JAPANESE PITCH ACCENT ACQUISITION BY LEARNERS OF JAPANESE: EFFECTS OF TRAINING ON JAPANESE ACCENT INSTRUCTION, PERCEPTION, AND PRODUCTION

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ABSTRACT

This dissertation investigated 1) American L2 learners' perceptual ability to accurately identify Japanese pitch accent, and 2) learners' realization of Japanese pitch accent. This study was conducted to determine whether these abilities could be improved through training.

Study 1 tested the ability to identify the accent location (pitch fall) in a word across all proficiency levels of L2 learners. This investigated whether learners improved as they progressed through their Japanese language study. Study 1 also analyzed the results of learners who were not adept at identifying the accent.

Study 2 conducted Japanese pitch accent training. Six 30-minute training sessions were conducted over the course of one month. Training was designed based on a pedagogical framework that aimed to raise L2 learners' awareness of Japanese pitch accent, and improve their self-monitoring skills. During training, effective approaches and techniques were also utilized to foster L2 learners' perceptual and production ability for Japanese pitch accent. Pretest and posttest results from both the experimental group (trainee group) and control group (non-trainee group) were analyzed. Results showed that the training had a significant effect on both perception and production. Trainees significantly improved their perceptual ability for Japanese pitch accent, whereas no statistical improvement was shown in the control group. Trainees improved their ability for almost all accentual pattern conditions (1^{st} accent, 2^{nd} accent, 3^{rd} accent words). This improvement was not limited to the words that they practiced during training, but also extended to new words. Trainees also improved significantly in their production, but this improvement was also found in the control group. However, the improvements of the experimental group for 1^{st} accent and 2^{nd} accent words, and the production (without accent information condition) were significantly greater than those of the control group. These results

suggest that learners perceptual and production ability of Japanese pitch accent improved through the three hours of training that this study implemented. After training, students were able to understand the accent feedback provided to them. The positive results obtained in this study suggest that the normal language curriculum could benefit by adopting similar training methods for Japanese pitch accent perception and production.

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CHAPTER ONE

1. INTRODUCTION

In a time of globalization, when technology has helped make the world smaller, people have an unprecedented number of opportunities to communicate using foreign languages. One can travel by air to other countries with no difficulty. Even if one cannot afford travel to a foreign country, technological advances like voice-over internet protocol software (e.g., *Skype*) still offer ample opportunities to speak with people in other countries in their own languages.

With the increase of needs for using foreign languages at work and in private life, the chance of encountering difficulty in understanding others has also increased. Misunderstanding can be due to various reasons such as poor grammatical accuracy, cross-cultural misunderstanding, and less than accurate pronunciation resulting in a foreign accent. For example, accented speech has resulted in low native speakers' regard for the foreign speaker and even in missed job opportunities (Sato, 1991). Shibata & Hurtig (2007) stated that a foreign accent could be caused by various kinds of pronunciation errors. For example, segmental errors, such as inaccurate production of a consonant or a vowel, are one kind. However, it has been claimed that segmental errors are easier to notice and make up for than are *non-segmental prosodic errors,* which have been identified as having a crucial influence in the perception of foreign accents. Therefore, proper realization of non-segmental prosodic features (*suprasegmental features*) such as rhythm, pauses, accents, amplitude, and intonation are important keys to successful communication. It follows, then, that teaching prosody of speech should be valued in foreign language education.

Linguistic findings of Japanese prosody studies began to be used in Japanese prosody training studies in the 1990s. Several practical reports of these training studies state that learners'

intonation could be improved, but that ill-formed accentual patterns could hardly be improved in production (Matsuzaki, 1999; Nakagawa, 2001a). Toda (2006) claimed that sentence intonation is affected by *accentual patterns* at the word level, so it is necessary to acquire the concept of accent at the word level. In other words, ill-formed accentual patterns can pose unsuccessful realization of proper intonation. To attain this, one must know where an accent is located in a word. In addition to practicing for these prosodic features in an integrated manner, focused practice for accentual pattern at a lexical level is also necessary.

Accentual pattern is a pitch pattern of Japanese words. Japanese is a pitch accent language; its rhythmic unit, *mora,* is realized with a high- or low-pitch. For example, the word *i-nu,* meaning 'dog,' is pronounced with a low-pitch for the first mora, and with a high-pitch for the second mora. Conversely, the word *ne-ko,* meaning 'cat' is pronounced with a high- and a low-pitch for the first and the second mora, respectively. *Accent* is often explained as *arbitrary,* so accentual patterns for words are not predictable for non-native speakers just by looking at words. Because of this characteristic of accent, learners of Japanese and language instructors are unaware of how to teach Japanese accent. Instructors try to provide learners with feedback on their ill-formed accentual patterns, but mispronunciation is fixed only temporarily, not permanently. Therefore, neither instructors nor learners are able to solve this problem. Shibata & Hurtig (2007) also stated that it is a generally held belief that even very advanced second language learners who control grammar and vocabulary well have moments when native speakers do not understand them because of their accented speech. To some extent, these cases are caused by the learner's production of ill-formed accentual patterns. Since advanced learners deal with more vocabulary than novice learners do, the chance of miscommunication increases. Toda (2004) emphasized the importance of practicing the accentual patterns of words because

words with ill-formed accentual patterns were harder for listeners to recognize. For example, one must correctly pronounce *tamanegi* 'onion' with LHHL[1]. However, if this word was mispronounced with a no-accented pattern (LHHH) which is an existent Japanese accentual pattern or ill-formed (HLHL), it would be clear that the no-accented accentual pattern sounds more like Japanese than HLHL form, which does not exist in Japanese. From this, knowing accentual patterns in Japanese is important.

