L2 Learners' Perception of Long Vowels and Geminates in Japanese Dialects

Cassidy Livingston

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First Reader: Dr. Dustin Crowther

Second Reader: Dr. Theres Grüter

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Abstract

Learners of Japanese are well known to have difficulties acquiring geminates and long vowels. What affects the perception of these has yet to be determined, with various studies coming to different conclusions about what cue learners use. In addition to these more difficult phonological features of the language, Japanese has a few different dialects that may play an additional role in perception. This study focuses on the Standard Japanese, Okinawa, and Kansai dialects. Participants completed two tasks in addition to a background questionnaire. The main task in this experiment required participants to transcribe nonwords that they heard in Hiragana. The nonwords included either a long vowel, geminate, or their minimal pairs which were short vowels and singletons, respectively. Results were analyzed in R through mixed-effects logistic regressions. The results from the main task found that perceptual accuracy dropped when learners transcribed words containing long vowels, however the dialect in which they heard the long vowels did not cause a difference in perception. In terms of geminates, participants did not perform significantly different between geminates and singletons, but similar to the results for long vowels, participants were found not to perform differently due to any of the dialects.

Keywords: dialect, accent, long vowel, geminate, Japanese, listening

Introduction

Japanese has a few phonological features that are less common in other languages. For learners, these features can be difficult to acquire when first learning the language and, for some, can continue to persist as a difficult feature in both speech perception and production. One of these features is the long and short vowel contrast, which in Japanese serve as minimal pairs. Another feature of Japanese that is difficult for learners to acquire is geminates, which is a minimal pair with singletons in the language. While many researchers have looked at learners and their acquisition of geminates and long vowels, all listening studies in Japanese, to the researcher's knowledge, used either one speaker (Amano & Hirata, 2015; Hui & Arai, 2020; Motohashi-Saigo & Ishizawa, 2020) or they used multiple speakers who spoke the same dialect (Tajima et al., 2008). All of these listening studies done on learners used only the Standard Japanese dialect as their stimuli, which is the dialect most commonly used and taught in Japanese language classrooms. While there is a perception that dialects throughout Japan do not have much variation, Japanese dialects range from slight differences from the Standard Japanese dialect to quite large variation (Shibatani, 1990). These differences serve as the basis for the following study, which investigates whether perceptual performance in recognizing geminates and long vowels in Japanese is affected by the dialect in which they are heard.

Japanese Linguistic Inventory

The Japanese language in the Standard Japanese dialect is made up of five vowels and fifteen consonants. These five short vowels are minimal pairs with five contrastive long vowels. A short vowel in regular speech was found to have a mean length of 72.1ms (Kozasa, 2004). However, long vowels are longer than short vowels at 119ms, which to native speakers, along with pitch accent is a contrastive difference leading to the realization of different words. An

example of this is the words *tori* /toɾi/ and *torii* /toɾiː/, where the first word means "bird" and the second word means "gate". Similarly, Japanese has geminates in the language, which only occur with voiceless stops. Geminates are frequently recognized as sounding like a harder consonant sound or referred to as a double consonant (Sadakata et al., 2014). In Japanese, geminates are realized through the previous vowel being slightly longer than a normal short vowel, however, this vowel is not as long as a long vowel (Sadakata et al., 2014). This difference leads to words like *kitte* /kitːe/ "stamp" which contain a geminate being recognized as a different word from *kite* /kite/ "come" which do not contain a geminate and is called a singleton.

The Japanese language contains moras, which are the unit of timing in the Japanese language and operate across V and CV structures. Moras have some similarities with syllables, but with the slight difference of what are considered special morae (Kubozono, 1989; Port et al., 1987). These special morae make it distinct from a syllable-timed language. Special morae are aspects of the language like geminates and long vowels where they do not constitute an entire syllable on their own, but they have what is considered to be moraic weight (Cutler & Otake, 2002).

Pitch cues are the overall rise and fall of pitch contours in Japanese (Warner et al., 2010). In Standard Japanese, spoken in Tokyo and surrounding areas, this pitch accent contour tends to be quite predictable, with the majority of pitch rises occurring at a word boundary, indicating to listeners where the word boundary is (Warner et al., 2010). In total, there are two types of pitch accents for Standard Japanese (Heffernan, 2006). The one pitch accent is a high-pitch accent followed by a low-pitch accent, which occurs when the first mora is accented. The second pitch accent is a low pitch followed by a high pitch. In the case of the second pattern, after the first mora, all mora will have a high pitch until reaching the accented mora, and then it will be

followed by a low pitch (Heffernan, 2006). For example, the words *kata* "shoulder" and *kata* "form" are distinguished by the pitch accent. The word *kata* when it has a High-Low pattern means the word "shoulder", but when it has a Low-High pattern, it means the word "form" (Motohashi-Saigo & Hardison, 2009). These pitch accents when combined with duration are some of the primary cues that are used by native speakers of the language to determine both the meaning of a word and whether it contains a long vowel and a geminate (Kozasa, 2004; Ofuka, 2003)

Long Vowels

Researchers have looked at Japanese long vowels in multiple ways over the years, but only recently have they begun to look at how proficiency level may affect acquisition (Hui & Arai, 2020). In the study conducted by Hui and Arai (2020), it was found that the learners' proficiency did not play a role in perceiving long and short vowels. No matter what proficiency level the learners were at, there were those who could use pitch accent cues to distinguish between long and short vowels, especially once the duration of the words was made ambiguous with some performing similarly to native speakers. However, the learners who did not make use of the pitch cue on the ambiguous words did not perform above chance.

