (S/he said 'thanks.') and the target word was [i:.ma.ɕi.ta]. Due to the lack of clear distinction between the word final [o] of 'to' and the word initial [i:] of 'iimashita', the duration of the initial high front vowel was consistently measured on spectrographs created for all respondents as beginning at the end of the rising F2 arc of the preceding [o] from 'to' (where vowels [o] and [i] met) and ending at the point at which energy was decreased in the F2 and F3 (the point at which closure for bilabial [m] began). The length of [i:] was thus recorded as the F2 plateau between the rising F2 arc of [o] and the end of F2 voicing, as is indicated with arrows in Figure 5.1 below.

Figure 5.1 NS respondent production of [i:.ma.ɕi.ta] ('said')



t o i: m a ɕ i̥ t a

Nine NNS respondents were identified as having errors in initial [i] production in long vowel [i:] when producing the word [i:.ma.ɕi.ta] 'said.' When we compare the length of the

initial [i:] of NS and NNS recordings we see that the ratio of the duration of the first vowel [i:] to the second vowel [a] is clearly smaller in NNS responses than in NS responses, resulting in segments that are roughly the same length, as is represented in Table 4.1 below.

Although short [a] is intrinsically longer than short [i] due to a lower vowel height, note that all NS produced a word initial long [i:] that was at least one and a half times the length of the short [a]. This supports work by Vance and others that reveals that the durational ratio of Japanese long vowels to short vowels is generally phonetically realized by NS as between 1.5:1 and 2:1. In this study NNS all produced a high front vowel ([i]) that was shorter in duration than the low central [a], more closely reflecting the durational nature of short [i].

Table 5.3 NS and NNS durations of first and second vowels in [i:.ma.ɕi.ta].

Respondent	V1 ([i:]) length	V2 ([a]) length	V1/V2
NS #29	0.150613	0.099096	1.52
NS #31	0.189323	0.103757	1.82
310_03m25	0.044397	0.142439	**0.31**
310_04m19	0.069759	0.099168	**0.70**
310_10f20	0.060320	0.095993	**0.63**
310_15m23	0.069835	0.133393	**0.52**
310_25m19	0.066312	0.096972	**0.68**
310_28f20	0.082236	0.094696	**0.87**
310_39m21	0.065241	0.108346	**0.60**
310_40f22	0.075652	0.120895	**0.63**
310_41f21	0.054860	0.096004	**0.57**

In another example NNS again shortened word initial [i:] to [i], producing the semantically incorrect member of a minimal pair. In this instance the minimal pair consisted of the following: [i:ko] (‘good child’) and [iko:] (‘Let’s go.’). The second member of the pair, [iko:] (‘Let’s go.’), is often realized in the emphatic form as having a short final [i[followed by a glottal stop, resulting in [iko?] (‘Let’s go!’). The final glottal stop of the emphatic form is

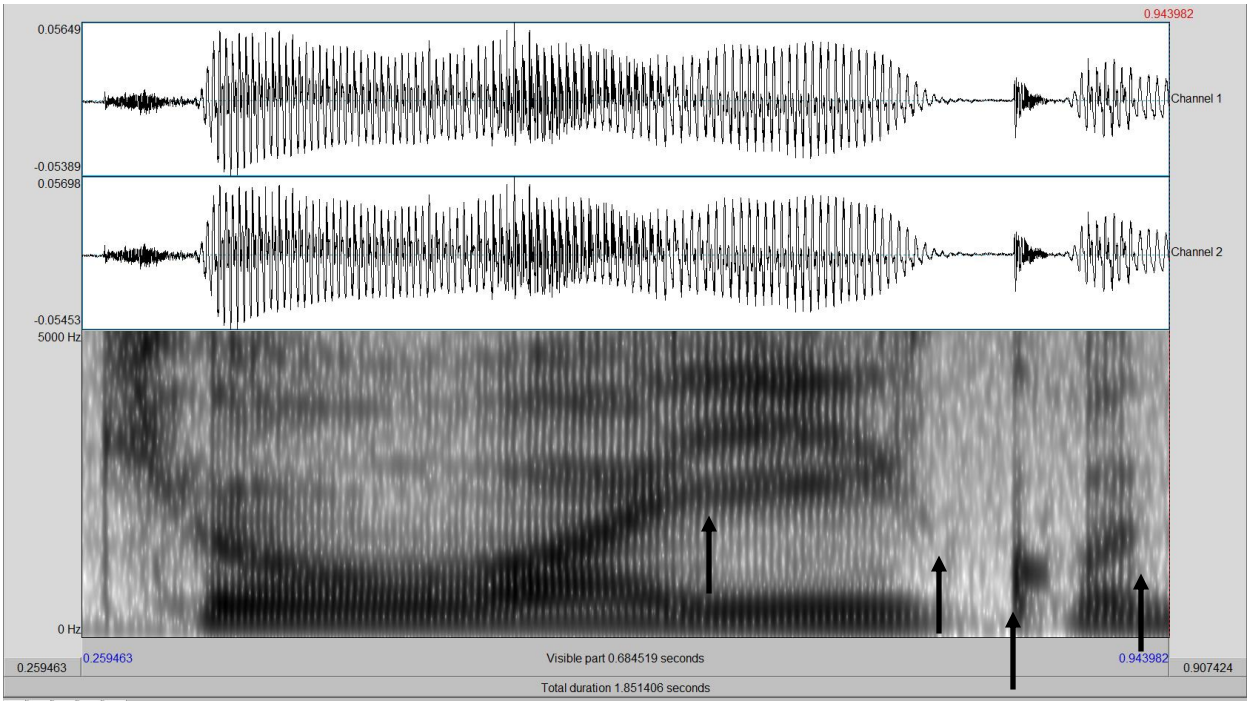
generally not indicated in the orthography, thus typical L2 learners are unaware of the existence of this segment unless explicitly taught to insert a final glottal stop in the emphatic form. NNS respondent 17m21 is likely incorrectly producing the second member of the minimal pair mentioned above [iko:] (‘Let’s go.’), however NNS respondent 33m19 seems to be merging the common imperative [iko:] (‘Let’s go.’) and the emphatic [iko?] (‘Let’s go!’) by simply dropping the word final glottal stop. The full token given was ‘kyou ha iiko deshita ka’ (Were you a good child today?). As ‘iiko’ begins with a vowel, in this example we also see vowels at both word boundaries, making measurement difficult unless a pause is included in production. NS do not generally produce a pause between the topic marker ‘wa’ and the noun ‘iiko’, however, classroom observation reveals that NNS tend to pause after the topic marker in an effort to maximize listener comprehension. This is a strategy that is practiced in class. For NS vowel length for word initial [i:] was again measured from the point at which stability was reached after the rise from [a] to [i:] and for NNS the duration of [i:] was measured from the increase in energy in the F2 and F3 at the point of voicing. In order to obtain consistent measurements across all responses, any aspiration from production of velar [k] in ‘iiko’ was included in the duration of word final [o]. The results are given in Table 5.4 below.

Table 5.4 NS and NNS durations of first and second vowels in [i:.ko].

	V1 ([i:]) length	V2 ([o]) length	V1/V2
NS #29	0.116217	0.080341	1.45
NS #31	0.147913	0.078887	1.87
326_17m21	0.093464	0.161103	**0.58**
326_33m19	0.084506	0.073332	**1.15**

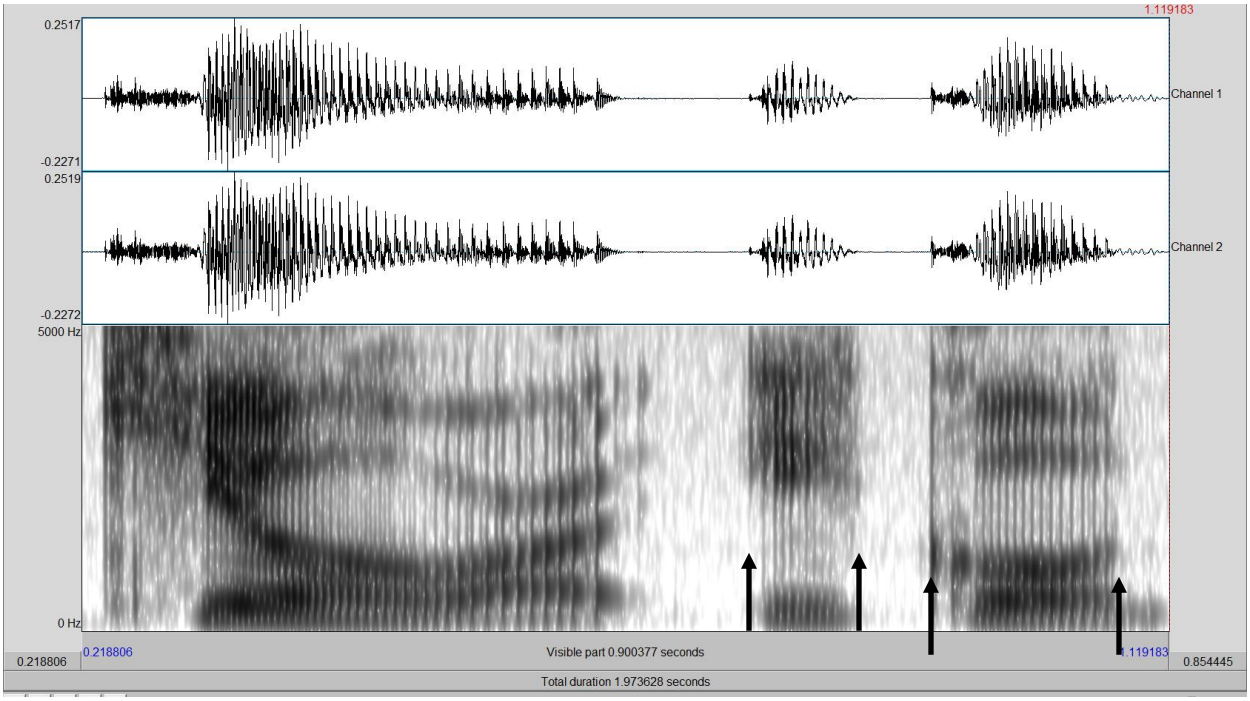
Durational measurements for long vowel [i:] and short vowel [o] produced by NS #29 and NNS 17m21 are indicated with arrows below in Figures 5.2 and 5.3.

Figure 5.2 NS #31 production of [kjo: wa i:ko] (‘a good child today [TOP]’)



i: k o

Figure 5.3 NNS 17m21 production of [kjo: wa i:ko] (‘a good child today [TOP]’)



i k o:

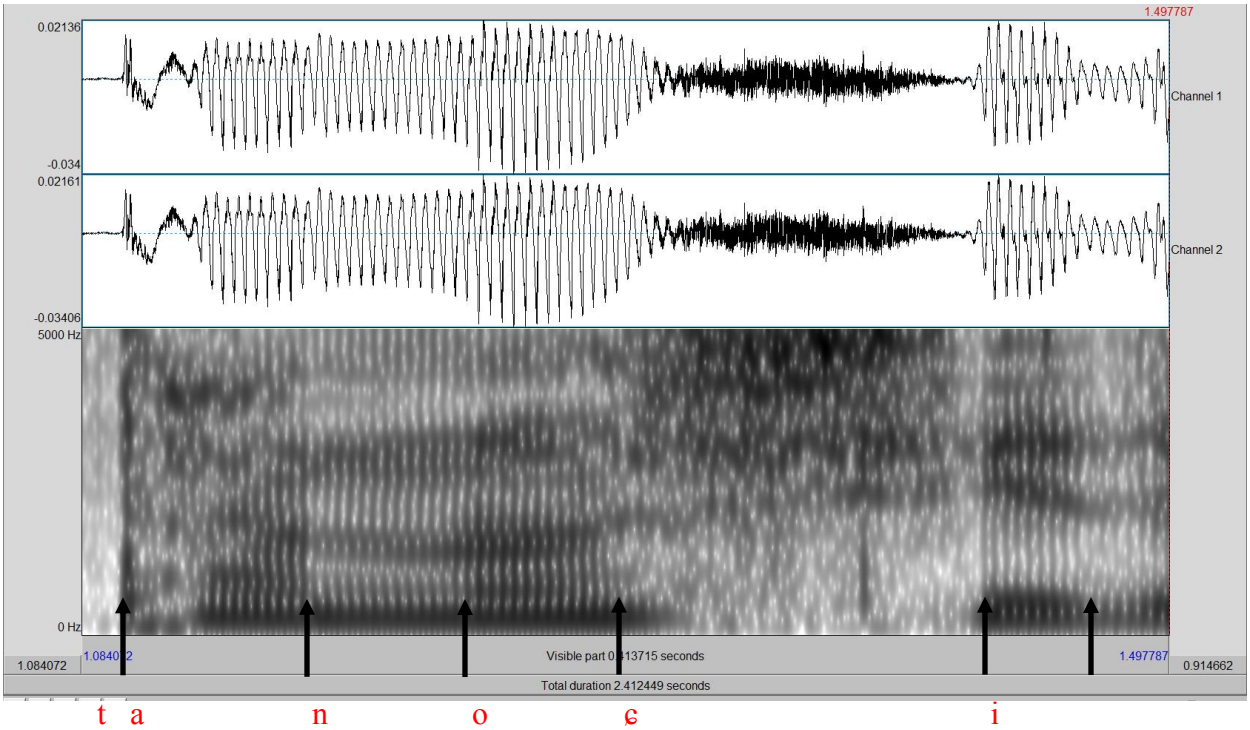
Non-minimal pairs with long vowels

Contrasting length in word final [i:] was also problematic for NNS respondents. The token ‘kurasu ha tanoshii desu’ (‘Class is fun.’) contained target word [ta.no.ɕi:] (‘fun’), which includes long vowel [i:] in word final position. NNS 35f22 offers a clear example of final vowel shortening. In Figure 4.4 below arrows indicate the beginnings and endings of vowels. It is evident that her word final high front vowel is no longer and, in fact, shorter than any of the other vowels in her production of the word [ta.no.ɕi:]. When we contrast this with NS responses we see a clear shortening of the final vowel, as per Table 5.5.

Table 5.5 NS and NNS vowel durations in [ta.no.ɕi:]

	V1 ([a]) length	V2 ([o]) length	V3 ([i:]) length	V1:V2:V3
NS #29	0.114266	0.118949	0.165779	1.00:1.04:1.45
NS #31	0.089235	0.082045	0.159439	1.00:0.92:1.79
314_35f22	0.070988	0.063382	0.040001	**1.00:0.89:0.56**

Figure 5.4 NNS 35f22 production of [ta.no.ɕi:] (‘fun’)



NNS respondents were also identified by NS raters as making errors in producing long [e:]. Production of the target word [e:.ga] from token 'eiga ga sugoku suki' ('I really like movies.') resulted in NNS responses with reportedly shortened initial [e]. In the case of the NS responses we see that the word initial [e:] is more than twice the length of word final [a], whereas NNS 13f22 produced a word initial vowel sound that was only 1.34 times the duration of the word final vowel, considered illicit by the local NS rater.

Table 5.6 NS and NNS vowel durations in [e:.ga]

	V1 ([e:]) length	V2 ([a]) length	V1/V2
NS #29	0.228947	0.099797	2.29
NS #31	0.202351	0.092733	2.18
322_13f22	0.106275	0.079471	**1.34**

The token 'oneesan ga imasu' ('Elder sister is [present].') contains a familial word that does not occur in any minimal pair, nevertheless often seems to confuse L2 Japanese learners. NNS respondent 04m19 produced the same illicit form of the target word [o.ne:.saN] in two separate tokens: 'oneesan ga imasu' ('Elder sister is [present].') and 'oneesan ni aitai' ('I want to meet with the elder sister.').