However, since accent is arbitrary, it is impossible to teach and have learners memorize every word with its location of accent. Therefore, the first step in teaching Japanese pitch accent is to raise learners' awareness of Japanese pitch accent. It is important that learners know what the Japanese pitch accent is and why learning it is important. Then, training is necessary to improve learners' perception and production for Japanese pitch accent.

1.1 Research Purpose

This dissertation pursues several objectives. The main goal is to develop learners' perceptual and production ability so that they can continue to learn about Japanese pitch accent (and other Japanese prosodic features) by themselves without an instructors' assistance in the future. To achieve this goal, training in *Study 2* had two main pedagogical objectives. One was to raise awareness and prompt better understanding to elicit better outputs. The second objective was to strengthen learners' self-monitoring skill. To accomplish these goals, *Study 1* tried to reveal evidence of Japanese pitch accent perception by the learners of Japanese participating in this study. The content of training in Study 2 was designed after considering findings from Study 1. To achieve the pedagogical goal, an effective pedagogical framework, teaching methods, and techniques were implemented during the training. This study investigated whether

[1] When a word is described with a pitch using *L* (low-pitch) and *H* (high-pitch), it is notated in accordance with the moraic unit.

or not learners could improve perception and production of Japanese pitch accent through training specifically designed for this dissertation.

This study also sought to find solutions for Japanese language instructors who struggle with teaching Japanese pitch accent. To accomplish this, this study will describe the training in detail. Training must be effective to improve learners' ability in perception and production. The procedure must be teachable to language instructors.

1.2 Organization of the Dissertation

The next chapter presents previous research that forms the basis of this study, including theoretical and phonetic frameworks of Japanese pitch accent, Japanese pitch accent training studies, and studies of *Processing Instruction,* which this study used as its pedagogical framework. Chapter 2 includes the literature review and research questions. Chapter 3 details the methodology and statistical analyses of the data collected in *Study 1,* which sought evidence of Japanese pitch accent perception by learners. The methodology section includes a description of participants, stimuli, and test procedures. There are two experiments in Study 1. One is called "identification test," which examined learners' perceptual ability to identify the accent location in words, and the second is called "discrimination test," which examined whether learners are able to differentiate accentual patterns in minimal-pairs. In Chapter 4, the nature of training is described first. Next, Chapter 4 presents the methodology and statistical analyses of the data collected in *Study 2,* which aimed to demonstrate the effects of Japanese pitch accent training in learners' perception and production abilities. The methodology section includes a description of participants, stimuli, and procedures of tests and training. Study 2 had a "perception task" and a "production task." As to the production task, native speakers of Japanese participated for *goodness rating judgment* where they rated the goodness of learners'

production. Chapter 5 combines results from Studies 1 and 2 and discusses conclusions. The chapter also suggests pedagogical and research implications and additional studies needed for the future.

CHAPTER TWO: LITERATURE REVIEW

2.1 Japanese Pitch Accent

In this section, the theoretical framework of Japanese pitch accent is presented. Next, previous studies that address acoustic and perceptual studies about Japanese pitch accent are reviewed to establish primary acoustic and perceptual cues to Japanese pitch accent.

As it was introduced in Chapter 1, an *Accentual pattern* is a pitch pattern of Japanese words. Japanese is a pitch accent language; its rhythmic unit, the *mora*,[2] is realized with a high- or low-pitch. For example, the word *i-nu*, meaning 'dog,' carries a LH[3] (low-high) accentual pattern, and the word *ne-ko*, meaning 'cat' carries a HL (high-low) accentual pattern. Because *accent* is often explained as *arbitrary*, accentual patterns for words are not predictable for non-native speakers simply by looking at words. However, the accentual pattern of the entire word is predictable once the location of the accent is given. *Accent* or *accent nucleus* represents the location in a word where the pitch falls from high to low (also referred to as *lexical accent*). For instance, a four-mora word "HLLL" has its accent on the first mora. Thus, the first mora is pronounced with a high-pitch, and the rest of morae of the word are pronounced with low-pitch. Haraguchi (1977) established the *Initial Lowering Rule* in Tokyo Japanese, which states that the first mora of a word always begins with a low-pitch unless the word has its accent location on the first mora. Another generalization of the Tokyo Japanese accent is that the accented mora and the morae preceding it both receive a high-pitch; morae following the accented mora are realized with a low-pitch (Tsujimura, 2007). Therefore, if the accent location in a word is provided, the accentual pattern of the entire word is predictable. For instance, if *n* is the number of mora in a word, an *n* +1 accentual pattern exists in Tokyo Japanese. Therefore, four-mora words are