Previous research on Japanese long vowels has examined how language background may play a role in learning this feature and whether positive transfer is a factor (Tsukada, 2012). Within this study, it was found that there was no positive transfer for those who had an L1 with a vowel length contrast (Tsukada, 2012). The participants in this study had four different language backgrounds. Two of these languages, Arabic and Japanese, contain a vowel length contrast. The remaining two language backgrounds of the participants, L1 English L2 Japanese and Australian English, lack a vowel-length contrast in their L1. However, the L1 English L2 Japanese

participants spoke an L2 that does contain a vowel-length contrast. The participants completed an AXB Discrimination Task where they indicated whether the second word that they heard was the same as the first or third word. 125 of the trials were conducted in Japanese and 100 of the trials were conducted in Modern Standard Arabic. The native Japanese and native Arabic speakers performed the most accurately on their native language and had a drop in accuracy with the other language. The L1 English L2 Japanese speakers performed better on the Japanese stimuli than the L1 Australian English speakers who had no prior experience learning Japanese, but the two groups along with the Native Japanese group performed similarly with the Modern Standard Arabic stimuli. These results showed that L1 transfer may not have influenced the participants' performance, as those with a vowel-length contrast in their L1 performed similarly on the task in an unfamiliar language to the participants whose L1 lacked this contrast. Other research has examined whether learners can be taught this contrast through training and whether the training can extend to other contrasts that the learners were not explicitly exposed to during training. (Tajima et al., 2008). The results found that learners improved in the contrasts they were trained in, but this did not transfer to other contrasts. These studies show that learners of Japanese have difficulties perceiving the long vowel/short vowel contrast in the language and that various cues including pitch accent may help learners perceive the contrast.

Geminates

In studies that have looked at learners' acquisition of Japanese geminates, it has been found that they rely on pitch accent cues to determine the difference between a singleton and a geminate, although this partially had to do with what the L1 of the speaker was (Minagawa & Kiritani, 1996; Minagawa, 1996). In a study looking at the training of beginner learners of Japanese, Motohashi-Saigo and Hardison (2009) found that they could identify geminates more

accurately through training that provided both audio and visual cues compared to learners in the control group and audio-only group. However, the most common mistake made by all learners was to identify the geminates as long vowels, indicating that beginner learners may be able to identify that there is a moraic unit there, but cannot identify the specific segment correctly.

While it is useful to look at previous studies done on learners and how they performed on different types of tasks, it is also important to keep in mind how native speakers perceive these differences and what they use to perceive differences. There are differing accounts as to what native speakers use when determining geminates. On the one hand, studies claim that they use the subword duration (Hirata & Amano, 2012). On the other hand, other studies say that, to some extent, native speakers use pitch accent cues, which have also been found to be used by L2 speakers (Amano & Hirata, 2015; Ofuka, 2003). In terms of pitch accent cues, it has been found that native speakers perceive geminates differently depending on the pitch accent that the stimuli has been presented in with the Low-High pattern requiring more time to be able to perceive (Ofuka, 2003). The cue that learners as well as native speakers use is debated with some research finding support for pitch accent being one of the key cues, whereas other studies have found that pitch accent is a minor factor and other factors such as subword duration may be a more important cue.

Dialects and Accents

Research on the effect of dialect and accent on learners and how it effects perception and performance on tests has primarily been looked at in a variety of major world languages. One such study looked at how Church of Latter-Day Saints missionaries that conducted Spanish-speaking missions performed on a listening test after they returned. That study found that the participants who had completed their missions in areas where they regularly came into contact

with more dialects of Spanish performed better on a listening test that contained multiple accents of Spanish, contrary to the original hypothesis of the researcher (Adams, 2020). Another study that looked at listening comprehension related to accents was conducted by Major, Fitzmaurice, Bunta, and Balasubramanian (2005). In this study, they looked at how L2 English speakers performed on a listening comprehension test made up of short lectures and multiple-choice comprehension questions when the lectures included various English accents. They found that the lectures heard in the general American accent compared to others resulted in the highest scores on the comprehension test. Lectures presented in Australian and Subcontinental Indian English had the lowest comprehension scores. These results led the researchers to suggest that this may be due to the participants having had less familiarity with these accents than with the General American accent, although prior exposure to the accents on the test was not information gathered from the participants and was noted as a limitation.

In terms of perception research related to various dialects, one study (Baker & Smith, 2010) looked at how learners of French perform on a vowel identification task when half of the stimuli was presented in European French and the other half was presented in Quebecois French. The participants in this study were all L1 English speakers who studied European French in the classroom, but half of the participants (n = 10) additionally studied abroad in Quebec, Canada. Participants were instructed that they would hear words in two different languages, although all stimuli was actually in French, and were told to identify whether the word that they heard was either the same language with the same vowel, the same language with a different vowel, a different language where the noun contains the same vowel, or a different language where the vowels are not the same. Results found that the participants who had studied abroad in Quebec were better able to distinguish between the various vowels of interest in the study.

Another study looked at the identification of the dialectal aspirated-s, for example [ˈsieh-ta] in Spanish by L1 English speakers who were at varying levels of proficiency (Schmidt, 2018). Participants completed an identification task where they had to select the written representation of nonwords with six options presented to them. In total, they heard the stimuli in three different dialects of Spanish. Results found that the more proficient a learner was, the more they were influenced by prior exposure to the different dialects. Demonstrating that dialect familiarity can be an important factor for identifying phonological contrasts. While research into how accents and dialects can affect comprehension has been looked at in a few different languages, how the speaker's dialect affects the perception of geminates and long vowels in learners of Japanese has yet to be examined.

Standard Japanese

The dialect known as *hyojungo* or Standard Japanese began to develop after the Meiji Restoration in 1868. During the Meiji Restoration, the emperor was restored as the country's political power, which marked the end of the empire of the Tokugawa Shogunate, a military government which had begun in 1603 (Magnuson, 2009). As a result, it was determined that for Japan to unify as a singular country, everyone needed to understand the same dialect of Japanese. When deciding what variety of Japanese should be used as the Standard, officials chose a specific variety spoken by the upper class who presided in the Yamanote district of Tokyo (Magnuson, 2009). To further spread the dialect of Standard Japanese, a national radio broadcast was used to teach the new Standard Japanese dialect to residents of Japan (Magnuson, 2009). Features of the Standard Japanese dialect are included in the previous section on the linguistic inventory of Japanese.