Table 5.7 NS and NNS respondent 04m19 vowel durations in [o.ne:.saN]

Respondent	Token	V1 ([o]) length	V2 ([e:]) length	V2/V1
NS #29	'oneesan ga imasu'	0.080070	0.184160	2.30
NS #31	'oneesan ga imasu'	0.070455	0.221505	3.14
04m19	'oneesan ga imasu'	0.164519	0.159142	**0.97**
NS #29	'oneesan ni aitai'	0.074702	0.149404	2.00
NS #31	'oneesan ni aitai'	0.090892	0.228458	2.51
04m19	'oneesan ni aitai'	0.109651	0.077011	**0.70**

In the case of NS respondents, the mean duration of long vowel [e:] in target word [o.ne:.saɴ] is 2.49 times the duration of short vowel [o], whereas for NNS 04m19 the mean duration of [e:] is only 0.83 times the duration of [o]. This target word also presented difficulties phonotactically for NNS. NNS 18m20 diphthongized medially occurring long vowel [e:] as [ei]. The spectrograms in Figures 5.5 and 5.6 below show clearly a broadening gap between F1 and F2 in the NNS pronunciation of [ne:] from [o.ne:.saɴ], which is not evident in the very regular and linear NS pronunciation of [ne:]. The waveform above the spectrogram for the NNS also indicates the point midway through pronunciation at which a change in vowel quality occurs.

Figure 5.5 18m20 Pronunciation of [ne:] from [o.ne:.saɴ]

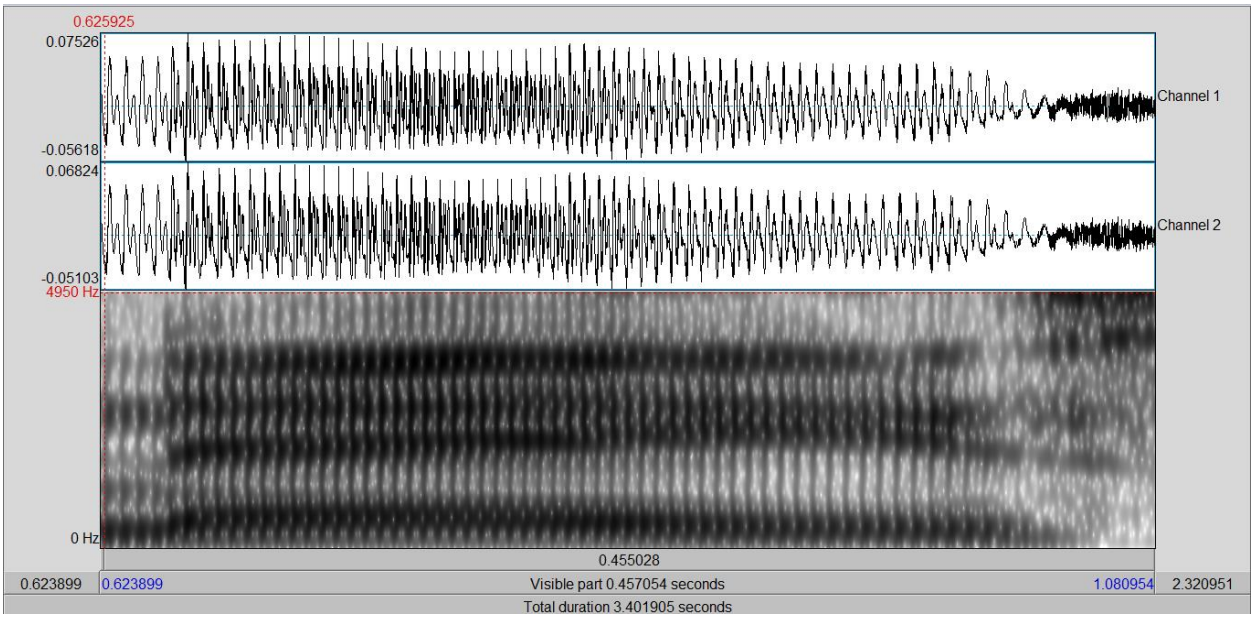
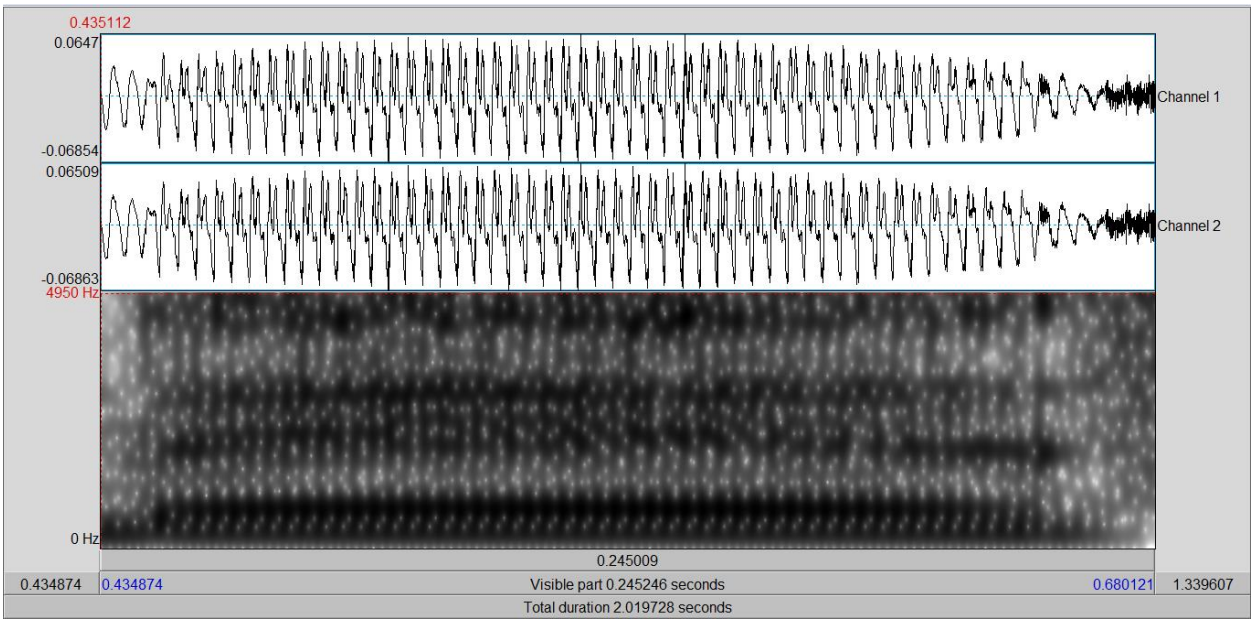


Figure 5.6 NS31 Pronunciation of [ne:] from [o.ne:.saɴ]



The word for 'younger sister' [i.mo:.to] also proved difficult for one NNS, who inserted syllable [an] medially, splitting syllable [mo], resulting in [i.ma.no:.to], which has no meaning and is incomprehensible.

Other examples of long vowel [o:] that proved difficult for L2 Japanese learners were [no:.to] 'notebook', [so:.daɴ] 'consultation', and [çi.ko:.ki] 'airplane.' We see reports of shortening by NNS responses to target word stimulus [çi.ko:.ki], as per Table 5.8 below. NNS respondent 40f22 was reported to have shortened the first long vowel in the word [no:.to] in response to the token 'nooto wo kaimashita' (I bought a notebook.). Upon closer examination we can see that rather than shortening the vowel, for which the ratio of duration to the following vowel [o] is very similar to that of the NS respondents, this NNS has lengthened the closure period for medial consonant [t]. It seems that gemination of this consonant, which results in a nonce word in Japanese, is perceived by NS as shortening of the initial vowel. In Table 4.10 we compare the length of the initial nasal and vowel segments ([no:]) with closure time of the

medial consonant ([t]) and duration of the final vowel ([o]). Interestingly we find that the first and third vowels, though phonemically different lengths, are realized phonetically by all three respondents as roughly the same length. The only visible difference in duration is the medial consonant, which is less than half the length of any vowel in the word in all NS responses, but roughly the same length as the first phonemically "long" vowel [o:]. It appears as though NS are able to define a vowel as long or short by comparing its length not only to other vowels, but also to interceding consonants.

Table 5.8 Reported NNS vowel shortening in [no:.to]

	NV1 ([no:]) length	Medial C ([t]) length	V2 ([o]) length	NV1/V2	NV1:C:V2
NS #29	0.224668	0.100190	0.203416	1.10447556	1.00:0.45:0.91
NS #31	0.217590	0.095325	0.178217	1.2209273	1.00:0.44:0.82
343_40f22	0.160575	0.188304	0.120432	1.33332503	**1.00:1.17:0.75**

Target word [çi.ko:.ki] occurring in the token 'hikouki de ikimashou' (Let's go by plane.) elicited the same type of response with lengthening of a medial consonant, which, together with a longer word initial [i] seems to have led to NS perception of a shortened long vowel [o:]. We find that initial [i], medial consonant [k] and final vowel [i] all have roughly the same duration for NNS 03m25, whereas the duration of medial consonant [k] for all NS is around one third the length of long vowel [o:] and that all phonemically short vowels have less than half the duration of long] o:].

Table 5.9 Reported NNS vowel shortening in [çi.ko:.ki]

	V1 ([i])	V2 ([o:])	Medial C ([k])	V3 ([i])	V2/V3	V2:C:V3
NS #29	0.056051	0.194336	0.067915	0.093281	2.08333959	1.00:0.35:0.48
NS #31	0.074366	0.191670	0.064185	0.095171	2.01395383	1.00:0.33:0.50
327_03m25	0.120694	0.158973	0.109885	0.109435	**1.45267054**	**1.00:0.69:0.69**

Vowel lengthening

Although most errors related to vowel duration resulted in the shortening of long vowels, lengthening of short vowels also occurred. In order to create the adverbial form the final [i] is removed from an 'i' adjective and replaced by [kɯ]. This pattern obtains for adjectives like:

ureshii 'happy' > ureshiku 'happily'

kibishii 'strict' > kibishiku 'strictly'

[ta.no.ɕi.kɯ] 'enjoyably' is the adverbial form of adjective [ta.no.ɕi:] 'enjoyable'. Two NNS respondents lengthened the third vowel [i] in the adverbial form, resulting in [ta.no.ɕi:.ku]. Although understandable, this pronunciation is immediately confusing as it merges the adjectival and adverbial forms of the word. Other errors show lengthening of short vowels that do not form a minimal pair. NNS 18m20 lengthened the initial vowel in [eɴ.pi.tsɯ] 'pencil' to [e:ɴ.pi.tsɯ] and the medial [a] in [o.ha.ɕi] 'chopsticks' to [o.ha:.ɕi]. As these words are not members of minimal pairs contrasted by vowel length, this lengthening does not diminish intelligibility. It only results in a noticeable foreign accent. Target word [çi.ko:.ki] 'airplane' also presented difficulties for one NNS, who lengthened word final [i]. It is unclear why this lengthening occurred, but it is conceivably due to the long [o] that precedes the [i]. In one instance a NNS inserted a vowel in the syllable preceding the long vowel. In the target word [ki.ɽe:] 'pretty', the NNS inserted [e] after syllable [ki], resulting in [ki.e.ɽe:]. It is not entirely clear why this insertion occurred.

Elicited Imitation Errors: Loanwords

As mentioned above, long vowel [o:] in [no:.to] 'notebook' proved difficult for L2 Japanese learners. This is one of several loanwords found to cause errors in L2 Japanese vowel production. The target word [o:.sɯ.to.ɽa.ɽia] 'Australia' is generally difficult for native English speakers due to the Japanese LWA processes applied. Three processes are applied to vowels in the English word [ɔ:streɪlijə]: 1) vowel substitution, 2) monophthongization, and 3) epenthesis. The initial [ɔ:] is replaced with [o:][17], the medial cluster [str] is broken up with epenthetic [ɯ] and [o], the diphthong [eɪ] is shortened to [a], and the final schwa is replaced with [a]. Multiple epenthesis and shortening of the diphthong proved too difficult for NNS 12m19, who produced *[o:sɯtɽa:ɽia]. The word initial long vowel and epenthesis of cluster [st] caused problems for NNS 18m20, who responded with *[ostoɽaɽia]. Despite the difficulties in epenthesis and vowel lengthening, vowel height errors were more common than errors in vowel duration. Table 5.10 below shows clear differences in vowel height between native speakers and non-native learners. The columns on the far left are average vowel heights for Japanese NS adults taken from Kasuya, et al 1968, as described above. The vowel in syllable [sɯ] is devoiced, making it impossible to measure formant frequencies for this vowel. Note that three NNS respondents deleted vowel [o] in third syllable [to]. Highlighted cells are those in which formant frequencies vary significantly from that of the average NS as well as of the NS respondents in this study.

[17] The fact that Japanese /o/ is pronounced between [o] and [ɔ] may mean there is little to no difference in height from the original English sound for the initial segment.

Table 5.10 Vowel heights in MHz in the word [oː.sɯ.to.ɾa.ɾi.a]

	Average NS Female	Average NS Male	NS29	NS31	13f22	18m20	22f18	35f22	38m23
	[oː]								
F2	925	838	1082	868	**1596**	997	1189	1054	942
F1	483	550	704	485	**294**	556	670	503	568
	[sɯ]								
F2	1675	1300	-	-	-	-	-	-	-
F1	375	363	-	-	-	-	-	-	-
	[to]								
F2	925	838	941	934	-	-	-	**1571**	**1216**
F1	483	550	584	554	-	-	-	**500**	**436**
	[ɾa]								
F2	1363	1163	1131	1357	**1570**	**1443**	**1633**	**1939**	1394
F1	483	475	478	561	**900**	**474**	**636**	**648**	436
	[ɾi]								
F2	2725	2263	2392	2591	**1851**	2186	2143	2174	**1588**
F1	325	263	406	387	**471**	276	474	455	**368**
	[a]								
F2	1363	1163	1270	1005	**1970**	**1048**	1491	**1767**	**1198**
F1	483	475	497	480	**627**	**635**	548	**691**	**408**

Elicited Imitation Errors: Vowels in Hiatus

As noted above, the moraic structure of the Japanese language requires vowels to appear in hiatus, when these same vowels only appear as diphthongs in English. This confused NNS learners 4.33% of the time as they made errors in vowel height and duration. Again minimal pairs seem to be more difficult than words that do not form minimal pairs.

Minimal pairs

A variety of errors was observed in NNS production of target word [ie] ‘house’, which forms a minimal pair with both [iːe] ‘no’ and [iː] ‘good’: 1) lengthening of the first member [i], 2) deletion of the first member [i], 3) deletion of the second member [e], and 4) a combination of

lengthening of [i] with deletion of [e]. Eleven instances of error involving target word [ie] were observed in two different tokens: #344 suteki na ie desu ne 'It's a lovely house, isn't it?' and #443[444 dare no ie ni ikimsu ka 'Whose house are you going to?'. In neither token would the context lend itself to misinterpretation in which the other member of the minimal pair ([i:e] 'no') would be a likely semantic candidate for interpretation. Table 5.11 below shows the specific vowel lengths recorded for each instance of [ie] production in responses identified as erroneous by the local NS.