[2] Mora is rhythmic unit of Japanese, similar to the syllable of English. In a broad sense, mora is realized as 1) (C)V, 2) the first part of a long consonant (a geminate), and 3) syllable-final, or moraic, nasal /n/ (Tsujimura, 2007).
[3] When a word is described with a pitch using *L* and *H* it is notated in accordance with the moraic unit.

categorized into five (4+1) accentual patterns. An example of each of these patterns is provided below:

1) LHHH (H):	*no- accent*	e.g., *gakusee (ga)*	'student'
2) HLLL:	*initial accent*	e.g., *ka'makiri*	'mantis'
3) LHLL:	*medial accent*	e.g., *hima'wari*	'sunflower'
4) LHHL:	*medial accent*	e.g., *tamane'gi*	'onion'
5) LHHH (L):	*final accent*	e.g., *imooto'(ga)*	'sister'

Note that no-accent words and final accent words are identical in accentual pattern, but the last mora receives a high-pitch for no-accent words (LHHH[H]), and a low-pitch for final accent words (LHHH[L]).

Japanese pitch accent has two primary functions; 1) syntactic functions and 2) distinctive functions. Syntactic functions show a word or a phrase boundary in a sentence. These indicate the organization of a sentence (Kubozono, 1995). For example, Toda (2004) introduced the sentence "*kyookai- ni itta*" in her Japanese pronunciation textbook by showing that this could be interpreted in one of three different ways: 1) (I) went to church, 2) (I) went to the meeting today, and 3) (I) went to shop today. 2) and 3), *kyo-o* 'today' pitch falls within a word, and goes up for *ka-i-ni* (HLL); and (LHH) means 'to the meeting' and 'to shop,' respectively. Since there is a rule stating that pitch never goes up within a word once it falls, one knows that there is more than one word in *kyookai* for 2) and 3). The distinctive function discriminates the accentual minimal-pairs such as *ame* 'candy' realized with LH and *a'me* 'rain' realized with HL.

Kindaichi (1967) explained his opinion about how these accentual patterns should be produced in order to be perceived correctly as Tokyo Japanese accent. For example, *o-ka-si*

could be interpreted as 'Mr. Oka' (HLL), 'snack' (LHL), or 'lending' (LHH). He explained that these words should be pronounced using the following rules:

a) HLL: The first mora should be higher than the second mora. The pitch of the third mora can be produced freely.
b) LHL: The second mora has to be higher than the third mora. In addition, the second mora cannot be lower than the first mora. It is not necessary for the second mora to be higher than the first mora.
c) LHH: It is essential that the third mora is not lower than the second mora, and the second mora is not lower than the first mora. Other than that, it is not a problem even if the third mora is higher than the second mora, or the second mora has same pitch as the first mora.

Kindaichi's explanation emphasizes the accent (pitch fall), but not necessarily about the pitch rise from low- to high-pitch. According to Kindaichi, it is not necessary to make an L-H distinction clearly in order to be perceived correctly as long as H is not lower than L. Kindaichi's advocacy seems to be rational since several previous acoustic studies investigating Japanese pitch accent reported findings supporting his idea. These acoustic studies analyzed the phonetic data more objectively by measuring the *fundamental frequency* (*F*0)[4]. Sugito (1972) showed that the acoustic cue to differentiate accentual patterns is the abrupt pitch fall in words. Other studies in support of Sugito's idea, such as those by Minagawa, Maekawa, and Kiritani (2002), argue that LHH words whose word initial mora is composed of a long vowel, such as *zooni* 'rice cakes boiled in vegetable soup,' have a relatively small pitch rise (measured by *F*0) compared to LHH words, such as *kiguu* 'coincidence' whose initial mora is not composed of a long vowel. Sugito (1997) stated that the pitch of the first mora of a sentence could be

[4] Fundamental frequency (*F*0) is the pitch, and is a technical term for an acoustic property of a sound. Namely, the number of complete repetitions (rate of vocal fold vibration) of variations in air pressure occurring in a second. This unit of frequency measurement is the hertz, usually abbreviated Hz.

influenced by the previous sentence by changing its *F*0 value. Kawakami (1956) found that *accent initial rise F*0 rises at the beginning of the phrase boundary. This may cause *F*0 of the first mora to be varied in its value. These observations allow us to conclude that the L-H distinction is not realized clearly. Based on the results of a L2 learners' perceptual study, Minagawa, Maekawa, and Kiritani (2002) suggested teaching pitch by specifying the pitch fall for accent location in words rather than teaching pitch with fully specified representation (e.g., LHL). Toda (2004) also explains that the fact that the first two morae of words receive a different pitch (initial lowering rule: e.g., LH) is a phonological principle. The emphasis of pitch differences on the first two morae in a word results in unnatural or non-native-like production. Those findings revealed that the primary cues for recognizing accent patterns are not present in the pitch rise as much as they are in the pitch fall, as Kindaichi (1967) emphasized.