Kansai Dialect

The Kansai dialect is one of the few dialects in Japan that has survived throughout the standardization of the language. The survival of the Kansai dialect is partly because of the various positive stereotypes associated with speakers from this area. Throughout most of Japan's history, the Kansai region has served as the center of political power, resulting in dialects from that region gaining prestige. In particular, the dialect spoken in Kyoto is the dialect that has gained the most prestige. Additionally, speakers from Osaka are also viewed positively because of their straightforwardness and the popularity of comedians from that part of Japan (Magnuson, 2009).

The dialect from the Kansai region is similar in many ways to Standard Japanese. However, some notable differences make it important to take into consideration. The Kansai dialect, like Standard Japanese, has fifteen consonants and five vowels. Some differences between these two dialects are the pronunciations of these consonants and vowels. While one of the 5 vowels in Standard Japanese is produced as /ɯ/, Kansai speakers are more likely to pronounce the same vowel as /u/. Kansai dialect speakers are also less likely to devoice the vowels /u/ and /i/ between voiceless obstruents than speakers of Standard Japanese (Sugito, 2005). In the occasions when they are devoiced in the Kansai Dialect, usually when they are preceding the vowels /a e o/ like in the word *kusa* /kusa/ "grass", they are accented unlike in Standard Japanese where the accent shifts to the following mora (Sugito, 2005). Additionally, there are some differences in the production of some consonants, most noticeably the Japanese flap. There are numerous ways that the Japanese flap can be produced, dependent on highly specific environments (Magnuson, 2009). Most importantly, vowel lengthening is different from Standard Japanese. The Kansai dialect, unlike Standard Japanese, does not allow for

monomoraic nouns. To combat this, Kansai dialect speakers will lengthen the vowel by one and a half times in cases where the noun is not followed by a particle and more rarely when the noun is followed by a particle (Sugito, 1975). For example, *ki* /ki/ "tree" being produced as /ki:/. Alternately in words with multiple moras, some speakers will shorten long vowels, most typically with the vowel /o/ in verbs with 3 morae. For example, the phrase *ikou ka* /iko: ka/ "Shall we go?" being produced as /iko ka/. The pitch accent for Kansai dialect is also quite different from Standard Japanese (Shibatani, 1990). Unlike the two pitch accent patterns allowed for in Standard Japanese, the Kansai dialect follows an almost opposite pitch accent pattern and additionally allows for more patterns than the High-Low and Low-High that exists in Standard Japanese. These patterns are High-High, High-Low, Low-HighLow, and Low-High (Sugito, 2005). The -HighLow pattern being where there is a change from high to low within one mora.

Okinawa Dialect

Okinawa dialect within this study refers to the dialect of Japanese spoken by people in Okinawa and not the Ryukyuan languages spoken in Okinawa. Okinawa was previously part of the Ryukyu Kingdom, and it is believed that Ryukyuan and Japanese are related; however, they separated at some point between the 5th and 8th centuries AD (Noguchi & Fotos, 2000). Because of this separation, the two languages are mutually unintelligible. In 1880, a conversation school was created in Okinawa to promote the acquisition of Standard Japanese. The promotion of Standard Japanese and the desire to work in other parts of Japan created a large shift towards bilingualism for many people in Okinawa (Noguchi & Fotos, 2000).

The influence of Ryukyuan languages is prevalent in the Okinawa dialect, although less with younger speakers. However, the influence of Ryukyuan languages is still prominent in the pitch accent patterns in the Okinawa dialect amongst males of all ages (Heffernan, 2006). There

is a falling pitch accent pattern in this dialect where all words with two mora are produced with the same pitch accent, which differs from Standard Japanese patterns. While women seem to be adapting more of the Standard Japanese pitch accent pattern, there is still a strong presence of men producing this falling pitch contour as it is a marker of the Okinawan identity (Heffernan, 2006). Unlike the Kansai dialect and Standard Japanese, Okinawa dialect has between 3-5 vowels and 13-15 consonants (Noguchi & Fotos, 2000). These depend on the speaker and are more prevalent in older speakers living in Okinawa or in more rural areas, who are more likely to be bilingual in Ryukyuan and Japanese. The vowels of Ryukyuan, of which there are 3, have historically led to an overcorrection of vowels in Standard Japanese, but they still differ from the Standard pronunciation. The vowel /e/ often has a glide /j/ added before it. Then the vowels /o/ and /u/ are often treated as allophones and pronounced as /o/. Regarding consonants, /k/ and /g/ are often interchanged by speakers and /t/ and /d/ follow a similar pattern (Noguchi & Fotos, 2000).

The Current Study

How learners of Japanese perceive long vowels and geminates, including what cues they use, has been looked at in various studies. These cues have been noted to be the duration, the pitch accent, and potential other cues that need further investigation. However, none of these studies have looked at how the dialect of the speaker may affect how accurate a learner of Japanese is at perceiving geminates and long vowels. Since pitch accent is noted as being one of the cues that some learners may use to perceive geminates and long vowels, the three dialects in this study are all ones that have varying pitch accent patterns. This leads to the following two research questions:

· Does dialect affect perception of long vowels?

· Does dialect affect perception of geminates?

Methodology

Participants

Participants for this experiment were recruited from two universities in North America. A total of 16 learners of Japanese were recruited regardless of proficiency. Seven of the learners had experience taking the Japanese Language Proficiency Test (JLPT). The JLPT has 5 levels with N5 being the beginner level and N1 being the most advanced. Of the learners in this study, two learners had passed N1, four had passed N2, and one had passed N3. Japanese language classes taken by the participants ranged from only having taken two semesters of a beginner level course to intensive advanced level study abroad and Japanese masters programs. These participants had various L1 backgrounds, with the majority being L1 speakers of English. Other L1s of the participants were Swedish (n = 1), Chinese (n = 1), and Korean (n = 2). A total of 5 native speakers of Japanese were recruited to see whether native speakers could perceive the contrasts of interest between the three dialects. One of the native speakers grew up in the Kansai Region, but the rest grew up in regions where Standard Japanese is spoken.