Table 5.11 Vowel lengths in the production of [ie] 'house'

Phonemes	Respondent	V1 ([i])	V2 ([e])	[e] in 'desu'	V1: V2:[e]:[e]
[ie]	344 NS #29	0.099576	0.094069	0.112424	0.89:0.84:1.00
[ie]	344 NS #31	0.086955	0.076760	0.096487	0.90:0.80:1.00
[i:]	344_18m20	0.201019	0.000000	0.115655	1.74:0.00:1.00
[i:]	344_33m19	0.097936	0.000000	0.086952	1.13:0.00:1.00
[e]	344_38m23	0.000000	0.057835	0.069638	0.00:0.84:1.00
[i]	344_17m21	0.041558	0.000000	0.108284	0.38:0.00:1.00
[i]	344_22f18	0.081894	0.000000	0.139296	0.59:0.00:1.00
[i]	344_39m21	0.113234	0.000000	0.127006	0.89:0.00:1.00
[i]	344_40f22	0.039046	0.000000	0.119089	0.33:0.00:1.00
[i]	344_14m20	0.078159	0.000000	0.140382	0.56:0.00:1.00
[i:e]	344_16f20	0.215002	0.135505	0.125568	1.71:1.08:1.00

Vowel height was also difficult for three NNS, each of whom replaced the final [e] of [i.e] 'house' with [i], resulting in [i.i] or, in the case of 11m19 who inserted an intervocalic rhotic, [i.ri]. Table 5.12 below compares the vowel heights of two NS and the three NNS who mispronounced the final vowel of [ie].

Table 5.12 Vowel height in the production of [ie] ‘house’

	Average NS Female	Average NS Male	NS29	NS31	11m19	14m20	18m20
[i]							
F2	2725	2263	2669	2492	2335	1993	2093
F1	325	263	301	357	334	272	366
[e]							
F2	2317	1738	2285	2056	**2197**	**2009**	**2297**
F1	483	475	482	447	**329**	**272**	**289**

Non-minimal pairs

Other words that were not members of minimal pairs also presented difficulties when they contained vowels in hiatus. One set of segments that led to vowel shortening was [oi]. Respondent 02m22 deleted [i] in hiatal vowel set [oi] in the target word [o.i.ɕi:] ‘delicious’ and also shortened the final long vowel resulting in *[o.ɕi].

Errors occurred in both sets of tasks. Errors identified in the reading aloud tasks are detailed below.

Reading Aloud Errors: Long Vowels

In the reading aloud tasks respondents made errors in producing long vowels similar to those observed in the elicited imitation tasks. Again, minimal pairs caused the most difficulty. One familial term mentioned above that caused numerous errors was ‘obaasan’ (grandmother). In the token ‘obaasan no ie ni imasu’ (‘(Sbd) is at grandmother’s house.’) several NNS respondents shortened long vowel [a:] in [o.ba:.saɴ] producing instead [o.ba.saɴ], meaning ‘aunt.‘ Table 5.5 shows first and second vowel durations in NS and NNS production of [o.ba:.saɴ].

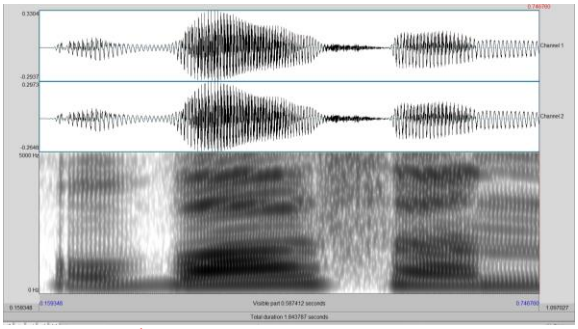
Table 5.13 NS and NNS vowel durations in [o.ba:.saɴ]

	V1 ([o]) length	V2 ([a:]) length	V2 ([a]) length	V1:V2:V3
NS #29	0.095193	0.175187	0.102792	1.00:1.84:1.08
NS #31	0.074688	0.216339	0.134342	1.00:2.90:1.80
435_03m25	0.059015	0.111042	0.062509	**1.00:1.88:1.06**
436_04m19	0.089778	0.126549	0.201523	**1.00:1.41:2.24**
436_22f18	0.101527	0.144066	0.270549	**1.00:1.42:2.66**

The duration of NNS 04m19 and 36f18 second vowel ([a:]) in relation to the first vowel [o] is slightly shorter than that of the NS, however, in relation to third vowel [a], the medial long vowel seems very short. While it is possible to lengthen the final vowel for dramatic or comedic effect, when listening to speakers who lack native pronunciation this lengthening acts as an indication to a NS that the respondent is producing the word for 'aunt' ([o.ba.saɴ]) and not the word for 'grandmother' ([o.ba:.saɴ]). Note that although durational ratios are very similar for NS #29 and NNS 03m25, this NNS was selected by the local NS rater as having an error in V2 length. This is very likely due to differences in vowel quality misinterpreted by the NS rater as the more common error in vowel duration. Figure 5.7 compares spectrographs of two NS and two NNS respondents revealing patterns of NS vowel duration clearly different than those of NNS.

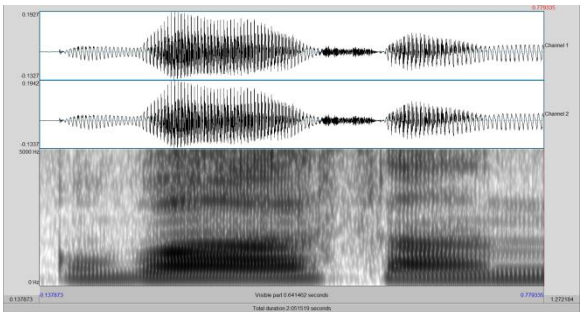
Figure 5.7 NS and NNS vowel durations in [o.ba:.saɴ]

NS #29



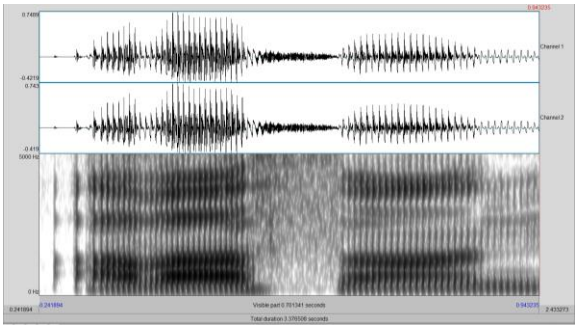
o b a: s a ɴ

NS #31



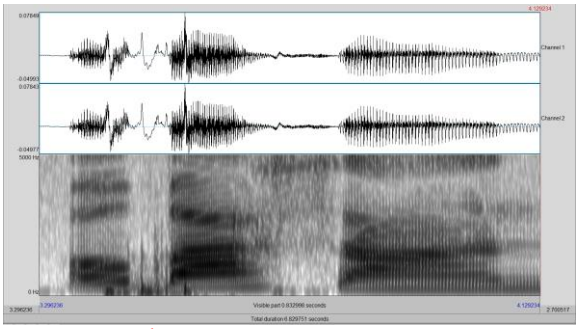
o b a: s a ɴ

NNS 04m19



a b a s a ɴ

NNS 36f18



o b a s a ɴ

Token ‘hito ga ooku iru tokoro’ (‘a place with many people’) presented challenges for a number of L2 Japanese learners who participated in the study. The initial [o:] of target word [o:.kɯ] (‘many’) was reported as shortened by four NNS respondents. Durations of their respective productions of [o:] are contrasted with NS productions in Table 5.14 below.

Table 5.14 NS and NNS vowel durations in [o:.kɯ]

	V1 ([o:]) length	V2 ([ɯ]) length	V1/V2
NS #29	0.192480	0.074883	2.57
NS #31	0.262716	0.100787	2.61
432_22f18	0.125473	0.546299	**0.23**
431_02m22	0.215062	0.490991	**0.44**
431_32m20	0.092233	0.225032	**0.41**
431_33m19	0.092288	0.378382	**0.24**

The shortened word initial [o:] in addition to overly long word final [ɯ] (usually realized as [u:]) indicate that the L2 learner has observed a long vowel in the word, but is unable to identify which vowel is long and has mistakenly shortened the long word initial vowel and lengthened the short word final vowel. The environment in which word final [ɯ] appears gives speakers the option of devoicing it, however, there is no option of lengthening the vowel as all four NNS have done in these responses. One NNS respondent shortened the initial vowel and lengthened the final vowel in the word [o:.kɯ] 'many'. Interestingly, [o:.kɯ] forms a minimal pair with several homophones of [o.kɯ]: '(to) put', 'interior', 'hundred million', and 'wife'. The respondent, however, pronounced the word as [o.kɯ:], a nonce word.

In the case of [so:.daɴ], target word from the token 'soudan shitai hito' (person who wants to have a consultation), we find evidence of shortening as well as substitution. In the response by NNS 22f18 a short [u] replaces medial [o:].[18] See Table 5.15 for a comparison of vowel lengths in the production of [so:.daɴ]. As the initial vowel is a long vowel (phonemically two moras), it should theoretically be closer in length to the second vowel followed by a moraic nasal, which phonemically make up two moras. We find that the length of the long first vowel is not adequate in relation to the length of this second vowel-nasal sequence in the case of the NNS for the local NS to rate it as nativelike or acceptable.

Table 5.15 Reported NNS vowel shortening in [so:.daɴ]

	V1 ([o:])	V2+N ([aN])	V1] V2+N
NS #29	0.163451	0.232013	0.704490697
NS #31	0.319415	0.350763	0.910629114
413_22f18	0.164929	0.403721	**0.408522222**

[18] This L2 Japanese learner not only shortens the vowel, but substitutes a high back vowel in place of the mid back vowel.

Respondent 412_22f18 was also reported by the local NS rater to have shortened the final long vowel in [da.ɽo:], from the token 'shikata ga nai darou' (There's probably nothing to be done about it.) The evidence for this shortening is very clear as her initial [a] is 0.279026 Ms in length, while her final [o:] is only 0.113888 Ms long.

A number of other words containing long vowels were found to have vowel errors. Four responses to the token 'asa no tsuukin rasshu' (the morning commuter rush) contained vowel shortening errors in which target word [t͡sɯ:.kiɴ] 'commute' was shortened to [t͡sɯ.kiɴ]. [ɯ:] in the number [dɕɯ:.i.tɕi] 'twenty-one' was shortened to [ɯ] in one response to the token 'juuichinichi deshita' (It was the twenty-first [day of the month].).

Reading Aloud Errors: Romanization

Words written in Roman letters presented a serious problem for English speaking learners of Japanese. 8.00% of all responses to stimuli given in Roman letters included vowel errors. These errors included both durational and height errors. Table 5.17 offers an overview of all errors in the reading aloud task. Target words in Roman letters whose error percentage rate is higher than 10% are highlighted. Note that for these target words the error rate when presented in Roman letters ("ROM" below) is significantly larger than when presented in Japanese kana ("KANA" below).

As mentioned above, four responses to the token 'asa no tsuukin rasshu' (the morning commuter rush) contained vowel shortening errors. Three of these errors were made by respondents reading this phrase in Roman letters and one while reading in native hiragana. Even though written as 'tsuukin', with two vowels represented orthographically, the first long vowel in target word [t͡sɯ:.kiɴ] is pronounced as a short vowel. This is likely a native English speaker

response to Roman letters and transferred English rules designating stress on the second syllable, which is the penultimate syllable in the noun phrase ‘tsuukin rasshu’ (commuter rush). Table 5.16 below lists lengths in Ms for the first two sets of consonants and vowels. The respective frication of the initial [ts] and aspiration of [k] makes it difficult to differentiate these obstruents from the vowel and so they have been included in durational measurements.

Table 5.16 Durations in pronunciation of [t͡sɯ:.kiɴ] ‘commute’

Respondent	CV1 ([tsu:])	CV2 ([ki])	CV1:CV2
NS29	0.240158	0.120079	2.00:1.00
NS31	0.293346	0.187242	1.57:1.00
04m19	0.180158	0.224968	**0.80:1.00**
20f21	0.095976	0.172893	**0.56:1.00**
26m21	0.190326	0.254396	**0.75:1.00**

As previously mentioned, adverb [o:.kɯ] ‘many’ proved difficult for a number of NNS respondents. All errors were produced in response to stimuli written in Roman letters. This is indicative of transfer of English stress timing in place of Japanese durational contrast, even when written with double vowels as ‘ooku’. Table 5.14 above reveals the extent to which transferred English stress on the final syllable seems to have shortened the initial vowel length.

Table 5.17 Percentage of reading aloud errors for each token

	Target Word	Meaning	ROM	KANA
			% Error	% Error
401/402	kurisumasu	‘Christmas’	8.00%	6.00%
403/404	makudonarudo	‘McDonald’s’	6.00%	0.00%
405/406	chikin	‘chicken (meat)’	8.00%	0.00%
407/408	tenisu	‘tennis’	0.00%	8.00%
409/410	konpyuutaa	‘computer’	8.00%	**11.00%**
411/412	darou	‘probably’	0.00%	8.00%
413/414	soudan	‘consultation’	8.00%	6.00%
415/416	kirai	‘dislike’	6.00%	8.00%
417/418	supootsu	‘sports’	8.00%	**17.00%**
419/420	shirenai	‘cannot know’	6.00%	0.00%
421/422	kinou	‘yesterday’	0.00%	0.00%
423/424	oishii	‘delicious’	**11.00%**	0.00%
425/426	tabeyou	‘Let’s eat.’	0.00%	0.00%
427/428	wo	Direct Object	**17.00%**	0.00%
429/430	sakihajimeta	‘began blooming’	8.00%	6.00%
431/432	ooku	‘many’	**17.00%**	8.00%
433/434	hontou	‘really’	**17.00%**	6.00%
435/436	obaasan	‘grandmother[elderly woman’	6.00%	**17.00%**
437/438	tsuukin	‘commute’	**25.00%**	6.00%
439/440	oneesan	‘older sister’	0.00%	8.00%
441/442	aoi	‘blue’	8.00%	**11.00%**
443/444	ie	‘house’	**11.00%**	0.00%
445/446	ranpu	‘lamp’	8.00%	6.00%
447/448	ue	‘up[above’	6.00%	0.00%
449/450	miemasen	‘cannot see’	8.00%	6.00%

Although Japanese orthography has been standardized and certain earlier kana letters removed, remnants of earlier, now nonexistent phonemes remain in the orthography. Table 5.18 illustrates the current set of kana letters used with their transcriptions in Hepburn Romanization. Several kana containing glides are no longer in use. Cells in gray indicate kana that are no longer in use.