Previous studies found that an abrupt pitch fall was the primary cue for perception of accent. In an attempt to investigate how this abrupt pitch fall is realized in speech production, some acoustic phenomena which may influence the realization of accent pitch fall will be reviewed next. It appears that a speech production is realized with an association with a variety of other suprasegmental features. *Sentence intonation*, *declination*, *downstep*, *dephrasing*, and *delayed accent* are some of the examples. *Declination* is a physiological, unintentionally created phenomenon where the pitch declines gradually as a sentence is spoken. When a sentence consists of lexically unaccented words, a gradual pitch fall is observed in spanning the whole time portion after its initial rise (Maekawa, 1994). This is not a special phenomenon unique to the Japanese language, but it is observed in most other languages. This phenomenon does not have a linguistic meaning and is not ordinarily perceived (Enomoto, 2000). *Downstep* is also referred to as *catathesis* (Poser, 1984; Pierrehumbert & Beckman, 1988; Maekawa, 1994;

Enomoto, 2000). *Catathesis* is a phenomenon where the pitch declines for each word in a step-wise manner when a sentence consists of lexically accented words. Phonological analyses of Japanese intonation hold that *dephrasing* is that two or more accentual phrases can be dephrased and merged into one, thereby deleting all lexical accents except for the first element of the compound (McCawley, 1968; Poser, 1984; Maekawa, 1994; Kubozono, 1995). *Delayed accent* is an acoustic realization that the pitch peak (*F*0) appears slightly in delay (Sugito, 2004). Sugito states that a delayed accent is typically observed in a situation where the word's lexically accented mora is devoiced and the following mora is an open vowel. In her study, these lexically devoiced accented morae were produced in a relatively lower pitch, and the following open vowels were produced with a relatively higher intensity. Sugito posits this as the reasoning of delayed accent. The concept of delayed accent is observed in manuals of intonation labeling systems known as J_ToBI and X-JToBI. In these intonational labeling systems, a lexical accent is indicated as "A." Maekawa et al. (2002) states that "A" is given at the *F*0 peak point due to the lexical accent, where *F*0 starts to descend. Thus, it is frequently observed that "A" is located slightly after a mora that holds a lexical accent when a delayed accent occurs. Thus, a speech production carries various acoustic phenomena. Sugito (1997) commented that "intention of utterance," meaning the intention with which one makes a speech production (発話の「意図」), and "realization of utterance," meaning the acoustic realization of that production (音響的「現実」), are different. If they are different, it is necessary to investigate what kinds of feature need to be taught to learners in order for them to properly perceive and realize Japanese pitch accent. The next section reviews how L2 learners perceive a "pitch fall" from these complex pieces of information that appeared in a speech production.

2.2 Japanese Pitch Accent and L2 learners of Japanese

2.2.1 L2 learners' Perception of Japanese Pitch Accent

Several studies investigated the perceptual ability of second language learners of Japanese (L2 learners of Japanese). Specifically, these studies tried to determine whether learners were able to identify the location of the accent in words (Ayusawa, Nishinuma, Lee, Arai, Odaka and Hoki, 1995; Nishinuma, Arai, and Ayusawa, 1996; Ayusawa and Odaka, 1998; Toda, 2001). Each study conducted an "accent listening test," but each test had different conditions and types of participants. For example, Ayusawa et al. (1995) reported the results from 10 different language groups. Nishinuma et al. (1996) analyzed the results obtained from 54 American students (three different skill level groups: 18 subjects each). Ayusawa et al. (1998) targeted participants whose L1 varied across 21 languages (approximately 30 participants in each language group). In this study, the participants in each language group were divided into two groups (top group and bottom group) to investigate how the perceptual ability in these two groups differed from each other. Toda (2001) had 9 participants and their L1 varies.

Ayusawa et al. (1995) and Nishinuma et al. (1996) tested accent identification in three, four, and five mora words. Their tests had three conditions: 1) words in isolation, 2) words extracted from sentences pronounced with interrogative and non-interrogative intonation patterns, and 3) words presented within a carrier sentence. Toda (2001) used only four-mora stimuli that were composed of *light syllables*, and four-mora stimuli that included a *heavy syllable*. A light syllable is the syllable that is composed of regular morae such as (C)V; a heavy syllable indicates that the syllable is composed of a combination of regular and special morae, such as a geminate or a long vowel. Her study investigated how learners perceived the pitch fall in words that contain a special mora. Toda (2001) also conducted pronunciation training between the pretest

and the posttest of accent listening test. In Toda's study (2001), exercises for 1) minimal-pairs, 2) accentual patterns of one- four morae words, 3) nouns at a sentence level, 4) compound nouns, and 5) adjectives and verbs were employed during training.

Nishinuma et al. (1996) found that condition 1), words in isolation, was the easiest, since participants scored the highest (63%). This was followed by condition 3), words presented within a carrier sentence (59%), and 2), words extracted from sentences pronounced with interrogative and non-interrogative intonation patterns, (53%). Toda (2001) reported that learners had more difficulty identifying the accent location in words that included a heavy syllable than in words that did not. Her study suggested that learners' perceptual ability to identify the accent location in words including heavy syllables improved after training.

A similar trend was found across all tests for the accentual patterns. The results of most of the studies above suggest that first language transfer (L1 transfer) was salient for beginners and tends to fade out as learners study Japanese for longer periods.