Most participants did not receive compensation for their participation, although a select few who signed up for the experiment through a research website run by one of the universities received bonus credit for their classes by participating. All learner participants have experience travelling to Japan, with most of them (n = 13) having lived in Japan in addition to travelling there. The average length that the learners had lived in Japan was 5.12 years (SD = 6.01) with a large range varying from never having lived there to 13 years. From the regions of interest, 8 learners have lived in a region where Standard Japanese is the primary dialect spoken by native speakers and 4 learners have lived in the Kansai region. None of the learners have lived in

Okinawa. Regarding travel history in the country, 11 out of 16 learners have experience travelling to the Tokyo region, 8 have travelled to the Kansai region, and only 1 learner has been to Okinawa.

Instruments

Participants completed two tasks in addition to a background questionnaire. The first task looked at the Hiragana knowledge of the participant, which is one of the three writing systems in Japanese. This particular task (Appendix A) was developed for this study to ensure that participants knew what long vowels and geminates are and how to type them correctly. This task was also developed instead of a regular translation task because some vocabulary items were of a lower frequency to get the different types of ways that long vowels can be written. The results of this task were used as an exclusionary criterion. These results determined if any participants did not know how geminates and long vowels are typed and, therefore, would be unable to transcribe any of the differences between the dialects of interest in this study. Participants were presented with 20 Japanese words written in romaji, and they had to type in the blank how they are written in Hiragana to complete this task. Five of these words contained a geminate, and five contained long vowels in the various ways long vowels can be written in Japanese. The other ten words in the task were all fillers. One example of an item from this task is the word *konshuu*, which participants then had to transcribe into こんしゅう meaning "this week."

The main task of this experiment was adapted to be delivered online from the transcription task used by Motohashi-Saigo and Ishizawa (2020), who delivered the task in person and on paper. Following Motohashi-Saigo and Ishizawa (2020), the task used a carrier phrase to deliver each sentence. In total, participants heard 30 experimental sentences and 30 filler sentences. All 60 sentences used the same carrier phrase, with the carrier phrase for this

task being *kore ha ____desu.* "これは_____です." (This is a _____.). One major change from the transcription task used in Motohashi-Saigo and Ishizawa (2020) is that all the experimental stimuli participants transcribed were nonwords. In contrast, in the other study, all experimental stimuli were words chosen from the students' textbooks. Nonwords are instead being used for this task to ensure that vocabulary knowledge, which may come from higher proficiency in the language could not affect the results.

The experimental stimuli contained 36 tokens (Appendix B) across thirty sentences with a total of six sentences containing two tokens each. The other 24 sentences contained one token. The tokens included three factors in a 2x2x3 design. One factor was the phoneme type. This factor resulted in tokens either having a consonant or a vowel that was of interest. In total, half of the tokens in the experiment had a consonant and half had a vowel. The second factor was length. The length factor applied to whether the token had a geminate, long vowel, singleton, or short vowel. Half of the tokens had length and were either a long vowel or geminate and the other half had no length and were singletons or short vowels. The final factor was dialects. The dialects that made up this factor were the Kansai dialect, Okinawa dialect, and Standard Japanese. These three factors resulted in a total of 12 conditions. See Table 1 for the mean average length of the phonemes of interest in each condition.

Table 1

Mean length of targeted phonemes in ms

Dialect	Geminate	Long Vowel	Singleton	Short Vowel
Standard Japanese	123	143	62	61
Kansai	114	122	59	73
Okinawa	122	123	44	54

All sentences were recorded in each of the three dialects of interest in the study: Okinawa, Kansai, and Standard Japanese. Participants were randomly distributed across one of four lists during this task. Each list began with a filler item and contained all thirty experimental sentences with one filler intervening between each experimental item (k = 60). In addition, each list was created to ensure that participants never heard the same word twice in a row to try to make certain that the experiment's purpose is less obvious. The lists differed in the order in which the experimental items were presented with list two being the reverse of list one and list four being the reverse of list three.

The filler words for this experiment were all nonwords for a total of 10 unique filler words. The filler words were five minimal pairs, each of which featured a voicing contrast or have a phoneme that is minimal pairs in one dialect but allophones in another. An example of one of the minimal pairs of filler words is *hagine* and *hakine,* which features a voicing contrast. Similar to the experimental sentences, all sentences were recorded in the Okinawa, Kansai, and Standard Japanese dialects for a total of thirty filler sentences.

The recordings that participants heard were recorded by three males with one for each dialect. All Standard Japanese sentences were recorded by someone who was born and raised in Yokohama, a region where Standard Japanese is the dialect that is spoken. The Kansai dialect stimuli was recorded by someone from Hyogo, a prefecture in the Kansai region, and the Okinawa dialect stimuli was recorded by someone from Okinawa. At the time of the recording, the Standard Japanese speaker and the Okinawa speaker were both in North America and either working or attending school abroad. The Kansai dialect speaker was in Japan at the time of recording and has never lived abroad. Since all three speakers were in different countries, they all received instructions on how to create the recordings and met with the researcher over Zoom

to answer any questions that they had. Each of the speakers created the recordings themselves with their own sound equipment and the recordings were then evaluated by the researcher for quality with some stimuli being rerecorded in a couple cases of sound issues.

The background questionnaire asked participants for demographic information in relation to their experience with the Japanese language and Japanese classes, their travel/study abroad history in Japan, and asked them to rate their familiarity with the three different dialects on a scale of 1-6 with a six meaning extremely familiar and a one meaning not familiar at all. The regions that the dialects are typically spoken in were included when introducing each dialect on the questionnaire in case some participants were not aware of what the dialects are called as many people are not familiar with where the Kansai region is, but do know of the prefectures Osaka and Kyoto, which are part of the Kansai Region.