Table 5.18 Hiragana and katakana letters with transcriptions in Romanization and IPA

	a	*i*	*u*	*e*	*O*
ø	あ/ア a [a]	い/イ i [i]	う/ウ u [ɯ]	え/エ e [e]	お/オ o [o]
K	か/カ ka [ka]	き/キ ki [ki]	く/ク ku [kɯ]	け/ケ ke [ke]	こ/コ ko [ko]
S	さ/サ sa [sa]	し/シ shi [ɕi]	す/ス su [sɯ]	せ/セ se [se]	そ/ソ so [so]
T	た/タ ta [ta]	ち/チ chi [t͡ɕi]	つ/ツ tsu [t͡sɯ]	て/テ te [te]	と/ト to [to]
N	な/ナ na [na]	に/ニ ni [ni]	ぬ/ヌ nu [nɯ]	ね/ネ ne [ne]	の/ノ no [no]
H	は/ハ ha [ha]	ひ/ヒ hi [çi]	ふ/フ fu [ɸɯ]	へ/ヘ he [he]	ほ/ホ ho [ho]
M	ま/マ ma [ma]	み/ミ mi [mi]	む/ム mu [mɯ]	め/メ me [me]	も/モ mo [mo]
Y	や/ヤ ya [ja]		ゆ/ユ yu [jɯ]		よ/ヨ yo [jo]
R	ら/ラ ra [ɾa]	り/リ ri [ɾi]	る/ル ru [ɾɯ]	れ/レ re [ɾe]	ろ/ロ ro [ɾo]
W	わ/ワ wa [wa]	ゐ/ヰ i/wi [(w)i]		ゑ/ヱ e/we [(w)e]	を/ヲ o/wo [(w)o]

Kana letters ゐ/ヰ ‘wi’ have been replaced by い/イ ’i’ and ゑ/ヱ ‘we’ have been replaced by え/エ ‘e’ in common Japanese writing. Of the kana letters that begin with glide [w], only [wa] and kana letter を/ヲ ‘wo’ have been retained. を/ヲ ‘wo’ in now only used to act as a postpositional direct object particle. The direct object particle, which originally included a [w] glide, is now pronounced [o], identically to kana letter お/オ, which serves no specific grammatical purpose. Despite months of practice with sentences containing を written both in kana and Roman letters, several NNS attempted to approximate the glide originally pronounced in this direct object particle. This affected both vowel height and duration. Table 5.19 below compares duration and height for this word as pronounced by both NS and NNS respondents.

Target word ‘wo’ was embedded in token ‘hashi wo watatte kara’ (after crossing the bridge). Duration is given in Ms and formant height in MHz. Note that the NS produce no vowel sound other than [o], whereas three NNS produce another vowel sound before [o]. The formant frequencies of this vowel sound indicate that it may be [u] or glide [w].

Table 5.19 Pronunciation of direct object particle ‘wo’ [o]

	u	o	F1 [u]	F2 [u]	F1 [o]	F2 [o]
NS29	-	0.159040	-	-	523	1016
NS31	-	0.145962	-	-	556	994
02m22	0.174445	0.327085	334	1403	412	797
13f22	0.064888	0.186645	369	1011	546	1034
33m19	0.104014	0.349251	327	713	523	1041

The spectrograms given in Figures 5.8 and 5.9 show clearly the difference in pronunciation between NS and NNS. Here our NS moves smoothly from the preceding high front vowel [i] (from ‘hashi’) into the [o] of direct object particle ‘wo’. The NNS pronounces an additional sound before the flat [o] of ‘wo’, in which the F2 is lowered so that it has pinched together with F1 to form a high back vowel or glide before rising again into a long, flat [o].

Figure 5.8 NS31 pronunciation of direct object particle ‘wo’ [o]

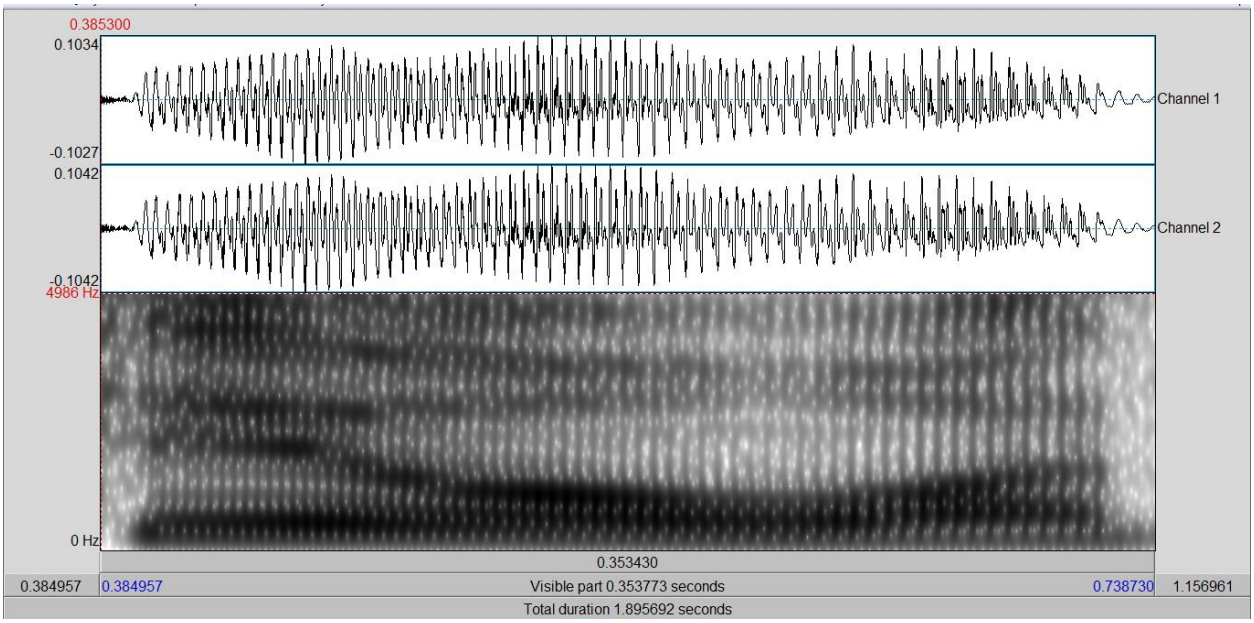
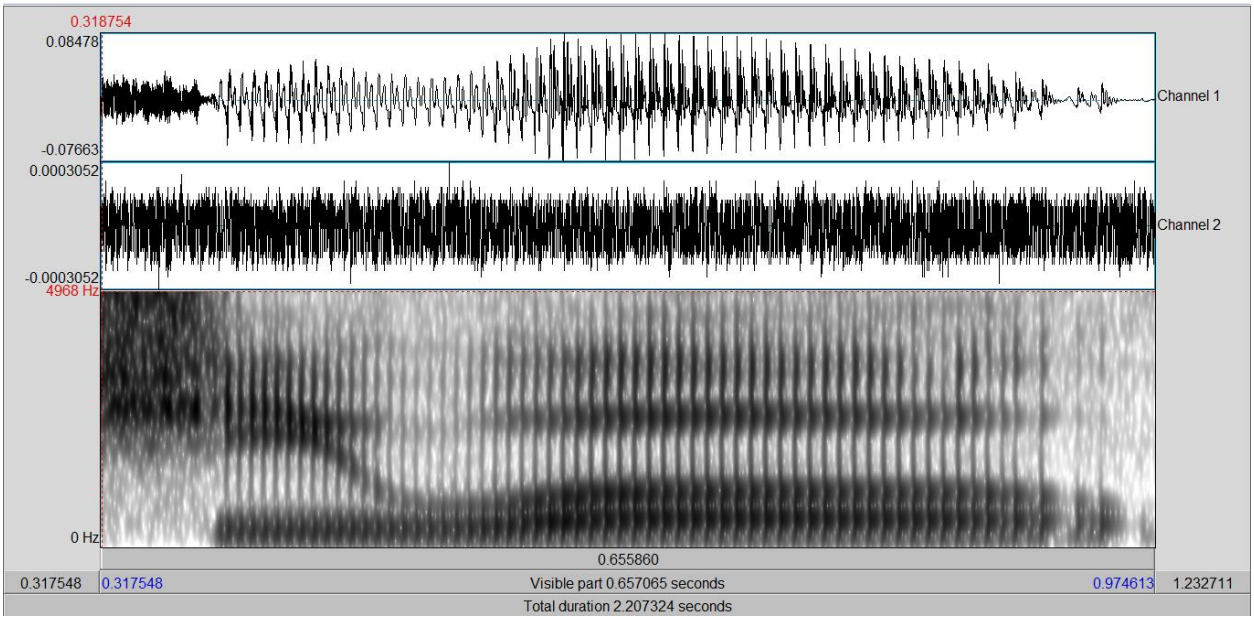


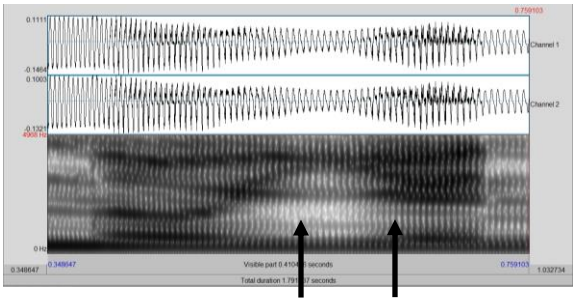
Figure 5.9 33m19 pronunciation of direct object particle ‘wo’ [o]



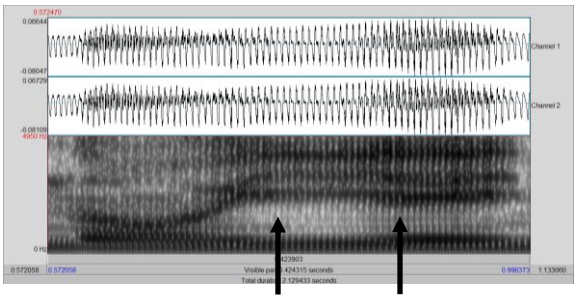
Words containing vowels in hiatus also proved difficult for NNS when given in Roman letters. A comparison of spectrograms for target word ‘ie’ (house) from token ‘dare no ie ni ikimasu ka’ (Whose house are you going to?) shows a clear change between vowels [i] and [e] in NS responses, but a single long vowel in NNS responses.

Figure 5.10 Comparison of NS and NNS pronunciation of [ie] ‘house’

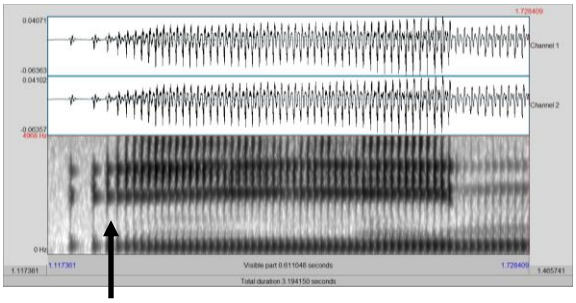
NS29



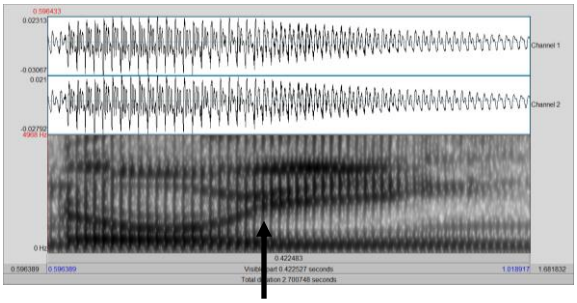
NS31



02m22



18m20



Learners most likely had difficulty distinguishing between long vowels and vowels in hiatus due to the idiosyncratic representation of long front vowels in Roman letters as Xi, where X represents a front vowel. Examples include ‘ei’ [e:] (stingray) and ‘ii’ [i:] (good). ‘ie’, however, is always pronounced as [ie].

The target word ‘oishii’ (delicious) in token ‘kono ame ga oishii’ (This candy is delicious.) was also problematic for NNS 2m22 and 35f22 when presented in Roman letters. Two NNS respondents pronounced the word ‘oishii’ [oiɕi:] as ‘oshii’ [oɕi:], which, ironically, means “almost correct, but not quite[19].” The cause of this vowel deletion is unclear, however, multiple appearances of the same Roman letter ‘i’ could be confusing the reader. In Japanese kana the same letter only appears twice, but in Roman letters the same letter appears three times:

おいしい

oishii

Reading Aloud Errors: Loanwords

Loanwords also presented a problem for NNS because of the differences in vowel duration and height from the original English word. Overall, vowels in loanwords were mispronounced 5.29% of the time. When these loanwords also included long vowels this error rate rose slightly to 5.97%.

Word final [a:] in loanword [koɴ.pjɯ:.ta:] (‘computer’) is lengthened to reflect the word final English rhotic. This final [a:] was reported to have been shortened by multiple respondents in responding to the token ‘konpyuutaa ga hoshii’ (‘I want a computer.’).

Table 5.20 NS and NNS vowel durations in [koɴ.pjɯ:.ta:]

	V1 ([o]) length	GV2 ([jɯ:]) length	V2 ([a:]) length	V1:GV2:V3
NS #29	0.098894	0.159751	0.190687	1.00:1.62:1.93
NS #31	0.134788	0.222943	0.212722	1.00:1.65:1.58
409_04m19	0.144571	0.124010	0.164490	1.00:0.86:1.13
410_35f22	0.086069	0.219454	0.101569	**1.00:2.55:1.18**

[19] The learners were not aware of this member of the minimal pair and were probably not simply mistaking one member for another.

NS data in Table 5.20 supports the idea of variation in the realization of long vowels, as long as they are above an allowable ratio of duration when compared with phonemically short vowels. The word final [a:] as produced by NNS 35f22 is not above that allowable ratio as it is almost the same length as the word initial short [o]. All of NNS 08m20's long vowels do seem to be long enough in relation to the word initial short vowel. This L2 learner, however, tends to have errors in vowel quality, which may lead to misidentification as length errors by the NS rater.

Compensatory lengthening is often used in loanwords containing syllable final rhotics. The preceding vowel sound is simply lengthened so that the short vowel becomes a long vowel. The English word [spɔɹts] has been adapted into Japanese as [sɯ.po:.t͡sɯ], substituting a medial long [o:] in place of [ɔɹ]. This proved difficult for the native speakers of American English in the study, who seem to have no trouble deleting the rhotic, but are unable to replace it with a long vowel sound.

Table 5.21 NS and NNS vowel durations in [sɯ.po:.t͡sɯ]

	V2 ([o:]) length	V3 ([ɯ]) length	V2/V3
NS #29	0.142674	0.101910	1.40
NS #31	0.357881	0.224987	1.59
417_22f18	0.182618	0.218955	**0.83**
418_12m19	0.219773	0.496821	**0.44**
418_35f22	0.286449	0.399560	**0.72**

As the first vowel [ɯ] is often devoiced by NS, which allows it to more closely reflect the word initial [sp] cluster of the English word [spɔɹts], we cannot compare the length of the first vowel to that of any other vowel and obtain a reliable ratio of long to short vowels. For this reason duration of word medial long vowel [o:] is compared to word final short vowel [ɯ] in production of the target word [sɯ.po:.t͡sɯ] in Table 5.21. The fact that the word final vowel is a

high vowel makes it intrinsically shorter than [o], which slightly lowers the required ratio to signify a long vowel below 1:1.5, as is seen in the data obtained from NS #29 in Table 5.21.

Epenthesis in Japanese loanword adaptation often adds a significant amount of material to English loanwords. This lengthening can often confuse NNS, especially when they are attempting to identify which syllable to which they may apply English stress rules. NNS 32m20 seems to have been attempting to apply English stress rules in the very long loanword [ma.kɯ.do.na.ɽɯ.do] 'McDonald's' when he lengthened the medial [o] into a long [o:]. His final [o] also received some lengthening; however, this seems to be related more to intonation as he seems to question his understanding of the word he has just read. Lengths and relative lengths of vowels in 32m20's pronunciation of this word are given in Table 5.22 below.