Nishinuma et al. (1996) stated that the identification accuracy was higher for type 0, type 2, and type 1, and lower for type 3 and type 4.[5] Not all accentual patterns were perceived equally well. Ayusawa et al. (1998) concluded that type 0 was the easiest and type 1 was the most difficult pattern with which to identify the accent location accurately. Toda's (2001) result agreed with Nishinuma et al. (1996) and Ayusawa et al. (1995, 1998) in that the identification accuracy for type 0 was the highest. However, in Toda's (2001) study, the type 1 accuracy rate was also high. This is probably due to the fact that Toda gave learners a pretest at the eighth week of her pronunciation courses. It is likely that students were already used to the pitch fall sound in type 1 stimuli. She posited that the type 1 accentual pattern may be the easiest pattern

[5] Number indicates the accent location of words. Type 0 is no accent words, type 1 is 1st accent word, type 2 is 2nd accent word and so forth.

to acquire. This was also pointed out by Ayusawa et al. (1998) because participants who were categorized in the top group scored relatively higher for type 1 stimuli compared to those that were in the bottom group. Previous studies found the same results that type 0 was a relatively easier accentual pattern for learners to identify, but other results varied. Nishinuma et al. (1996) indicated that the perception tendency observed in their study was specific to American learners comparing the results with other L2 learners whose native languages are not English. Nishinuma et al. (1996) explained that the reason for this perception tendency was that English is a stress language; that is, perception constraints are imposed by their native language. In terms of acquisition of Japanese accentual patterns by American L2 learners, there is room for future research into their perceptual ability.

2.2.2 Japanese Pitch Accent and Heavy Syllable in L2 learners' Perception

Acquisition of special morae (geminates, long vowels, moraic nasal) was examined from many perspectives, such as accent patterns, duration, and VOT values. These studies found that special morae are difficult for L2 learners to acquire (Toda, 2003; Maekawa and Sukegawa, 1995). Ishizawa (2011) found that the existence of a heavy syllable was significantly more difficult to perceive for L2 learners than its absence. Geminates were also more difficult to identify than were long vowels. Minagawa and Kiritani (1996) reported that native Chinese, Korean, English, and Thai speakers had a tendency to not recognize a geminate in LH pattern, even though there was a geminate. Exploring how pitch accent and heavy syllables are involved in L2 learners' perception is a subject for investigation. The following studies investigated the effect of pitch accent and how it is engaged in learners' categorical perception of special morae.

Nagano-Madsen (1992) investigated whether the pitch movement influences native speakers of Japanese's perception of vowel duration on the words *beru* [beɾɯ] and *beeru* [beeɾɯ]

with the use of synthesized speech. Japanese participants for this study were Tokyo dialect speakers, Osaka dialect speakers, and non-accent dialect speakers. Results indicated that when there was no pitch movement, Tokyo and Osaka speakers perceived the stimulus as *beru* [beɾɯ] even though the vowel duration was long. By contrast, the cues distinguishing the two stimuli were solely based on the duration for the non-accent dialect speakers. With the results of the study conducted by Nagano-Madsen (1992), Toda (2003) also stated that the ways pitch movement influences one's perception is not universal. These results lead to the following questions: 1) do L2 learners use pitch as a cue to identify Japanese special morae, and if they do, 2) how do they use it? and 3) how does increased exposure to the language change the way learners use this ability? In the following section, similar studies targeted English speakers to see how they use Japanese pitch accent.

Omuro et al. (1996) stated that accent did not influence the perception of long and short vowels for American L2 learners. L2 learners used the duration of vowels as a cue. However, Ishizawa (2011) found that the position of accent nucleus influenced the learners' perception of long and short vowels. Oguma (2000) stated that the perceptual ability to differentiate between long and short vowels improved significantly as one went from intermediate to an advanced level of Japanese proficiency. Oguma (2000) also found that pitch change in long vowels influenced advanced learners' perception of long vowels. The order of difficulty of identification for long vowels was when it is located in the word final > word medial > word initial position (A>B: A is more difficult than B). This result supported the results of other studies (Ishizawa, 2011; Minagawa, Maekawa, and Kiritani, 2002). Minagawa et al. (2002) posited that the difficulty in identifying vowel types was due to the final lengthening at word final position. Ishizawa's (2011) study found that if the heavy syllable was accented and located in the word's initial

position, L2 learners identified its existence significantly more easily than if it was unaccented or in the word's medial position. Oguma (2000) stated that the acquisition of the ability to perceive a long vowel was in a reverse order of difficulty. Learners improved their perception of the long vowel when it was at a word's initial first, followed by word's medial, and word's final position. Based on the results of these studies, the effect of syllable position in identifying long or short vowels is clear. Regarding an effect of pitch accent in identifying long vowel, learners have difficulty in the order of LL> HL> HH> LH. The acquisition order was found to be in the reverse order LH → HH → HL → LL. This corresponds with the result of Minagawa et al. (2002). They found that regardless of actual vowel type, American L2 learners tended to perceive sound as a long vowel when they heard high-pitch because of the higher intensity. Similarly, they perceived sounds as a short vowel when they heard a low-pitch because of its lower intensity. Therefore, L2 learners use pitch as a cue to identify vowel types. However, Minagawa et al. (2002) stated that this is not how native speakers of Japanese use pitch as a cue. When native speakers of Japanese heard accentual patterns of LH or HL, they perceived the pitch change (LH or HL) to determine that there are two morae. Regarding the effect of pitch accent, L1 transfer influenced learners' perception of heavy syllables because, in English, an accented syllable receives a higher pitch and is lengthened, as Ishizawa (2011) concluded. These studies explained why the accent perception of heavy syllables was relatively difficult, but they also suggest it is possible for learners to improve their perception.