Procedure

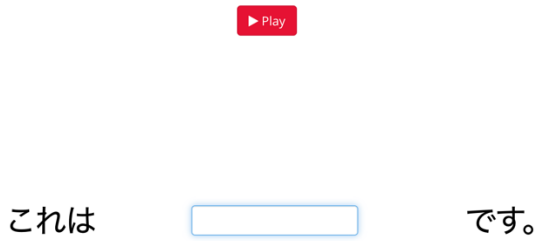
Participants completed all tasks over the behavioural software program Gorilla. Participants had the option to complete the task at any time online and did not have supervision while completing the task. The first task that participants completed was the Hiragana Task. Participants were presented with a questionnaire that included twenty words written in romaji and were instructed to type the Hiragana for the word in the blank. While it is possible to write all 20 words in Kanji, one of the other writing systems used in Japanese, the Kanji does not show either the long vowels or the geminates. For this reason, participants received the instructions to write in Hiragana.

The second task that participants completed was the main task. Participants received the instructions that they were only to write their responses in Hiragana. The choice of Hiragana was because while the words are nonwords, it is still typical to use Hiragana and not Katakana for

participants to transcribe. Katakana is more typically used within Japanese for loan words. However, it is common to use Hiragana experimentally if participants have lower proficiency levels, even in the case of nonwords. Participants saw the carrier sentence on the screen with the blank in the appropriate space (see Figure 1). Participants received the instructions that they would only hear each sentence once and were to type the missing word in the blank. Participants only had the option to hear each audio once. After listening to the sentence, participants were instructed to type the nonword in Hiragana in the blank.

Figure 1.

Display Screen of Transcription Task



At the end of the transcription task, participants were directed to the background questionnaire. The background questionnaire was chosen to be completed at the end of the experiment since it asks for familiarity with the three dialects of interest in the study. Total participation ranged from 10 minutes to 30 minutes with Native speakers taking 10-15 minutes on average, and the learner participants took 10-30 minutes.

Analysis

Following Motohashi-Saigo and Ishizawa (2020), the accuracy of the transcriptions was assessed purely by whether participants have transcribed the nonword correctly. Since this study

focuses on the transcription accuracy of the geminates and long vowels based on which dialect they hear and whether that affects perception, the analysis reflects that. Participants were assessed only on whether they correctly transcribed the geminate or long vowel and not whether they correctly transcribed every character in the word. Transcriptions by participants that used Katakana for some or all characters in a word were accepted as long as they were phonologically the same sound as the Hiragana character. On the rare occasion that a participant used Kanji, less than .01% of the data, for part of the transcription, the Kanji was not accepted.

All data was analyzed in R through a mixed-effect logistic regression using the *lmerTest* package. The log odds and probability for the fixed effects were additionally calculated in R. The results for log odds were converted from the results for logits given by the models and then the probability was derived from the results for the log odds. The alpha level was set at 0.05. The data was dummy coded with treatment levels coded with a value of 1 and reference levels with a value of 0. The four fixed effects in this study were:

- Geminate: 0 = no geminate, 1 = yes geminate
- Vowel: 0 = short vowel, 1 = long vowel
- Kansai Dialect: 0 = Standard, 1 = Kansai
- Okinawa Dialect: 0 = Standard, 1 = Okinawa

Two mixed-effect logistic regressions were used to analyze the learner participants. The first model analyzed how participants performed on the geminates and the second model analyzed how they performed on long vowels in the three different dialects. The intercept for both models is when the participants heard the nonwords in the listening task in Standard Japanese with no geminates and no long vowels. The random effects, which were the different participants and the

individual nonwords, were the same in both models. Due to the limited number of participants in the models, no interactions between the fixed effects were explored in the models.

Results

Hiragana Accuracy Test

The Hiragana test, which was used as exclusionary criteria for the learners, had an overall mean of 19.75, with the native speakers having a mean of 20 out of a total score of 20. All participants were determined to know how to type in Hiragana well enough to be included in the analysis. All results for the Hiragana test are included in Table 2 for the Native Speakers and Table 3 for the Learner participants. Additionally, participants were asked to rate their familiarity with the three dialects on a Likert scale of one-to-six with six being extremely familiar with the dialect and a one being extremely unfamiliar. The results for these ratings are included in Tables 2 and 3.

Transcription Accuracy

The two research questions ask whether dialect affects the perception of long vowels and geminates. The native speakers and the learner participants were analyzed separately with the native speakers being included in order to serve as a comparison between how native speakers and learners perform and whether native speakers are able to transcribe the contrast between the dialects with high accuracy. The results for the native speakers are described descriptively (Table 2). Looking at the descriptive statistics, it does not appear that there are any notable differences in how the participants perceived any of the three dialects with geminates compared to singletons and long vowels compared to short vowels between the Standard Japanese and Okinawa dialect. There does appear to be a slight difference in how the native speakers accurately perceived the Kansai dialect when comparing geminates with singletons with the native speakers being at

ceiling for geminates in the Kansai dialect, however their accuracy dropped to 0.87 out of 1.00 when participants heard the singletons. The pattern is the same with long vowels and short vowels, where the native speakers were at ceiling in the long vowel condition in the Kansai dialect, but had their accuracy drop again to 0.87 in the short vowel condition. However, due to the small number of participants, it is unclear whether this difference is notable.