Table 5.22 32m20 vowel lengths in pronunciation of [ma.kɯ.do.na.ɽɯ.do] 'McDonald's'

	V1 [a]	V2 [u]	V3 [o]	V4 [a]	V5 [u]	V6 [o]	V1:V2:V3:V4:V5:V6
NS29	0.100126	0.074670	0.088247	0.093338	0.059397	0.077216	1.00 : 0.75 : 0.88 : 0.93 : 0.59 : 0.77
NS31	0.103051	0.094383	0.104014	0.107866	0.094383	0.102087	1.00 : 0.92 : 1.01 : 1.05 : 0.92 : 0.99
32m20	0.126623	-	**0.232924**	0.128186	0.165704	**0.307960**	1.00 : 0.00 : 1.84 : 1.01 : 1.31 : 2.43

Epenthesis of the word initial consonant cluster in target word 'Christmas' [kɯɽisɯmasɯ] also seems to have confused two NNS respondents. Respondent 04m19 harmonized the second vowel with the first, pronouncing the target word as *[kɯ.ɽɯ.sɯ.ma.sɯ]. Respondent 38m23 pronounced the target word with a long vowel in the first syllable as *[kɯ:.ɽi.s.ma.sɯ]. He also deleted the high back vowel in the third syllable; however, this is acceptable to a certain degree due to high vowel devoicing. The high back vowel is epenthesized exactly for this reason as it is easily devoiced and the syllable may be perceived as closer to the original English pronunciation.

It seems that at times phonology plays a larger role in L2 Japanese loanword adaptation for NNS than perception. In one instance it seems that NNS may have been aware of the rules in Japanese loanword adaptation regarding vowel lengthening when a rhotic has been deleted. In Japanese loanwords like 'patrol car' [pato ka:] and 'parts' [pa:t͡sɯ] the rhotic or rhoticised portion of the vowel has been deleted and the vowel has been lengthened. This also seems to match the way in which many speakers of British English or English with a pronounced Bostonian accent pronounce syllable final rhotics. Unfortunately for NNS 28f20 and 37m19 the English word 'shirt/shirts'[20] is adapted to [ɕa.t͡sɯ] in Japanese with a short vowel occurring medially even though the rhotic has been deleted. These two NNS respondents each pronounced target word 'shatsu' (shirt) in token 'atarashii shatsu desu ka' (Is it a new shirt?) as *[ɕa:.t͡sɯ].

L1 English transfer also undoubtedly caused respondent 14m20 pronounced loanword [chi.kiɴ] 'chicken' as [chi.kɛɴ]. His formant frequencies for the vowel in the first syllable [chi] were F1: 269 Hz, F2: 2316 Hz and for the vowel in the second syllable [kiɴ] F1: 460 Hz, F2: 1948 Hz. This indicates some closure of the oral cavity and a lower vowel height on the second vowel.

Reading Aloud Errors: Vowels in Hiatus

Vowels occuring in hiatus proved difficult not only in the elicited imitation task above, but also in the reading aloud task. The same target word [ie] 'house' that challenged L2 Japanese learners in the elicited imitation task also incurred errors in the reading aloud task, in token 'dare

[20] There is no singular/plural distinction in Japanese, so it is impossible to tell which English word has been adapted.

no ie ni ikimasu ka' (Whose house are you going to?), as is shown in Table 5.23 below. Two respondents deleted the second segment of this word, leaving only some form of word initial [i].

Table 5.23 Vowel lengths in the production of [ie] 'house'

Phonemes	Respondent	V1 ([i])	V2 ([e])	[i] in 'ni'	V1: V2:[e]:[i]
[ie[	NS #29	0.103302	0.098875	0.122486	0.84:0.81:1.00
[ie[	NS #31	0.108600	0.128881	0.147854	0.73:0.87:1.00
[i:[	02m22	0.457373	0.000000	0.269508	1.70:0.00:1.00
[i[	18m20	0.140781	0.000000	0.362163	0.39:0.00:1.00

NS Misidentification of L2 Vowel Durational Errors

NNS were occasionally cited as having shortened long vowels in word-final position, when evidence did not support this local NS evaluation. The most prevalent case of supposed word-final vowel shortening occurred in the word [hoN.to:] (really) in the token 'hontou ni ii desu yo' (It is really fine] no problem.). L2 Japanese learners were reported to have pronounced the first and second vowels with roughly identical length, although the second vowel is a long vowel and the first short.

Table 5.24 Reported NNS vowel shortening of the final vowel in [hoN.to:]

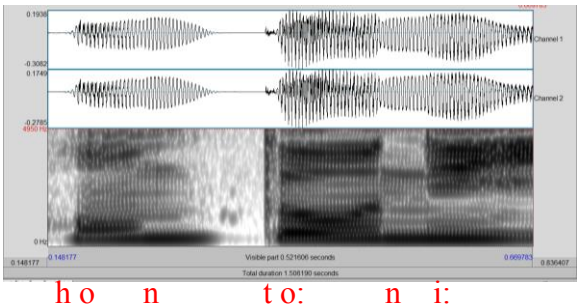
	V1+N ([oN])	V2 ([o:])	V1+N /V2
NS #29	0.161569	0.126446	1.277770748
NS #31	0.360450	0.445024	0.809956317
04m19	0.161162	0.208030	**0.774705571**
40f22	0.125243	0.153930	**0.813636068**
33m19	0.152501	0.147360	**1.034887351**

The evidence above does not support this NS evaluation of shortening. If length is not the actual cause of NS identification as vowel error, then we must look for other causes. Spectrographs show similar differentiation of vowel lengths in NS and NNS as long vowels are all longer than

short vowels (if not twice as long). If this is not a question of length, then we must consider that vowel height is actually erroneous and is being mistaken as error in vowel quantity.

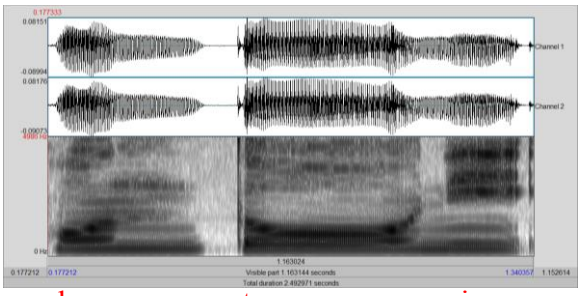
Figure 5.11 Respondent vowel duration in [hoɴ.to:]

NS29



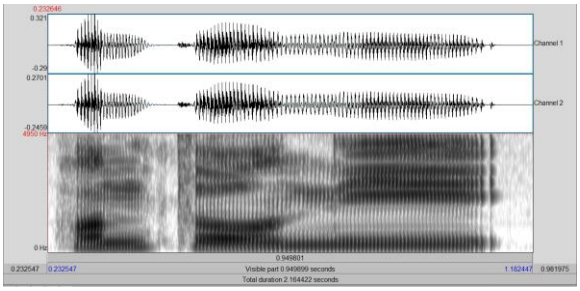
h o n t o: n i:

NS31



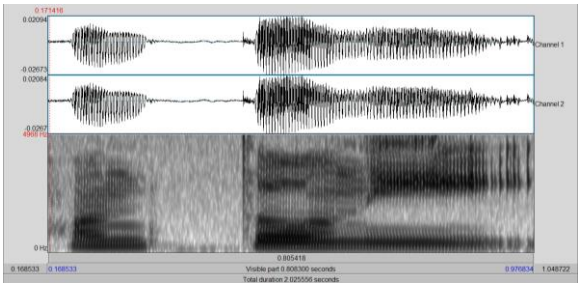
h o n t o: n i:

04m19



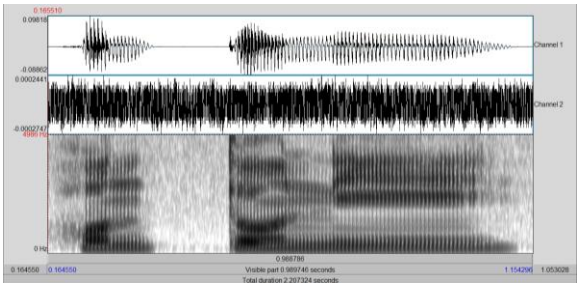
ho n t o: n i:

40f22



ho n t o: n i:

33m19



ho n to: n i:

NS Ratings and NNS Error

Although there is very clear and adequate evidence to support NS claims of NNS error, there is also reason to believe that NS themselves are capable of ascribing pronunciation errors to vowels when in fact other phonetic or phonological elements may be obscuring their ability to decipher exactly which part of the pronunciation of a word is incorrect. Some responses to the stimuli were incomprehensible due to the fact that the respondent was unable to comprehend the token or sufficiently reproduce the sounds heard. As the example above reveals, some NNS pronunciation may contain subtle differences which are pronounced to the NS listener, but are not detectable through scientific means. In these examples we NNS must defer solely to NS judgment.

CHAPTER 6

PEDAGOGICAL IMPLICATIONS

Students often comment on the fact that they are never consciously aware of the grammar of their own L1 until they attempt to learn an L2 and new grammatical concepts are contrasted with those of their L1 during lectures. This effect seems to be even stronger in the case of L2 phonological acquisition. Learners are rarely cognizant of the ways in which sounds in the L1 are articulated or which sounds act as allophones. This lack of awareness forms the basis of transfer as they are unable to contrast sounds in the L1 with similar sounds in the L2. Learners are given varying levels of training in Japanese pronunciation. Instructors tend to rely on textbooks as these are materials purchased by the learner and viewed as valuable resources that can be studied in the privacy of a student's home. Moreover, the written word is often seen as more objective than the spoken word and may be deemed more valuable than any observations verbally offered by an instructor. With the value accorded written Japanese materials in mind, we will now examine the ways in which Japanese textbooks teach the concepts of the long vowel, multiple vowels as monophthongs, and loanword acquisition. First, however, it is useful to look at the script used in offering these ideas.

Romanization and L2 Japanese Instruction

Written materials form the basis of Japanese language study in the United States for most learners. The fact that Japanese is a less commonly taught language in the US raises the likelihood that beginners will only have access to written learning materials available locally or online. Limited time in the classroom also means that Japanese learners studying in the traditional classroom are also forced to study written Japanese much more than Japanese in any other modality. This high dependency on learning from written sources increases the importance of providing the most appropriate written form for learner acquisition. Japanese instructors have long debated whether Romanization, which was created primarily for non-Japanese speakers and learners of Japanese, or a native writing system is the most appropriate means of teaching the Japanese language to non-Japanese learners. In Japan, it seems, the consensus among Japanese instructors is to provide all teaching examples in a native Japanese script. In the US, however, instructors seem to favor the usage of Roman letters to represent Japanese teaching examples.

A survey of five of the most popular Japanese textbook series used by L2 learners in the United States (Genki I, Nakama I, Yookoso!, Japanese: The Spoken Language Part I [hereinafter J:TSL], and Japanese for Busy People I [hereinafter JBP]) reveals that all rely on Roman letters to represent Japanese words to varying extents. Table 6.1 below lists the extent to which Romanization is used in each textbook.

Table 6.1 Usage of Romanization in Japanese Textbooks Available in the US

Book title	Genki I	Nakama	Yookoso	J:TSL	JBP
Year published	2011	1998	2006	1987	1994
Chapters using Romanization	Introduction; Greetings; L. 1-2; 読み書き編1	Chap. 1	Getting Started; Chap. 1	Introduction; L. 1-12	Introduction; L. 1-30
Pages using Romanization	Pg. 3-83; 290-291	Pg. 1-16	Pg. 1-124	Pg. 1-345	pg. 11-210
Pages using Romanization	83	16	124	345	199
Pages in book (excluding glossary)	350	443	511	345	204
Romanization in glossary?	No	No	No	Yes	Yes
System of Romanization used in book	C: Hepburn; V: Kunrei	C: Hepburn; V: Kunrei	C: Hepburn; V: Kunrei	Modified Kunrei	Modified Hepburn
% of book using Romanization (excluding glossary)	23.71%	3.61%	24.27%	100%	97.55%

Types of Romanization Used in Japanese Textbooks Available in the US

Mixed Systems of Romanization

Three of the textbooks surveyed use a mixed system of Romanization that includes consonants written in the Hepburn system and Vowels written in the Kunrei system. This system

of Romanization is usually used in conjunction with kana to offer the L2 learner a system of scaffolding when initially trying to access the kana. In this way learners are not required to learn the two long vowel markers い [i] and う [u] and are less likely to pronounce these as diphthongs. "Genki" and "Yookoso!" extend this usage of Roman letters over multiple chapters, each allowing the learner roughly one quarter of the course to familiarize themselves thoroughly enough with the kana to remove this scaffolding. "Nakama", however, only offers Roman letters for half of the first chapter, at which point the reader is required to rely completely on kana.

Modified Kunrei System

"Japanese: The Spoken Language" only offers the reader a modified Kunrei system (called the Shin-kunrei-shiki 'New Official System') with no kana or kanji usage at all. The kunrei system used in this book includes a complicated system of symbols including those for the velarized nasalization (g̃) and the moraic nasal (N̄) as well as rising (á), falling (à) and rising and quickly falling (â) accents. One reason that Jorden and Noda give for using a system whose letters do not phonetically mirror the sounds produced is that "for the student who plans to learn the native writing system, the transition from Hepburn is more difficult than from the other systems" (Japanese: The Spoken Language, 1987:21). While offering more information for the L2 learner than other systems of Romanization, the complexity of this system requires Jorden and Noda to include a 23 page section on pronunciation as part of the 27 page introduction. Jorden states very clearly in her Acknowledgements, however, that as she worked to modify the existing Yale University Press series "Beginning Japanese" (written in 1962), "every modification that has been made results from direct observation of language use by Japanese in Japan and of foreigners' successes and failures with the Japanese language" (1987:xiii).

Modified Hepburn System

"Japanese for Busy People" relies on a modified version of the Hepburn system called the Revised Hepburn system. It includes macrons for some long vowels. No explanation of the usage of macrons is included in Japanese for Busy People and the usage is unclear. The high front vowel may be represented as 'ii' or 'ī', however the long vowel form containing a macron only seems to appear in loanwords.

'good'	ii	'coffee'	kōhī
'said'	iimashita	'receipt'	reshīto

Long front mid vowel [e:] is also written as 'ee', 'ei', and 'ē', although the chart of "Long Vowels" listed on page 12 only lists the two latter options as representations of this long vowel. The glossary does, however, include the word informal affirmative 'ee' (yes). Although a modified Hepburn system, this system of Romanizing the Japanese language seems just as confusing to native English speakers as the Shin-kunrei-shiki used by Jorden and Noda. Table 6.2 below lists examples of the systems of Romanization used by Japanese textbooks available in the United States. When comparing these to the Hepburn and Kunrei systems, keep in mind that the Hepburn system is the most widely used and the Kunrei system is the official system of Romanization adopted by the Japanese government (although rarely used by the government).

Table 6.2 Examples of Romanization used in Japanese Textbooks Available in the US

Kana	IPA	Hepburn	Kunrei	Mixed	J:TSL	JBP
Long vowels						
おとうさん	[oto:saɴ]	otousan	otoosan	otoosan	otôosañ	otōsan
とけい	[toke:]	tokei	tokee	tokee	tokee	tokei
いい	[i:]	ii	ii	ii	îi	ii
Consonants						
えんぴつ	[eɴpit͡sɯ]	enpitsu	enpitu	enpitsu	eñpitu	enpitsu
さいふ	[saiɸɯ]	saifu	saihu	saifu	(sâihu)	saifu
ジーンズ	[dʑi:nzɯ]	jiinzu	ziinzu	jiinzu	(zîinzu)	(jiinzu)
ちゅうごく	[tɕɯ:gokɯ]	chuugoku	tyuugoku	chuugoku	Tyûuḡoku	Chūgoku
し	[ɕi]	shi	si	shi	sî	shi

Romanization in Other Japanese Textbooks

Romanization in Japanese Textbooks Available in Japan

A wide variety of textbooks are available in Japan for those learning Japanese as a second language. One of the earliest types of textbooks to become popular was the kanji practice book. A long-time best seller in this category is Toyoko Toyoda's "Yoku Tsukawareru Shinbun no Kanji to Jukugo" (Often used newspaper kanji and compound words) written in 1981. This 208-page textbook contains readings in kana for each kanji, as well as meanings and example sentences. The book, however, does not contain any Romanization at all. Its intended audience of foreigners is expected to learn kana on their own. As foreign exchange students to Japan increased in number textbooks like "Daigakusei no Tame no Nihongo" (Japanese for college

students), published in 1990, began to flourish. This textbook contains 256 pages and no Romanization is used. Instead, the authors begin by introducing kanji, a written form thought of as inaccessible to beginners, from the very first pages. In the latter half of the 1990's the standardized Japanese Language Proficiency Test grew in popularity as employers and universities made it a requirement for entry or employment. A multitude of guidebooks and materials has been produced for those taking the various levels of this exam around the world. Those materials, however, are also produced without any Romanization. Furigana readings for kanji are often included so that learners are able to look up kanji as they study, in addition to translations of example sentences that are also offered in English, Korean and Mandarin. These authors seem to see no need to include Roman letters in the study of the Japanese language.