2.2.3 L2 learners' Production of Japanese Pitch Accent

There are training studies that aimed to improve L2 learners' prosody of Japanese. As a result, some stated that learners' intonation improved relatively easily, but a realization of correct

accentual patterns was more difficult (Matsuzaki, 1995; Nakagawa, 2001b). This section will review studies that analyzed the realization of accentual patterns.

Sukegawa (1999) reported a case study of pitch realization of 2 or 3 mora words by advanced Brazilian L2 learners of Japanese. Results were as follows: Advanced L2 learners 1) applied different pitch assignment rules to nouns and verbs respectively, 2) tended to give a high-pitch to the heavy syllables in CVCVN[6] (e.g., *shizen*, *ehon*) and CVNCV structures (e.g., *kanji*, *henji*), and 3) had a tendency to give a high-pitch to the first two morae in CVN and CVRCV[7] (e.g., *kyooju*, *toori*) structures. As in perception, words that contain a heavy syllable appear to be difficult for learners to pronounce.

There are training studies aimed at improving learners' intonation in speech. Matsuzaki (1995) invented a *prosody graph* as a means to teach Japanese prosodic features, such as accent and intonation. A prosody graph is a visual, simplified pitch contour (*F*0 contour).
In Matsuzaki's (1995) study, which was designed to examine the effects of a prosody graph, all participants (Korean L2 learners) were asked to read aloud dialogues after the three different practice conditions: 1) no accent information, 2) with a prosody graph, and 3) with an accent symbol "¬". The utterances produced with the prosody graph had better results than the utterances produced in condition 1 and 3.

Nakagawa (2001b) also attempted to instruct prosody to six intermediate and advanced L2 learners. L2 learners were told to pay particular attention to accent and intonation and to practice pronunciation during training. Learners were instructed that the intonation of Japanese phrases appears like a "へ" *he*-shape, a string of pitch of high and low will look like へ (*he*). Nakagawa stated that L2 learners' intonation was improved after training with the increase of

[6] "C" and "V" indicate "consonant" and "vowel" respectively. "N" refers to moraic nasal /n/.
[7] "R" indicates second components of long vowel.

proper word accentual patterns. This indicated that the correct realization of accentual patterns at the word level contributes to the better realization of intonation at the sentence level.

Matsuzaki (1995) stated that learners' ill-formed accentual patterns remained after intonation showed improvement. The study suggested that the correct realization of accentual patterns was more difficult than improving intonation. Nakagawa also calculated the number of words that were realized with ill-formed accentual patterns before and after training. The average scores of pretest and posttest showed that L2 learners improved on realization of word accentual patterns. However, it is not certain that those scores indicated a significant improvement.

Sukegawa (1999) posited his advanced learners' tendencies were not affected by their L1. Since their productions were also different from target language norm, Sukegawa stated that the learners most likely used interlanguage realizations of Japanese word accentual patterns. Also, Nakagawa (2001b) suggested that L2 learners could improve their realization of accentual patterns of Japanese words with some instructions. Matsuzaki's (1995) suggestion posed the question of what kind of instruction can improve L2 learners' production of correct accentual patterns.

2.3 Pedagogical Framework

In order to instruct learners on the correct production of Japanese pitch accent, some approaches and techniques that previous studies have shown to be effective are reviewed in this section.

2.3.1 Processing Instruction

Processing Instruction is the pedagogical application of VanPatten's (1996) Input Processing (IP) model to teach foreign language grammar in a classroom setting. Within this

model, VanPatten (1996) proposes the concept of *intake*, which refers to the linguistic data in the input that learners attend to and hold in working memory. Where traditional instruction tries to manipulate a learner's output by operating mechanical drills, Processing Instruction tries to manipulate input to help learners obtain *intake* from the input.

VanPatten and Cadierno (1993) examined the effectiveness of Processing Instruction. There were three groups of learners in this study: a processing instruction group (n=27), a traditional instruction group (n=26), and a control group (n=27). The task was word order and object nouns in Spanish. Learners in the processing instruction group were assigned activities with right or wrong answers such as "Choose the picture that best goes with what you hear." This was followed by activities where learners expressed their opinions and comments. Learners in the traditional group received a treatment that was reading an explanation of object pronouns and the completed paradigm of the forms. This procedure was followed by drills. Learners in the control group had no instruction about the target task. Results showed that traditional instruction is effective only for output, while Processing Instruction is effective for both intake and output. Cadierno (1995) replicated this study, targeting Spanish past tense. This study reported the same results: the processing instruction group improved significantly for interpretation (intake) test.

González-Bueno (2005) adapted this Processing Instruction (PI) approach to the area of teaching pronunciation. The hypothesis was that if learners were exposed to strategically controlled drills that required them to pay attention to aural input in order to attach meaning to it, then learners would process and intake the phonological system and become capable of producing phonologically accurate pronunciation. A participant in González-Bueno's case study was a female English-Spanish bilingual child between four and five years of age. The objective

of the study was to have the participant perceive (discriminate and identify) and then produce the Spanish tap [ɾ] and trill [r] using Spanish minimal-pairs such as *pera* and *perra*, *coro* and *corro*.