Table 2

Descriptive Statistics for Native Speakers in target items

				Range	
	Mean	*SD.*	Median	Min	Max
Consonant – Geminate					
Standard Japanese	0.93	0.26	1.00	0.00	1.00
Okinawa	0.93	0.26	1.00	0.00	1.00
Kansai	1.00	0.00	1.00	1.00	1.00
Consonant – Singleton					
Standard Japanese	0.93	0.26	1.00	0.00	1.00
Okinawa	0.93	0.26	1.00	0.00	1.00
Kansai	0.87	0.35	1.00	0.00	1.00
Vowel – Long					
Standard Japanese	0.93	0.26	1.00	0.00	1.00
Okinawa	0.93	0.26	1.00	0.00	1.00
Kansai	1.00	0.00	1.00	1.00	1.00
Vowel – Short					
Standard Japanese	1.00	0.00	1.00	1.00	1.00

Okinawa	1.00	0.00	1.00	1.00	1.00
Kansai	0.87	0.35	1.00	0.00	1.00
Hiragana Test	20.00	0.00	20.00	20.00	20.00
Familiarity					
Standard Japanese	5.20	1.78	6.00	2.00	6.00
Okinawa	1.80	0.84	2.00	1.00	3.00
Kansai	5.80	0.45	6.00	5.00	6.00

The learners in this study showed to perform better on the geminates in both Standard Japanese and the Kansai Dialect with an increase of 0.10 in accuracy in Standard Japanese with geminates compared to singletons and an increase of 0.15 in the Kansai Dialect (see Table 3). However, the Okinawa dialect showed an opposite pattern and the learners' accuracy decreased by 0.12 when they heard words that contained geminates. In terms of long and short vowels, learners performed worse on long vowels when compared to short vowels in both Standard Japanese and the Okinawa Dialect. Participants had quite a sharp drop (0.30) in accuracy with Standard Japanese, whereas in the Okinawa Dialect, participants did have a decrease in accuracy, but it was only by 0.09. The Kansai Dialect, however, saw an increase in accuracy with long vowels from 0.69, a value that is quite similar to how participants performed on the long vowels in Standard Japanese, up to 0.76. It should be noted that with long vowels, participants were still the most accurate with the Okinawa Dialect 0.79, but the difference is quite small and with the Okinawa Dialect, this was a decrease in accuracy from short vowels.

Table 3

Descriptive Statistics for Learners in target items

				Range	
	Mean	*SD.*	Median	Min	Max
Consonant - Geminate					
Standard Japanese	0.90	0.31	1.00	0.00	1.00
Okinawa	0.71	0.46	1.00	0.00	1.00
Kansai	0.86	0.35	1.00	0.00	1.00
Consonant - Singleton					
Standard Japanese	0.80	0.41	1.00	0.00	1.00
Okinawa	0.83	0.38	1.00	0.00	1.00
Kansai	0.71	0.46	1.00	0.00	1.00
Vowel – Long					
Standard Japanese	0.67	0.48	1.00	0.00	1.00
Okinawa	0.79	0.42	1.00	0.00	1.00
Kansai	0.76	0.43	1.00	0.00	1.00
Vowel – Short					
Standard Japanese	0.97	0.18	1.00	0.00	1.00
Okinawa	0.88	0.33	1.00	0.00	1.00
Kansai	0.69	0.47	1.00	0.00	1.00
Hiragana Test	19.75	0.45	20.00	19.00	20.00
Familiarity					
Standard Japanese	5.29	1.33	6.00	1.00	6.00
Okinawa	1.64	0.93	1.00	1.00	4.00
Kansai	3.71	1.44	3.50	2.00	6.00

Dialect Effects on Transcription Accuracy

The model for geminates, presented in Table 4, included the fixed effects of geminate, Kansai dialect, and Okinawa dialect. This model converged and the code was the following: (Response ~ Geminate + Kansai + Okinawa + (1|Nonword) + (1|ID)). This model had an AIC of 286.3 and BIC of 307.8. Furthermore, the R^2c value of 0.02 indicated that the fixed effects accounted for a minimal portion of the variability in the data. When considering the additional variability contributed by the random effects, as reflected in the R^2m value of 0.05, it demonstrates that neither the fixed effects nor the random effects explain a significant amount of the variance in the data.

Table 4

Regression Table for Learners on Geminates

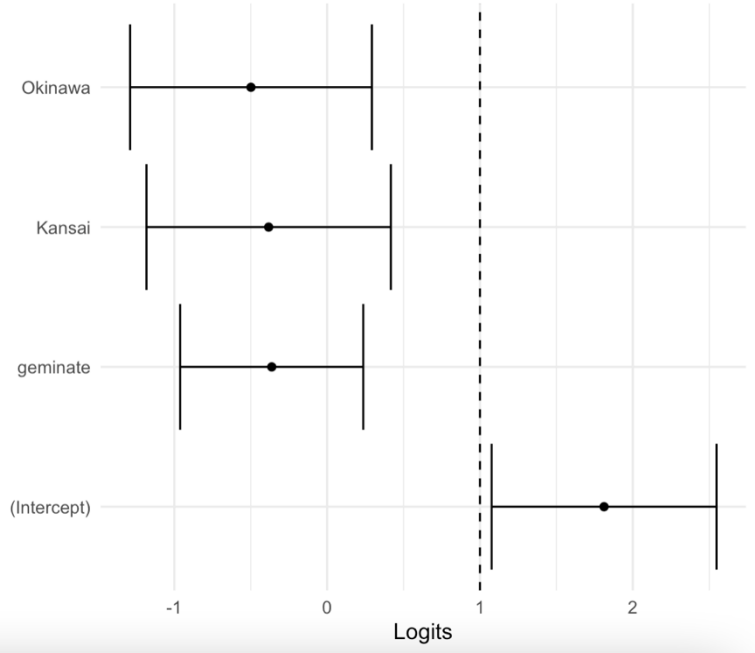
Fixed	Estimate	Std. Error	z	*p*	Odds	Probability
Intercept	1.81	0.38	4.83	<.001	6.11	0.86
Geminate	-0.36	0.31	-1.19	0.26	4.27	0.81
Kansai	-0.38	0.41	-0.94	0.35	4.17	0.81
Okinawa	-0.50	0.40	-1.24	0.22	3.70	0.79
Random Effects	Variance	*SD.*				
Nonword	0.01	0.08				
Participant	0.09	0.30				

The geminate model showed that learners did not statistically perform differently between words that did not have geminates and that did have geminates, with the probability of a

participant getting a word correct decreasing to 81% when a geminate was present. This result compares to the 86% probability of a correct response when the word featured a singleton in the Standard Japanese dialect. However, this decrease in probability was not statistically significant. When additionally looking at the Kansai and Okinawa dialects, participants were not found to perform differently despite the participants performing with slightly lower accuracy on geminates in the Okinawa dialect (see Figure 2).