Romanization in Other Books on the Japanese Language Available in the US

Although we see no usage of Romanization in texts created in Japan for the study of Japanese as a second language, not surprisingly we do see a reliance on Roman letters in texts created for English speakers studying Japanese as a foreign language. One of the most popular of these is, ironically, a book dedicated to the learning of kana. James Heisig's "Remembering the Kana" relies on imaginative and shocking stories to help learners remember the shapes of the kana. At the bottom of each page the book also includes Romanization of words written in kana letters. It is unfortunate that rather than offering English meanings to these words the author relies on Roman letters for sound, which could just as easily be given through an audio file. Heisig's book also uses the same complicated Revised Hepburn system as that of the Japanese for Busy People series. William McGovern's "Super Review: Japanese Grammar" is a grammar textbook published by The Research and Education Association based, ostensibly, on

McGovern's experience as a correspondent during the Sino-Japanese War. This archaic grammar book offers examples in an older Revised Hepburn system that, in addition to macrons, also employs hyphens between words in certain compounds, like 'ai-kawarazu' (as usual) and 'ban-meshi' (dinner). This book uniquely includes symbols for "short" vowels (devoiced vowels): ĭ, and ŭ.

The Effect of Romanization on Learning

Numerous Systems of Romanization

It is obvious that aside from two basic forms of Japanese Romanization, we are also presented with modified versions that include varying levels and types of specific information on phonological processes observed in the language. The Kunrei does not accurately represent Japanese phonetically as it includes phonetic representations of sound patterns that do not exist in Japanese, like 'tu' and 'zi'. Vance clearly shows that the Kunrei system is also unable to represent certain sounds, such as newer loanword sounds like [di] (2010:xx). The Hepburn system, however, is also not without its faults. In using the Hepburn system Jorden states that "in describing Japanese inflection, many statements become unnecessarily complicated and parallelism is obscured" (1987:21). The Hepburn system's faithful representation of kana letters also may appear to represent diphthongs when long vowels are present.

Jorden's inclusion of a full page "Conversion Table of Romanization" indicates that the author had some awareness of the effects the learner might face after taking the time to learn her unpopular system of Romanization, especially if this text were to be used in conjunction with other materials (1987:23). The lack of universal consensus on which system of Romanization is most appropriate leaves one with the overwhelming question as to why Romanization should be used at all in the L2 Japanese learning process.

Effectiveness of Romanization

Okuyama investigated the results of using Romanization to teach 40 Japanese content words applying computer-assisted language learning (CALL) techniques to 61 first-semester Japanese students at two universities in Arizona. Hiragana, colored illustrations of the meaning and audio recordings were given to two groups and one experimental group was also given the word in Roman letters. The results indicated that the use of Roman letters did not help the beginning students retain new vocabulary words. "The opportunity to view Japanese vocabulary in Romaji (Roman letters) had no effect on the number of words correctly identified by the students in the first-semester Japanese classes" (Okuyama, 2007: 371). Okuyama found instead that audio recordings had the greatest benefit on student retention of new lexical items.

Hatasa (2002) also found a lack of evidence for Roman letters aiding in the learning process. She divided students into two groups and introduced kana eight weeks later for one group than the other. The group that was able to use Roman letters longer performed at the same level on posttests as the group that had been introduced to kana earlier. All of this evidence amid the backdrop of confusing systems of Romanization indicates a need to reduce any reliance on Romanization.

Explicit Phonological Instruction

Regardless of which orthographic system is used to represent Japanese, some phonological instruction is usually offered in each textbook. Let us now look at the need for phonological instruction. The audiolingual method developed in the 1950's by researchers like Robert Lado took much of the focus in language learning away from grammar-translation, the de facto method of language teaching applied over the centuries, and refocused teaching efforts on

trying to instill new habits that mirror those of the native speaker. A great deal of attention was placed on pronunciation as the listener was asked to repeat second language material in a number of ways using drills. Several learning systems that arose during this period are still commercially popular, including the methods developed by Paul Pimsleur and that of Charles Berlitz, which instruct primarily through listening. Unfortunately the critical period (CP) hypothesis shifted focus away from methods of instruction in pronunciation towards the teaching of L2 grammar, which learners could model after their own L1 grammar. The CP hypothesis gives adult learners of a language little incentive to spend time on pronunciation practice, as it is posited to be one of the first skills lost during physical growth and brain lateralization.

The audiolingual method relies on drills that are expected to form habits in the NNS that mirror those of the NS. Those of us who have taught foreign languages are acutely aware that there is a lack of explicit phonological instruction. Most language instructors are minimally trained in linguistics (if at all) and do not approach the study of language scientifically, but rather as an extension of cultural immersion. For NS instructors of a language it is particularly difficult to identify the cause of pronunciation errors made by NNS learners of your own L1 due to the fact that they have not learned the target language as a foreign language themselves. While it is in no way appropriate to separate language from culture, looking at language from a scientific perspective allows us to more readily note errors and their consequences. Error analysis provides a means of isolating errors and trying to identify causes.

Vowel Errors and Comprehensibility

Language instruction is at its heart a means of instilling in the learner an ability to produce language that is comprehensible to native speakers of that target language. Some

pronunciation errors reduce the ability of NS to understand a learner, even when that learner has a high degree of grammatical accuracy. Here we consider the pronunciation of long vowels and of monophthongal vowels occurring in hiatus and the overall effect of intelligibility.

Vowel duration

Under normal circumstances native Japanese speakers with full articulatory control do not normally make durational errors in vowel production; however, as has been reported in previous chapters, L1 English learners of L2 Japanese do make durational errors. The extent to which these errors affects comprehensibility depends on two factors: 1) whether the word is a member of a minimal pair, and 2) context.

If a word is a member of a minimal pair that is contrasted only by vowel length, any error in vowel length (lengthening, shortening or deletion) may impede comprehensibility. However, context can either aid in or detract from comprehensibility in the case of durational error. Durational error involving minimal pairs of familial terms is relatively more common for NNS. The lack of durational contrast in English may be responsible for an inability to perceive vowel length, resulting in an incorrect analysis of the meaning of the utterance. For example, students are known to commonly mistake ‘obasan’ (aunt[middle-aged woman) with ‘obaasan’ (grandmother[elderly woman) in classroom exercises, resulting in inappropriate answers to questions in a drill. One example might be as follows:

‘dare ni aimashita ka’ Whom did you meet?

‘obaasan ni aimashita.’ I met (the/my) grandmother.

The potential appropriacy of these answers depends fully on context, however, and may allow for inaccurate answers to be deemed acceptable by the listener, who has no knowledge of the

actual events that occurred. Context, however, may require the other member of this minimal pair for comprehensibility:

'ojisan no tsuma, tsumari obasan, ha ashita kimasu.'

My uncle's wife, my aunt, will come tomorrow.

If the speaker were to mistakenly replace 'obasan' (aunt) with 'obaasan' (grandmother) in this context the meaning would be obscured. The listener might imagine that the speaker was emphasizing the age of his or her uncle's elderly wife, rather than simply referring to his or her aunt. Vance offers the example of 'kooto' (coat) and 'koto' (Japanese koto traditional musical instrument) as minimal pairs distinguished only by vowel length. (2008:6) It would be very difficult for a listener to misconstrue a statement regarding a coat as one regarding a Japanese musical instrument in most all situations, however, this is a common NNS error.

These sorts of mistakes can be especially taxing for NS listeners when attempting to form plans with a NNS. For example:

NNS: 'Yoka ni aimashou.'

Let's meet on the *eighth.

NS: 'Youka ni aimashou ka. Sore ka yokka ni aimashou ka.'

Shall we meet on the eighth? Or shall we meet on the fourth?

The word for the eighth day of the month 'youka' contains long vowel [o:], whereas the word for the fourth day of the month 'yokka' similarly contains a geminate [k:], making them easily confused by NNS. Although these are not minimal pairs, germination involving identical sounds makes them resemble each other to such an extent that NNS have trouble both perceiving and producing these words.

When vowel duration errors occur in a word that is not a member of a minimal pair context may guide the listener in guessing the appropriate word. If a NS listener is presented with a sentence

'atarashii tebukurou ga hoshii desu.' I want new gloves.

it is likely that the listener will immediately notice the incorrect pronunciation of 'tebukuro' (gloves), but will still be able to identify it semantically as the concept of "gloves" due to the lack of alternate words that this lexical item may be connected with. The listener could potentially view the word as a mispronunciation of 'fukurou' (owl)[21], but only if the context allowed such an interpretation, which is also related to the commonality of potential lexical items being referenced. Unless the conversation took place at a zoo or pet store, it is extremely unlikely that the speaker would desire a new "owl".

Occasionally context does not help. When a rare native word or seldom used foreign word is used it is often difficult to gauge meaning from context. To the uninitiated, some sentences like

'rokkaku wo watashite.' Hand me the Allen/hex wrench.

'honjyuurasu ni ikitai.' I want to go to Honduras.

'nan koma desu ka.' How many trade show booths?

may contain words that are too obscure or specific to one industry (i.e., jargon) to be understood even by the average NS. In this situation, vowel duration errors will likely prove fatal to comprehensibility.

[21] In Japanese compounding, the first segment of the second member of a compound word is often voiced. The compound 'tebukuro' is a combination of 'te' (hand) and 'fukuro' (bag). Hence, the first segment of 'fukurou' (owl) would also become a voiced bilabial if compounded.

Teaching Durational Contrast

The Need for Instruction in Durational Contrasts

An awareness of durational contrast would benefit L2 Japanese learners in both perception and production. As Japanese duration is phonemic, it affects word pronunciation on the segmental level, allowing speakers to differentiate lexical items. Beyond the fact that segmental errors may result in incomprehensible speech, a lack of awareness of phonemic distinction can result in the inability of the NNS listener to distinguish between similar words, leading to confusion. Minimal pairs proved more difficult for the NNS in this study due to a lack of ability to distinguish long vowel and short vowel durations. The use of minimal pairs in pronunciation training (for example, 'ship' and 'sheep') was prominent in the audiolingual approach of the mid-twentieth century. (Lightbown and Spada, 2006:104)

In a study of 18 Australian English L1 learners of L2 Japanese Toda reports that learners do have difficulty both perceiving and producing contrasts in vowel duration. She found that L2 learners required a longer duration for the long vowel than Japanese NS in order to identify it as a long vowel (2003:41). This tendency changed as the learner improved as "advanced learner threshold values (percentage of lengthening before noticeable as a long vowel) were similar to those of NS" (2003:44). Toda found that although L2 learners are not always able to recognize long vowels, both beginners and advanced students over exaggerate long vowels in production (2003:88). This reflects on a lack of clear awareness of contrasts in vowel duration and a desire to apply phonological processes that are not yet clearly defined.

Instruction of Vowel Duration in Existing Textbooks

An examination of explicit instruction in durational contrast in the five textbooks mentioned above (Genki I, Nakama I, Yookoso!, Japanese: The Spoken Language Part I [J:TSL], and Japanese for Busy People I [JBP]) shows varying levels of instruction. Unfortunately most of this instruction is located in the introduction to the textbook, which many learners neglect to read, preferring instead to begin learning vocabulary and grammar as soon as possible. In its section "Long Vowels", Genki I states that:

> When the same vowel is placed one right after the other, the pronunciation of the vowel becomes about twice as long as the single vowel. Be sure to hold the sound long enough, because the length of the vowel can change one word to another. (2011:26)

This statement is followed by seven examples, two of which include both minimal pair members (e.g. 'obaasan' and 'obasan'), which also happen to be familial terms. Nakama I begins teaching hiragana in the Introduction to Chapter 1. It offers examples of greetings that include long vowels on page 9, but does not introduce long vowels until page 16. Interestingly, Nakama I does include instruction in devoicing vowels (somewhat confusingly referred to as "whispered sounds") and pitch-accent, with macrons written above hiragana that carry a high tone. It is confounding as to why these suprasegmental features are described early on and yet the phonemic contrast of vowel duration is not touched upon until later. The fact that some phonetic symbols offered in brackets as examples of pronunciation conform to IPA standards (e.g. [k], [a], [t]) and some do not (e.g. [ah], [ooh]) is also confusing to the reader. Nakama I describes a long vowel in these terms:

> When two of the same vowel appear consecutively in a word, each of the vowels retains the same length and quality. However, the two vowels are pronounced as a continuous

sound rather than as two separate vowels. This is called a long vowel. (1998:16)

This description seems to capture the characteristics of a long vowel as two phonemic units, but one phonetic unit. Nakama I does well in introducing phonological concepts during hiragana writing practice in Chapter I, rather than in a dry introduction that will likely remain unread. Yookoso! describes the hiragana writing system at the end of Part 2 from pages 26 to 29, however, only offers explicit instruction in the pronunciation of each specific hiragana letter. On page 43 Yookoso! includes a section entitled "Double Vowels", which directs the reader to do the following: "when two of the same vowel occur together, hold the sound twice as long as a single vowel" (2006:43). It then instructs the learner as to how to write what it refers to as both "double vowels" and "long vowels" in hiragana. This instruction in writing long vowels comes after many examples that include long vowels (e.g. juu 'ten', doomo 'thanks') have already been introduced and applied to multiple drills. Japanese: The Spoken Language introduces the concept of vowel durational contrast on page 2:

> When two or more Japanese vowels follow each other directly, each one retains its original quality and length, but the sequence is regularly pronounced as a continuum. The occurrence of the same vowel symbol twice indicates a long vowel: e.g., aa represents a + a pronounced without a break. A word in Japanese has at least as many mora as it has vowels: thus, a-O-I is a 3-mora word; E-e is a 2-mora word. (1987:2)

Jorden, a trained linguist, offers the most thorough explanation of the long vowel found in any textbook available in the US. The fact that she includes the concept of the mora in a beginner's textbook makes this truly remarkable. The amount of detail given to such concepts early on in the book may, however, drive some readers to look elsewhere for more easily digestible learning and practice materials. Jorden also refers to a "whispered mora" (devoiced vowels), which is

somewhat surprising as it seems as though it might compel the learner to lower the volume of the mora in question. Japanese for Busy People describes long vowels in saying "Long vowels are a doubling of the single vowel and care should be taken to pronounce them as a continuous sound, equal in value to two identical short vowels" (1994:13).