The design for this study as a treatment required perception and production of the target sounds. Results showed that the process of acquisition of Spanish [ɾ] and [r] in this particular learner was accelerated, and in fact completed by the treatment. In another study, González-Bueno & Quintana-Lara (in press) applied Processing Instruction to the teaching on pronunciation in a classroom setting, with participants who were learners of L2 Spanish. Although the results were not as significant as in the case of the bilingual child, the results of this study suggested that process of acquisition of L2 phonology can be positively affected by the implementation of Processing Instruction as a teaching technique. The authors suggested that more studies are needed to confirm that the PI approach is practical for adult learners' acquisition of L2 pronunciation.

2.3.2 Techniques for teaching Japanese Pitch Accent

2.3.2.1 Techniques for perception and production

Several techniques have been introduced to instruct Japanese pitch accent. Mizutani (1989) showed that learners' sense of pitch (high or low) needs to be developed first. To do so, Mizutani suggested that it may be useful to use tools such as china bowls or musical instruments to describe pitch. Providing visual aids of accentual patterns was also helpful for learners to visualize the pitch movement. A simplified pitch counter-like prosody graph (Matsuzaki, 2002) and hand movements are also useful (Japan Foundation, 2009). Using musical notes is another way to visually provide pitch (Mizutani, 1989; Ogawa, 1982; Japan Foundation, 2009).

2.3.2.2 Using minimal pairs.

Teaching Japanese accentual minimal-pairs is one crucial element to achieve the learners' goal of being able to conduct a successful conversation. Successful conversation indicates that the conversation is not disrupted by the learners' incorrect accent patterns. However, it is not required for learners to learn all of the accentual minimal-pairs in order to distinguish those accentual minimal-pairs by pitch, and to remember what those words mean. There are several reasons for this: 1. there are only 14% homonyms in Tokyo accent distinguished by minimal-pairs; *doo-ongo* 'homonyms' (Shibata & Shibata, 1990), 2. it is usually possible to understand the meaning of a word from its context, and 3. if one of the minimal-pairs are less frequently used words, there is less chance to be misunderstood. This section reviews previous studies using accentual minimal-pairs to teach pronunciation.

As González-Bueno (2005) utilized minimal-pairs in her study, it is typical for Japanese teachers to use them for teaching Japanese as well (e.g., *ame* 'candy' and *a'me* 'rain'). Distinguish the meaning of two words in minimal-pair is a meaningful exercise, and therefore fits the PI technique as well. The following is an example of a conversation which could occur in real life.

A: *Nani ni suru ?* 'what will you get?'

B: *Sake ni suru*. 'I will get *sake*' (*sake* with LH: alcohol, HL: salmon).

Unlike this example, not many homonyms would work well in an authentic context. It is more difficult to prepare a similar exercise for the word, such as *ame* 'candy,' with LH, and 'rain,' with HL. *Ame ga huru,* meaning 'it rains,' takes a verb *huru,* meaning 'fall.' However, this verb does not work with 'candy.' One can use the verb 'like' saying 'I like candy' or 'I like rain' for the sake of minimal-pair practice. However, it is an unrealistic context where you

compare the likeness of rain and candy (unless a creative teacher designs an exercise making this possible). Toki (1989) also pointed out that those kinds of minimal-pair exercises do not motivate learners to practice because the exercises are unrealistic. Toki (1989) and Matsuzaki (2000) pointed out that the Japanese minimal-pair exercises include words that are not frequently used in real life. This may be attributed to the fact that there are not many minimal-pairs in Japanese that are composed of the same phonemes and have different pitch patterns. For example, Kubozono (1999) argues that distinctive function is a secondary function of Japanese accent, because Shibata et al. (1990) found that accent patterns distinguish homonyms only in 14% of the cases. There are more homonyms that share identical accent patterns than homonyms which accent distinguish the meanings of the two words. For example, there are nine different ways to pronounce the word *kooki,* which are represented with Chinese characters; 後期 'second half,' 後記 'postscript,' 好機 'chance,' 好奇 'curiosity,' 工期 'term of works,' 公器 'public organ,' 高貴 'nobleness,' 校旗 'school flag,' 綱紀 'discipline.' All of those words are pronounced with the first accent pattern (HLL). Shibata et al. (1990) noted another example, *kooshoo,* which has 22 homonyms; all 22 homonyms are pronounced with no-accent pattern (LHHH). In these cases, it is necessary to presume the meaning from the context in spoken Japanese. Thus, considering the fact that the accentual patterns have a distinctive function in only 14% of homonyms, teaching accentual minimal-pairs cannot be a primary emphasis when teaching word accent patterns. As it has been mentioned, these homonyms do not have to be judged by the accentual pattern as long as listeners and speakers can understand the meaning of the word from the context. In addition, it is possible that learners do not know one of the accentual minimal-pairs. Alternatively, if one of the minimal-pairs is less frequently used, then

it will not be misunderstood. In these cases, it is assumed that accent pattern does not have a distinctive function for learners to recognize the words.