Figure 2

Effect Plot of Geminate Model in Logits with 95% Confidence Intervals



The model for long vowels included the fixed effects of long vowels, Kansai dialect, and Okinawa dialect. This model converged and the code was the following: (Response ~ Long Vowel + Kansai + Okinawa + (1|Nonword) + (1|ID)). The model for long vowels had an AIC of 217.8 and BIC of 238.5. For this model, the R^2c was 0.13 and the R^2m was 0.58. This model for long vowels explained a lot more of the variance in the data than was explained by the geminate model. A total of 13% of the variance could be explained by the fixed effects and 58%

of the variance could be explained by both the random effects and fixed effects. The result of the R^2m show that much of the variance for how participants performed on long vowels could be attributed to the random effects with most of this variation coming from the individual participants (see Table 5).

Table 5

Regression Table for Learners on Long Vowels

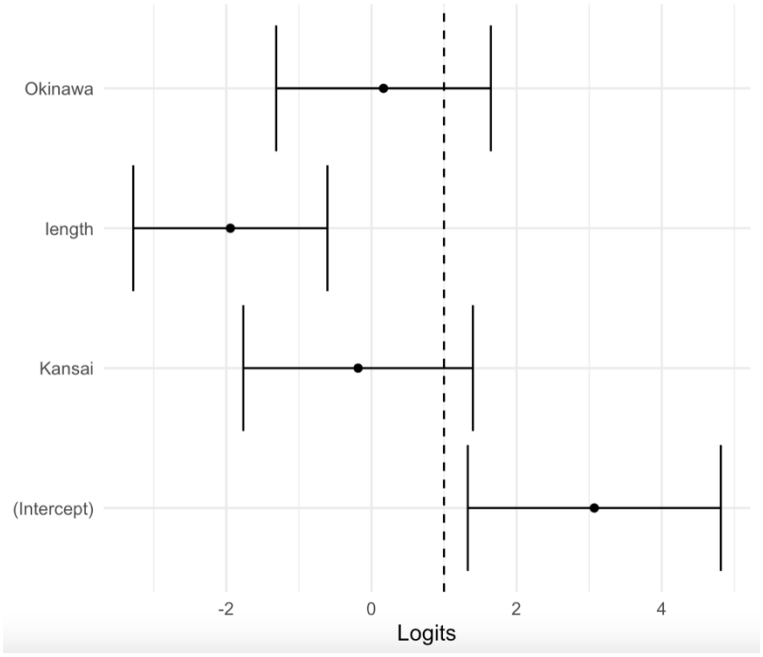
Fixed	Estimate	Std. Error	z	*p*	Odds	Probability
Intercept	2.30	0.69	3.32	<.001	9.97	0.91
Long Vowel	-1.34	0.52	-2.58	0.009	2.62	0.72
Kansai	-0.47	0.64	-0.73	0.73	6.23	0.86
Okinawa	-0.33	0.66	-0.50	0.22	7.17	0.88
Random Effects	Variance	*SD.*				
Nonword	0.56	0.75				
Participant	1.53	1.24				

Regarding long vowels, learners performed lower on words with long vowels (p = <0.001) with learners having a probability of only 72% for getting a word with a long vowel correct compared to a 91% chance when a short vowel was present, demonstrating that long vowels were overall more difficult for the learners to perceive. Participants were also analyzed within the model to compare their performance on the nonwords by dialect. Participants were not found to have a significant difference between how they performed in the Kansai or Okinawa dialect. Despite there being a large difference between how participants performed on the long vowels overall and how they performed in the Kansai dialect and Okinawa dialect with accuracy

on long vowels increasing in both dialects, there is not a significant difference as can be seen in Figure 3 with the 95% confidence intervals overlapping.

Figure 3

Effect Plot of Long Vowel Model in Logits with 95% Confidence Intervals



Discussion

This study sought to investigate how the dialects in which a learner of Japanese is listening to a task may affect their perceptual accuracy of specific phonemes. In particular, this study looked at two research questions. The first of which was whether dialect affects perception of long vowels. The results from this study found that while learners' perceptual accuracy was negatively affected by long vowels, the dialect in which they heard the long vowels did not seem to make a significant difference. The second research question asked if dialect affects the perception of geminates. The participants were found to not have any significant differences between their performance on geminates and singletons. Additionally, the dialect that

participants heard did not play a statistically significant role in their performance on words containing geminates.

Participants had lower accuracy on nonwords containing long vowels compared to short vowels. Learners' difficulty with long vowels has been well-researched (Hui & Arai, 2020; Tajima et al., 2008; Tsukada, 2012), and for the participants in this study, the long vowels were indeed found to be more difficult to perceive. Interestingly, participants had higher accuracy in the Kansai and Okinawa dialects with the participants' accuracy being close to how they performed on the short vowels in Standard Japanese. However, this difference was not shown to be significant.

Regarding geminates, the participants were shown to not perform significantly differently in any of the dialects of interest in this study. Additionally, words with geminates were not perceived as being significantly more difficult to perceive compared to words without them, demonstrating that while geminates are considered a difficult perceptual contrast for learners of Japanese to acquire, they may be easier than long vowels and may not be subject to differences between dialects. The major difference between these dialects is pitch accent, demonstrating that factors other than pitch accent, such as the length of the preceding vowel, may aid in the perception of geminates by learners.