The description above contains all of the information regarding long vowels readily available in textbooks to the ardent learner of Japanese living in the United States. Many of the descriptions are concise and several are nuanced in a way that they point to the phonemic nature of the long vowel as being composed of two moras as well as the phonetic property of being longer than a short vowel. These descriptions help to put into words the knowledge that an instructor may have, but is unable to clearly communicate to the learner. Unfortunately a fear of further questions from the learner often drives the instructor to simply assign the phonological descriptions in the textbook as reading homework without actually discussing them or providing examples. This refusal to address long vowels becomes untenable when hiragana practice requires explanation of the multiple representations of long vowels. Most instructors simply provide multiple examples hoping that the questions will cease. The results obtained in this study, however, reveal that if an instructor or a textbook were to offer multiple examples of minimal pairs differentiated only by vowel duration this might prove more useful to the learner who is attempting to acquire this new concept of the phonemic contrastive vowel duration. Some examples are given in Genki I, however, many more are available and might be included in a section that explicitly discusses vowel duration, rather than in the often unread fronts matter.

Explicit Instruction in Hiatal Vowel Pronunciation

It is common on the first day of class for an instructor to mention that unlike in English all sounds in Japanese should be "pronounced" or "enunciated." This one piece of advice is generally the only instruction a student of Japanese receives in the pronunciation of hiatal vowels. During in-class drills, whenever Romanization might seem to reflect what would otherwise appear to be a diphthong in English, the student is usually cautioned to pronounce these as individual sounds. When students practice long vowels they are subsequently taught that this rule does not apply to 'ei' and 'ou' combinations, which are to be read as long vowels. In the event that the instructor neglects to mention anything about the pronunciation of vowels occurring in sequence, it is up to the student to decipher the vocalic sequences encoded in whatever writing system is used on their own or by making use of the textbook assigned to their class. Those learners who are not studying Japanese in a classroom setting have no alternative but to rely on the textbook for instruction in the pronunciation of sequences of vowels.

Instruction on Vowels in Hiatus in Existing Textbooks

Genki I does not offer any instruction in the pronunciation of vowels occurring in hiatus. After a short two-page discussion of long vowels, the pronunciation of moraic nasal ん, "vowels to be dropped" (devoiced vowels), and pitch-accent, the book teaches the learner idiomatic greetings. Eight of these 18 greetings include vowels occurring in hiatus that would normally be pronounced as diphthongs by native speakers of English. These include:

[i:e]	iie.	'no'
[tadaima]	tadaima.	'I'm home.'
[okaeɽi nasai]	okaeri nasai.	'Welcome home.'

With minimal instruction in reading and pronouncing vowel sequences it should come as no surprise that some students pronounce these as:

[ije]	iie.	'no'
[tədaɪmə]	tadaima.	'I'm home.'
[okaɪɹi nəsaɪ]	okaeri nasai.	'Welcome home.'

Nakama I includes no explicit instruction in the pronunciation of vowels occurring in hiatus. On page 6, however, it does introduce long strings of monophthongal vowels; some of the arguably most difficult Japanese words for English speakers to pronounce properly. These include 'kao' (face), 'sekai' (world), and 'aoi' (blue). These are all represented in hiragana, which may actually help NNS avoid transferring L1 English pronunciations of these vowel sequences simply due to the fact that they are not written in the same script as any English diphthongs that might be inferred. Yookoso! includes no explicit instruction in the pronunciation of vowels occurring in hiatus. In her book Japanese: The Spoken Language Jorden offers remarkably little instruction on pronouncing hiatal vowel sequences. She lists the vowels in a table entitle "Row 1"[22] and then offers this word of advice before the next set of examples: "The values of the vowel symbols remain the same as in Row 1 above" (1987:2). Japanese for Busy People offers no instruction in pronouncing vowels that occur in hiatus, but does state that vowels are "pronounced clearly and crisply" (ostensibly referring to the fact that they are never lenited or diphthongized) and further that "If you pronounce the vowels in the following English sentence, making them all short, you will have their approximate sounds" (1994:12-13) The example sentence is as follows:

Ah, we soon get old.
a i u e o

[22] "Row 1" refers to the row on the kana chart. The Japanese kana chart follows that of Sanskrit in that all vowels appear in the initial row.

One criticism of this simple method, albeit described as approximating the vowel sounds of Japanese, is that it seems very difficult to avoid extending the vowel sound in "Ah." There are also multiple pronunciations of "get," which could prove problematic.

As is evident from the description above, there is a lack of explicit instruction on the pronunciation of vowels occurring in hiatus. Unless an instructor or native speaker specifically corrects the L2 learner, it is unlikely that the L2 learner will have any other option except to rely on his or her own perceptual capabilities in deciding how to pronounce sequences of vowels occurring in Japanese words.

Explicit Instruction in Loanword Adaptation

Loanwords are abundant in the Japanese language. Not only are they in use in every medium of communication available to Japanese, but they are growing in number daily. Textbooks also include numerous loanwords, mostly from English, and unfortunately offer no hints as to how they have come to be pronounced as they are in Japanese. The constant increase in the number of loanwords makes it apparent that L2 Japanese learners must be able to develop some sort of awareness of the processes involved in adapting foreign words to the Japanese language. The fact that Japanese NS are not only able to identify English words as their loan counterparts (e.g., 'spy' as [supai] and not [suppai] 'sour') and even create their own mutually agreed upon loanwords reveals a consensus among Japanese speakers of the rules or processes involved in loanword adaptation (LWA). Given enough time an L2 learner may be able to identify these processes on their own, however, in order to save time and quickly extend the L2 learner's ability to mentally process and even create loanwords on their own it is preferable to provide the learner with some simple rules regarding Japanese LWA early on in his or her study

of the language. Some examples of specific rules of LWA that may be offered with examples are:

1) All syllables must end in a vowel sound or a moraic nasal.

   Ex. computer > konpyuutaa

2) Epenthesis is generally applied when consonant clusters are present in the source word.

   Ex. spoon > supuun

3) The most common epenthetic vowel used in Japanese LWA is the high back un-rounded vowel.

   Ex. Christmas > kurisumasu

4) Vowels followed by rhotics in the coda position usually become long vowels.

   Ex. carnation > kaaneeshon

An early knowledge of Japanese LWA would offer two specific benefits to the L1 English L2 Japanese learner. First, it would allow the learner to augment his or her vocabulary with every English loanword that has been adapted into the language, thus equipping the learner with thousands of useful vocabulary terms. Second, it would give the L2 learner a much deeper awareness of the phonology of the Japanese language, which is also not normally taught explicitly in textbooks or classes. In addition, a knowledge of LWA and the phonological processes behind it may provide a means of avoiding L1 English transfer into L2 Japanese or at least making the speaker more aware of any such transfer so that he or she is more capable of addressing these sorts of errors.

Measured Exposure to Japanese Phonological Concepts

The data presented in this study makes it clear that L2 learners of Japanese are not adequately able to contrast Japanese long and short vowels, nor are they able to completely pronounce vowel sounds that occur in hiatus. They also lack the ability to predict how loanwords from English, the primary source of Japanese loanwords, are adapted to fit the phonology of Japanese.

The continuing reliance on grammar translation has led to a state in which Japanese orthographic acquisition is the primary objective among educators and phonological awareness ranks a distant second. In exposure to the concepts at work in LWA, learners gain access to an entire set of rules that govern pronunciation in Japanese. If one believes that each lexical level of the Japanese language has its own set of phonological rules, then these rules may be slightly different from those that govern the other lexical strata, however, they will allow the learner to identify which phonemes in the L2 should exist in their IL and avoid transfer of English phonemes that are illicit in Japanese. Vowel lengthening as well as monophthongization of English diphthongs (e.g. 'iron' [airoN], 'airbed' [ea:beddo], etc.) seen in LWA can be easily explained by the well-trained educator and serve as examples of applications of Japanese phonology that are easily recognizable to the native English speaker.

While English words may prove useful examples of LWA, all care should be exerted to avoid using the writing system that native English speakers are so familiar with in order to avoid unnecessary transfer based on visual stimuli. A system in which learners are taught the native writing systems without the aid of Roman letters would be optimal. This can be achieved through technology currently available online as well as on portable devices that allows letters to be shown with accompanying sound files. It is best to avoid attaching an English sound or

concept to a Japanese word or sound for the beginning learner so that they are not forced to unlearn the equivalency classifications they have made and immediately work on creating categories of contrast for new phonemes in the L2.

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Appendix I: Tokens Used in Elicited Imitation Task

Token	Target Word	TW contains devoiced V	TW is loanword	TW contains long V	TW contains long V minimal pair	TW contains hiatal V	control
iie, imasen deshita	iie			1	1		
ashita hana wo kaimasu	hana						1
ookii kuruma deshita	ookii			1			
raishuu shigoto ni iku	raishuu			1		1	
kare ga kuruma ni notta	kuruma						1
kaaten wo akemasu	kaaten		1	1			
koohii ga nomitai	koohii		1	1			
kusuri wo nomimashita	kusuri	1					
okaasan ga imasu	okaasan			1			
"doumo" to iimashita	iimashita			1	1		
shiroi kuruma ga aru	shiroi					1	
sueeden ni ikitai	sueeden		1	1		1	
ashita ame ga furimasu	ame						1
kurasu ha tanoshii desu	tanoshii			1			
sore ha taihen deshita	taihen					1	
kirei na ie wo katta	kirei			1			
aisukuriimu desu	aisukuriimu		1	1		1	
mekishiko ni ikitai	mekishiko		1				
tanoshiku narimashita	tanoshiku	1					
hashi no ue wo aruku	ue					1	
imouto ga imasen	imouto			1			
eiga ga sugoku suki	eiga			1			
keeki ga suki desu	keeki		1	1			
atarashii shatsu desu ka	shatsu		1				
enpitsu ha arimasu ka	enpitsu						1
kyou ha iiko deshita ka	iiko			1	1		
hikouki de ikimashou	hikouki			1			
kare ha warui hito desu	warui					1	
mada soko de tabete iru	mada						1
kaban ha pinku iro	pinku		1				
basu ni norimashou ka	basu		1				
ohashi de tabemashita	ohashi	1					
oneesan ga imasu	oneesan			1			
tonkatsu ga daisuki	daisuki					1	
kare to mizu wo nonda	kare						1
oosutoraria ni iku	oosutoraria		1	1		1	
wain ga ichiban suki	wain		1			1	
me to mimi to hana to kuchi	to				1		
otousan ga ikimasu	otousan			1			
tomodachi ni au tsumori	au					1	
hon wo takusan yonda	wo	1					
saafin shitai desu	saafin		1	1			
nooto wo kaimashita	nooto		1	1			
suteki na ie desu ne	ie				1		
juuichi nichi deshita	juuichi			1		1	
yama ni itta deshou	yama						1
asoko de tabeta yo ne	yo				1		

Appendix II: Tokens Used in Reading Aloud Task

Token	TW	TW is loanword	TW contains long V	TW contains long V minimal pair	TW contains hiatal V	control
mousugu kurisumasu ni naru	kurisumasu	1				
makudonarudo ga kirai	makudonarudo	1				
chikin to raisu ga tabetai	chikin	1				
tenisu ga suki desu ka	tenisu	1				
konpyuutaa ga hoshii	konpyuutaa	1	1			
shikata ga nai darou	darou		1			
soudan shitai hito	soudan		1			
suki kirai no nai hito	kirai				1	
motto supootsu shimashou	supootsu	1	1			
tsukareta ka mo shirenai	shirenai				1	
kinou ame ga futta	kinou		1			
kono ame ga oishii	oishii		1		1	
motto ohashi de tabeyou	tabeyou		1			
hashi wo watatte kara	wo					1
hana ga sakihajimeta	sakihajimeta					1
hito ga ooku iru tokoro	ooku		1	1		
hontou ni ii desu yo	hontou		1			
obaasan no ie ni imasu	obaasan		1	1		
asa no tsuukin rasshu	tsuukin		1			
oneesan ni aitai	oneesan		1			
aoi kuruma ga hoshii	aoi				1	
dare no ie ni ikimasu ka	ie			1	1	
akai ranpu ga tauita	ranpu	1				
teeburu no ue desu	ue				1	
zenzen miemasen	miemasen				1	

Appendix III: Elicited Imitation Task Target Words with Vowel Errors

Token	Target Word	TW contains devoiced V	TW is loanword	TW contains long V	TW contains long V minimal pair	TW contains hiatal V	control
ashita hana wo kaimasu	hana						1
kare ga kuruma ni notta	kuruma	1					
kaaten wo akemasu	kaaten		1	1			
"doumo" to iimashita	iimashita			1	1		
sueeden ni ikitai	sueeden		1	1		1	
ashita ame ga furimasu	ame						1
kurasu ha tanoshii desu	tanoshii			1			
sore ha taihen deshita	taihen					1	
kirei na ie wo katta	kirei			1			
mekishiko ni ikitai	mekishiko		1				
tanoshiku narimashita	tanoshiku	1					
hashi no ue wo aruku	ue					1	
imouto ga imasen	imouto			1			
eiga ga sugoku suki	eiga			1			
atarashii shatsu desu ka	shatsu		1				
enpitsu ha arimasu ka	enpitsu						1
kyou ha iiko deshita ka	iiko			1	1		
hikouki de ikimashou	hikouki			1			
mada soko de tabete iru	mada						1
ohashi de tabemashita	ohashi	1					
oneesan ga imasu	oneesan			1			
kare to mizu wo nonda	kare						1
oosutoraria ni iku	oosutoraria		1	1		1	
wain ga ichiban suki	wain		1			1	
me to mimi to hana to kuchi	to				1		
tomodachi ni au tsumori	au					1	
nooto wo kaimashita	nooto		1	1			
suteki na ie desu ne	ie				1		
juuichi nichi deshita	juuichi			1		1	
yama ni itta deshou	yama						1
Totals		3	7	13	4	7	6
Percentage of all errors		0.10	0.23	0.43	0.13	0.23	0.20

Appendix IV: Reading Aloud Task Target Words with Vowel Errors

Token	Target Word	TW is loanword	TW contains long V	TW contains long V minimal pair	TW contains hiatal V	control
mousugu kurisumasu ni naru	kurisumasu	1				
makudonarudo ga kirai	makudonarudo	1				
chikin to raisu ga tabetai	chikin	1				
tenisu ga suki desu ka	tenisu	1				
konpyuutaa ga hoshii	konpyuutaa	1	1			
shikata ga nai darou	darou		1			
soudan shitai hito	soudan		1			
suki kirai no nai hito	kirai				1	
motto supootsu shimashou	supootsu	1	1			
tsukareta ka mo shirenai	shirenai				1	
kono ame ga oishii	oishii		1		1	
hashi wo watatte kara	wo					1
hana ga sakihajimeta	sakihajimeta					1
hito ga ooku iru tokoro	ooku		1	1		
hontou ni ii desu yo	hontou		1			
obaasan no ie ni imasu	obaasan		1	1		
asa no tsuukin rasshu	tsuukin		1			
oneesan ni aitai	oneesan		1			
aoi kuruma ga hoshii	aoi				1	
dare no ie ni ikimasu ka	ie			1	1	
akai ranpu ga tauita	ranpu	1				
teeburu no ue desu	ue				1	
zenzen miemasen	miemasen				1	
Totals		7	10	3	7	2
Percentage of total errors		0.30	0.43	0.13	0.30	0.09

Appendix V: Elicited Imitation Task Errors as Noted by NS Raters

File#	TW	E?	E?	E?	U?	U?	U?	V?	V?	V?	Notes	Notes	Notes
		ayf25	hbm41	sif35	ayf25	hbm41	sif35	ayf25	hbm41	sif35	ayf25	hbm41	sif35
302_13f22	hana	1.00	1.00	1.00	1.00	1.00	1.00	a			hanaの最後のaがエラー		はないかいます　と聞こえる
305_02m2	kuruma	1.00	1.00	1.00	0.00	0.00	0.00	u	a	a		Aがlになっている	くるみのった　と聞こえる
305_30f22	kuruma	0.00	1.00	1.00	1.00	1.00	1.00	a					
306_03m2	kaaten	1.00	1.00	1.00	0.00	0.00	0.00	e	e		カーテンのteのeが短い		カーテノ　と聞こえる
310_03m2	iimashita	1.00	1.00	0.00	1.00	1.00	0.00	i	i	i	「言いました」が「いました」になっている。		いました　と聞こえる
310_04m1	iimashita	1.00	1.00	1.00	1.00	1.00	0.00	i	i	i	「言いました」が「いました」になっている。		いました　と聞こえる
310_10f20	iimashita	1.00	1.00	1.00	1.00	1.00	0.00	i	i	i	「言いました」が「いました」になっている。		いました　と聞こえる
310_15m2	iimashita	1.00	1.00	1.00	1.00	1.00	0.00	i	i	i	「言いました」が「いました」になっている。	iiがiになっている	いました　と聞こえる
310_25m1	iimashita	1.00	1.00	1.00	1.00	1.00	0.00	i	i	i	「言いました」が「いました」になっている。		いました　と聞こえる
310_28f20	iimashita	1.00	1.00	1.00	1.00	1.00	1.00	i	i	i	「言いました」が「いました」になっている。		いました　と聞こえる
310_39m2	iimashita	1.00	1.00	0.00	1.00	1.00	1.00	i	i	i	「言いました」が「いました」になっている。		いました　と聞こえる
310_40f22	iimashita	1.00	1.00	0.00	1.00	1.00	1.00	i	i	i	「言いました」が「いました」になっている。		いました　と聞こえる
310_41f21	iimashita	1.00	1.00	1.00	1.00	1.00	1.00	i	i	i	「言いました」が「いました」になっている。		いました　と聞こえる
312_02m2	sueeden	1.00	1.00	1.00	1.00	1.00	1.00	e			スウィーデン		
313_41f21	ame	1.00	1.00	0.00	1.00	1.00	1.00	e	e		あめ→あみ	eがiになっています	
314_35f22	tanoshii	1.00	1.00	1.00	1.00	1.00	1.00	i			たのしwithout い		
315_25m1	taihen	1.00	1.00	1.00	1.00	1.00	1.00	i			たへん		
316_10f20	kirei	1.00	1.00	1.00	1.00	1.00	0.00	i	e	e	きれいが「きれ」になっている。	REがEに聞こえる	きえいないえのかった　と聞こえる
316_17m2	kirei	1.00	1.00	1.00	0.00	1.00	0.00	e	e	e	きれいがキーライになっている。	REがEに聞こえる	きえいないえのかった　と聞こえる
316_22f18	kirei	1.00	1.00	1.00	1.00	1.00	0.00	i	e	e	きれえ	REがEに聞こえる	きえいないえのかった　と聞こえる
316_34m2	kirei	1.00	1.00	1.00	0.00	0.00	0.00	e	e	e			
318_01f20	mekishiko	1.00	1.00	1.00	1.00	0.00	1.00	o	o	o			めきしお　と聞こえる
318_38m2	mekishiko	1.00	1.00	1.00	1.00	1.00	1.00	i			メコシコ		
319_04m1	tanoshiku	1.00	1.00	1.00	0.00	0.00	0.00	i	u	u	たのしーく	KUが発音されていない	し　と　く　の発音に間がある
319_14m2	tanoshiku	1.00	1.00	1.00	0.00	0.00	0.00	u	u	u	たのしか	UがAになっている	
319_17m2	tanoshiku	1.00	1.00	1.00	1.00	1.00	1.00	o			たなしく		
319_28f20	tanoshiku	1.00	1.00	1.00	1.00	1.00	1.00	i			たのしーく		
320_03m2	ue	1.00	1.00	1.00	0.00	0.00	0.00	u	u	u		Uがlになっている	いえ　と聞こえる
320_11m1	ue	1.00	1.00	1.00	0.00	0.00	0.00	u		ue			うえ→れい　を聞こえる
320_41f21	ue	0.00	1.00	0.00	1.00	0.00	1.00	u	u				
321_14m2	imouto	0.00	1.00	1.00	1.00	1.00	1.00	o					
321_16f20	imouto	1.00	1.00	1.00	0.00	0.00	0.00	o	o	ou			いまおと　と聞こえる
321_39m2	imouto	1.00	1.00	1.00	0.00	0.00	0.00	final o	o	o		TOが駄目	いまうた　と聞こえる
322_13f22	eiga	1.00	1.00	1.00	1.00	1.00	1.00	i					
324_28f20	shatsu	1.00	1.00	1.00	1.00	1.00	1.00	a			シャーツ		
324_37m1	shatsu	1.00	1.00	1.00	1.00	1.00	1.00	a			シャーツ		
325_18m2	enpitsu	1.00	1.00	1.00	1.00	0.00	1.00	e			えーんぴつ		
326_17m2	iiko	1.00	1.00	1.00	1.00	1.00	0.00	i	i	i	いこ	iiがiになっている	い　が短い（いこー　と聞こえる）
326_17m2	iiko	1.00	1.00	0.00	1.00	1.00	0.00	i					
326_33m1	iiko	1.00	1.00	1.00	1.00	1.00	1.00	i			いこ		
326_33m1	iiko	1.00	1.00	1.00	1.00	0.00	1.00	i					
327_02m2	hikouki	1.00	1.00	1.00	1.00	1.00	1.00	i			ひーこうき		
327_03m2	hikouki	1.00	0.00	1.00	1.00	1.00	1.00	u		u	ひこき		u　が聞こえない
329_11m1	mada	1.00	0.00	1.00	0.00	1.00	1.00	a		a	まど		まど　と聞こえる
329_39m2	mada	1.00	0.00	1.00	0.00	1.00	0.00	a		a	まど		まど　と聞こえる
332_18m2	ohashi	1.00	1.00	1.00	1.00	1.00	1.00	a			おはーし		
333_04m1	oneesan	1.00	1.00	1.00	1.00	1.00	1.00	o			おーねさん		
333_18m2	oneesan	1.00	1.00	1.00	1.00	1.00	1.00	e			おねいさん		
335_11m1	kare	1.00	0.00	1.00	1.00	1.00	0.00	e		e	かる		かる　と聞こえる
335_40f22	kare	1.00	1.00	1.00	0.00	0.00	0.00	e	e	e	かお		かお　と聞こえる
336_12m1	oosutoraria	1.00	1.00	1.00	1.00	0.00	0.00	o/a			オースラーリア		
336_13f22	oosutoraria	1.00	1.00	1.00	1.00	0.00	0.00	o			オストラリア		
336_18m2	oosutoraria	1.00	1.00	1.00	1.00	1.00	1.00	o/a			オゥストリャリア		
336_22f18	oosutoraria	1.00	1.00	1.00	1.00	0.00	1.00	o			オストラリア		
336_35f22	oosutoraria	1.00	1.00	1.00	1.00	1.00	1.00	a			オーストラーリア		
336_38m2	oosutoraria	1.00	1.00	1.00	1.00	1.00	1.00	o			オストラリア		
337_38m2	wain	1.00	1.00	1.00	1.00	1.00	1.00	a			ワーイン		
338_39m2	to	1.00	1.00	1.00	1.00	1.00	1.00	o					
338_40f22	to	1.00	1.00	1.00	1.00	1.00	1.00	o					
340_17m2	au	1.00	1.00	1.00	1.00	0.00	1.00	u	u	u		Uが発音されていない	u　が聞こえない
340_18m2	au	1.00	1.00	1.00	0.00	0.00	0.00	u	u	u		Uがlになっている	あい　と聞こえる
340_22f18	au	1.00	1.00	1.00	1.00	1.00	0.00	u					
343_18m2	nooto	1.00	1.00	1.00	1.00	1.00	1.00	o			ノゥト		
343_40f22	nooto	1.00	1.00	1.00	1.00	0.00	1.00	o	o		ノト	oが発音されてない	
344_11m1	ie	1.00	1.00	1.00	1.00	1.00	1.00	e					
344_14m2	ie	1.00	1.00	1.00	1.00	1.00	1.00	e					
344_16f20	ie	1.00	1.00	1.00	1.00	0.00	1.00	e					
344_17m2	ie	1.00	1.00	1.00	1.00	1.00	1.00	e					
344_18m2	ie	1.00	1.00	1.00	1.00	1.00	1.00	e					
344_22f18	ie	1.00	1.00	1.00	0.00	0.00	1.00	ie					
344_33m1	ie	1.00	1.00	0.00	1.00	0.00	1.00	e					
344_38m2	ie	1.00	1.00	1.00	1.00	1.00	0.00	i					
344_39m2	ie	1.00	1.00	1.00	0.00	0.00	0.00	ie					
344_40f22	ie	1.00	0.00	1.00	1.00	1.00	0.00	e					
345_13f22	juuichi	1.00	1.00	1.00	1.00	1.00	1.00	u					
346_02m2	yama	1.00	0.00	1.00	1.00	1.00	1.00	a		a			よま　と聞こえる

Appendix VI: Reading Aloud Task Errors as Noted by NS Raters

File#	TW	E?	E?	E?	U?	U?	U?	V?	V?	V?	Notes	Notes	Notes
		ayf25	hbm41	sif35	ayf25	hbm41	sif35	ayf25	hbm41	sif35	ayf25	hbm41	sif35
401_04m19	kurisumasu	1.00	1.00	1.00	1.00	1.00	1.00	last u	i			RIがRUになっている	
402_38m23	kurisumasu	1.00	1.00	1.00	1.00	1.00	1.00	first u					
403_32m20	makudonarudo	1.00	1.00	1.00	1.00	1.00	1.00	first o					
405_14m20	chikin	1.00	1.00	1.00	1.00	1.00	1.00	first i					
408_22f18	tenisu	1.00	1.00	1.00	0.00	0.00	0.00	u					
409_04m19	konpyuutaa	1.00	1.00	1.00	1.00	1.00	1.00	a		o	「コンピュータ」になっている。		oがaと聞こえる
410_08m20	konpyuutaa	1.00	1.00	1.00	1.00	1.00	1.00	a			「コンピュータ」になっている。		
410_35f22	konpyuutaa	1.00	1.00	1.00	1.00	1.00	1.00	a	a		「コンピュータ」になっている。	最後のAがだめ	
412_22f18	darou	1.00	1.00	1.00	1.00	1.00	1.00	u			「だろ」になっている。		
413_22f18	soudan	1.00	1.00	1.00	0.00	0.00	0.00	o	u a	a			aがoと聞こえる
414_02m22	soudan	1.00	1.00	1.00	0.00	0.00	0.00	o	u a	o			ouがuと聞こえる（すーだん）
415_38m23	kirai	1.00	1.00	1.00	1.00	1.00	1.00	first i	i			IがUになっている	
416_14m20	kirai	1.00	1.00	1.00	1.00	1.00	1.00	first i	i			IがUになっている	
417_22f18	supootsu	1.00	1.00	1.00	1.00	1.00	1.00	o		o			スポッツ　と聞こえる
418_08m20	supootsu	1.00	1.00	1.00	1.00	1.00	1.00	o					
418_12m19	supootsu	1.00	1.00	1.00	1.00	1.00	1.00	o					
418_35f22	supootsu	1.00	1.00	1.00	1.00	1.00	1.00	o		o			
419_18m20	shirenai	1.00	1.00	1.00	1.00	1.00	0.00	e	e	e			
423_02m22	oishii	1.00	1.00	1.00	1.00	1.00	1.00	first i					
423_35f22	oishii	1.00	1.00	1.00	1.00	1.00	1.00	first i					
427_02m22	wo	1.00	0.00	0.00	1.00	1.00	1.00	wo					
427_13f22	wo	1.00	0.00	0.00	1.00	1.00	1.00	wo					
427_33m19	wo	1.00	0.00	0.00	1.00	1.00	1.00	wo					
429_22f18	sakihajimeta	1.00	0.00	1.00	1.00	1.00	1.00	e			「はじめぃた」になっている。		
430_37m19	sakihajimeta	1.00	1.00	1.00	0.00	0.00	0.00	i	i	a	「はじょめた」になっている。	全然駄目	さきわじぇめた　と聞こえる
431_02m22	ooku	1.00	1.00	1.00	1.00	1.00	1.00	u					
431_32m20	ooku	1.00	1.00	1.00	1.00	1.00	1.00	o					
431_33m19	ooku	1.00	1.00	1.00	1.00	0.00	1.00	o	o	o		OOがOになっている	oが短い（おく　と聞こえる）
432_22f18	ooku	1.00	1.00	1.00	1.00	1.00	0.00	u	o	ou		OOがOになっている	おくー　と聞こえる
433_04m19	hontou	1.00	0.00	0.00	1.00	1.00	1.00	u			「ほんと」になっている。		
433_40f22	hontou	1.00	0.00	0.00	1.00	1.00	1.00	u			「ほんと」になっている。		
434_33m19	hontou	1.00	0.00	0.00	1.00	1.00	1.00	u	u		「ほんと」になっている。	UがOになっている	
435_03m25	obaasan	1.00	1.00	1.00	1.00	0.00	1.00	first a	a			Obasanになっている	
436_04m19	obaasan	1.00	1.00	1.00	0.00	0.00	0.00	first a	a	o		Obasanになっている	oがaと聞こえる(あばさん)
436_22f18	obaasan	0.00	1.00	1.00	0.00	0.00	0.00	first a					
437_04m19	tsuukin	0.00	1.00	1.00	0.00	0.00	0.00	u					
437_20f21	tsuukin	1.00	1.00	1.00	1.00	1.00	1.00	u	u	u		Tsukinになっている。Tsuukinであるべき	uが聞こえない（つきん）
437_26m21	tsuukin	1.00	1.00	1.00	1.00	1.00	1.00	u	u	u		Tsukinになっている。Tsuukinであるべき	uが聞こえない（つきん）
438_33m19	tsuukin	1.00	1.00	1.00	1.00	1.00	1.00	u	u	u		Tsukinになっている。Tsuukinであるべき	uが聞こえない（つきん）
440_04m19	oneesan	1.00	1.00	1.00	1.00	1.00	1.00	o	e	o		Anesanになっている。Oneesanであるべき	oがaに聞こえる（あねさん）
441_17m21	aoi	1.00	1.00	0.00	1.00	1.00	1.00	o	o			OがIになっている	
442_32m20	aoi	1.00	1.00	1.00	1.00	1.00	0.00	a	a	a		OOIになっている	おおい　と聞こえる
442_35f22	aoi	1.00	1.00	1.00	1.00	1.00	0.00	a	a	a		UIになっている	ううい　と聞こえる
443_02m22	ie	1.00	1.00	1.00	1.00	1.00	0.00	e		e			いい　と聞こえる
443_18m20	ie	1.00	1.00	1.00	1.00	1.00	0.00	e		e			eの発音が弱い
445_25m19	ranpu	1.00	0.00	1.00	1.00	1.00	1.00	u			「ランプン」になっている。		
446_01f20	ranpu	1.00	1.00	1.00	0.00	0.00	0.00	u	u	u	「ランパ」になっている。		らんぱ　と聞こえる
447_12m19	ue	1.00	1.00	0.00	1.00	1.00	1.00	u					
449_22f18	miemasen	1.00	1.00	1.00	1.00	0.00	1.00	first e	i	ie			めいません　と聞こえる
450_02m22	miemasen	1.00	1.00	1.00	1.00	1.00	1.00	first e		ie			みいません　と聞こえる