Despite the Kansai dialect being well known for being difficult to understand and having a very different pitch accent pattern from other dialects of Japanese (Shibatani, 1990), the results found that the participants did not perform significantly differently on either long vowels or geminates in this dialect. Additionally, a similar result found that the Okinawa dialect showed no evidence of either improving or decreasing accuracy compared to the Standard Japanese dialect. Research has shown that learners of Japanese use pitch accent cues for determining geminates

and long vowels in the language, and despite all three of these dialects having very different pitch accent patterns, the participants did not perform either better or worse on either long vowels or geminates in the Okinawa or Kansai dialects when compared to Standard Japanese. The pitch accent cue, which has been found to be a perceptual cue used by learners in multiple studies (Amano & Hirata, 2015; Hui & Arai, 2020; Ofuka, 2003) may not be the only cue that learners are using during perception of these non-native contrasts.

Limitations

This study had many limitations, many of which were attributed to coding errors. Results in Standard Japanese could not be obtained for the first couple of participants included in the experiment due to a coding error. Additionally, proficiency results intended to be included in the calculations had to be excluded from analysis due to an error in the collection of the proficiency data, which led to only 6 of 21 participants having their proficiency results recorded and being unable to be included in the analysis. Finally, a big limitation was the number of participants included in the study. Since there were only 16 learners and 5 native speakers included in the data, the results should be viewed with caution. As there was a limited number of participants, this led to limitations of the types of models that could be run and there is the possibility that with a larger amount of data that factors, like familiarity, as well as interaction effects would be able to be analyzed to see if they play a role in how learners perceived the three different dialects.

Future Directions

One of the future directions from this research is to look at whether proficiency plays a role in how learners hear long vowels and geminates in various dialects. As the learners in this study had a wide variety in their proficiency levels and in the future, it would be good to look at

whether proficiency plays a role in how accurate they are at identifying the geminates and long vowels in the different dialects.

Another point of interest that arises from this research is to look at the dialects of Japanese spoken in Fukuoka and Tohoku, which are another two dialects of Japanese that are known to be widely different from Standard Japanese. The Tohoku dialect in particular is viewed as different enough from the Standard to require subtitles on TV when a Tohoku speaker is presented. The key difference present in the Tohoku and Fukuoka dialects relate to geminates, where the vowel before the geminate is shorter than in most other Japanese dialects (Mizoguchi et al., 2020). Since this is the opposite of the dialects of focus in this study, it would be interesting to see if geminates do cause issues for learners if the duration cue is changed.

Additionally, since much of the research looking at dialects and accents looks at comprehension on listening tests, it would be useful to explore how learners of Japanese perform on listening tests where the passages are spoken in various Japanese dialects, however, this would potentially expand to morphosyntactic differences between the dialects depending on the formality of the passage and effects other than just the accent of the speaker would need to be taken under consideration. Where languages like English primarily just have vocabulary and phonological differences between dialects, Japanese has large morphosyntactic differences between some dialects.

Conclusion

This study investigated the perception of long vowels and geminates in different dialects of Japanese by learners of the language. Consistent with previous research, the findings found that learners had lower accuracy identifying long vowels in nonwords compared to short vowels. Interestingly, the participants did not show statistically significant differences in how they

performed on both long vowels and geminates across the three dialects. Contrary to previous research showing pitch accent as an important cue for learners to distinguish geminates and long vowels, this research found that three dialects with different pitch accent patterns did not cause participants to perform differently on the three dialects. These findings indicate that other cues may be employed by non-native speakers to distinguish these contrasts.

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Appendix A

Words from the Hiragana Task

Romaji	Hiragana
gakkou	がっこう
kodomo	こども
torii	とりい
kao	かお
kekkon	けっこん
hana	はな
douzo	どうぞ
sora	そら
chotto	ちょっと
kuruma	くるま
tanoshii	たのしい
atsui	あつい
kitte	きって
katsu	かつ
konshuu	こんしゅう
shiro	しろ
nikki	にっき
soto	そと
oneesan	おねえさん
kaze	かぜ

Appendix B

Main Task Tokens

Tokens	Condition
shippato	Consonant, Geminate, Standard Japanese
shipato	Consonant, Singleton, Standard Japanese
chuutasu	Vowel, Long, Standard Japanese
chutasu	Vowel, Short, Standard Japanese
tekkyokoo	Consonant, Geminate, Standard Japanese
tekyoko	Consonant, Singleton, Standard Japanese
massa	Consonant, Geminate, Standard Japanese
masa	Consonant, Singleton, Standard Japanese
giipa	Vowel, Long, Standard Japanese
gipa	Vowel, Short, Standard Japanese
tekkyokoo	Vowel, Long, Standard Japanese
tekyoko	Vowel, Short, Standard Japanese
shippato	Consonant, Geminate, Kansai Dialect
shipato	Consonant, Singleton, Kansai Dialect
chuutasu	Vowel, Long, Kansai Dialect
chutasu	Vowel, Short, Kansai Dialect
tekkyokoo	Consonant, Geminate, Kansai Dialect
tekyoko	Consonant, Singleton, Kansai Dialect
massa	Consonant, Geminate, Kansai Dialect
masa	Consonant, Singleton, Kansai Dialect
giipa	Vowel, Long, Kansai Dialect
gipa	Vowel, Short, Kansai Dialect
tekkyokoo	Vowel, Long, Kansai Dialect
tekyoko	Vowel, Short, Kansai Dialect
shippato	Consonant, Geminate, Okinawa Dialect
shipato	Consonant, Singleton, Okinawa Dialect
chuutasu	Vowel, Long, Okinawa Dialect
chutasu	Vowel, Short, Okinawa Dialect
tekkyokoo	Consonant, Geminate, Okinawa Dialect
tekyoko	Consonant, Singleton, Okinawa Dialect
massa	Consonant, Geminate, Okinawa Dialect
masa	Consonant, Singleton, Okinawa Dialect
giipa	Vowel, Long, Okinawa Dialect
gipa	Vowel, Short, Okinawa Dialect
tekkyokoo	Vowel, Long, Okinawa Dialect
tekyoko	Vowel, Short, Okinawa Dialect