However, there are also several reasons why the accentual minimal-pairs should be taught, because there is a chance to cause misunderstanding or confusion in some contexts. Previously, it was mentioned that 'minimal-pairs' in Shibata et al. (1990) indicates the *doo-ongo* 'homonyms,' and their definition was not "same-sounding words" but the *doo-tetsuigigo* 'homographs.' This definition is the same as the one stated in the Japanese dictionary named *reikai sin kokugo jiten* (Hayasi et al., 1984), whose accentual patterns of homographs Shibata et al. (1990) researched. For instance, words such as 小売 (こうり) *ko-u-ri* 'retail sale' and 公理 (こうり) *ko-u-ri* 'axiom' are treated as homonym/ homographs because their spelling with *hiragana* orthography are the same. However, 小売 'retail sale' is pronounced as [koɯɾi], whereas 公理 'axiom' is pronounced [kooɾi]. On the other hand, ケーキ *keeki* 'cake' and 景気 *keiki* 'economic condition' are not treated as homonyms in this study, even though both words are pronounced the same, [keeki]. Hence, since minimal-pairs in this study were defined as "same spelling words", if allophones of phonemes in words were considered, the accentual pattern would discriminate the minimal-pairs. This dictionary, *reikai sin kokugo jiten* (Hayasi et al., 1984) also provided the accentual pattern types for verb minimal-pairs such as, 着る *ki-ru* (LH) 'to wear' and 切る *ki-ru* (HL) 'to cut.' However, some of the verbs could be minimal-pairs in their conjugated forms. For example, past tense of the verb 買う *ka-u* 'to buy' is 買った *ka-t-ta*; and the past tense of the verb 勝つ *ka-tu* 'to win' is also pronounced 勝った *ka-t-ta*. In addition, 買った 'bought' is pronounced LHH, but 勝った 'won' is pronounced HLL. Therefore, these two Japanese verbs are accentual minimal-pairs in their past tense. In the

dictionary, verbs are stated in plain forms. It is uncertain that Shibata et al. (1990) counted these accentual minimal-pairs of conjugated verbs. Regarding these facts, it could be the case that the accentual pattern distinguishing homonyms is more than the 14% reported by Shibata. When a Japanese verb is used by itself in spoken language such as, *ka-t-ta?* (HLL with pitch rise at the end for question) meaning "did (you) win?," or *ka-t-ta?* (LHH with pitch rise) meaning "did (you) buy?" It is unclear how much these factors increase the chance of the distinctive functions of accent. However, for those reasons, it is essential to teach not only for the accentual noun minimal-pairs, but also for the minimal-pairs in other word classes such as verbs, adjectives and so forth. It is also important to look at those with conjugated forms. Therefore, it is believed that the teaching of the distinctive function of Japanese should be conducted.

Matsuzaki (2000) demonstrated how many minimal-pairs can be introduced for learners who are in the elementary level of Japanese (300 hours of Japanese instruction: vocabulary is 1500 words). To collect minimal-pairs, he used the JLPT[8] vocabulary lists (level 3 as a base) as a database. This study aimed to collect only frequently used words. As a result, Matsuzaki's study found that the distinctive function of Japanese accent occurs in about 19% of the cases, which was slightly more than what Shibata & Shibata (1990) found (14%). Matsuzaki stated that about 150 minimal-pairs could be used for elementary level learners. When teaching minimal-pairs, exercises also needed to be conducted at a sentence level. Matsuzaki pointed out that there are a few pairs that could be embedded in the same authentic context for both words in pairs (all minimal-pairs were provided in Matsuzaki's (2000) appendix.)

Matsuzaki suggested the importance of teaching Japanese accent minimal-pairs from a different perspective. For example, he posited that non-proper realization of minimal-pairs of

[8] Japanese-Language Proficiency Test is a standardized test sponsored by The Japan Foundation and Japan Educational Exchanges and Services.

the same words differentiated by vowel length can be perceived correctly as long as accentual patterns were correct. For example, the words *ojiisan* ‘grandfather’ and *ojisan* ‘uncle’ is a minimal-pair differentiated by vowel length. The word *ojiisan* (LHLLL) and *ojisan* (LHHH) have a difference in their accentual patterns. One has a pitch fall and the other one does not. Therefore, what Matsuzaki implied here was that if one’s production has a pitch fall on the second mora, it may be perceived as ‘grandfather’ regardless of the length of vowel /i/. Contrarily, if one’s production did not have a pitch fall, it might be perceived as ‘uncle’ regardless of the length of vowel /i/. Therefore, Matsuzaki suggested that besides the accentual patterns, other contrast features, such as long versus short vowel, or voiced versus devoiced consonant, should be taken into consideration for making minimal-pair exercises. Considering this point, minimal-pairs do not have to be pairs that consist of the same sequence of phonemes, with only pitch discriminating the words. Toda’s (2004) introduced the following sentences to show the accent functions.

1. 来てください. *kite* (HL) *kudasai*. “please come.”
2. 着てください. *kite* (LH) *kudasai*. “please wear.”
3. 切ってください. *kitte* (HLL) *kudasai*. “please cut.”
4. 切手ください. *kitte* (LHH) *kudasai*. “please give me a stamp.”
5. 聞いてください. *kiite* (LHH) *kudasai*. “please listen.”

The sentence 1 versus 2 and 3 versus 4 are the accentual minimal-pairs. Considering the findings described in 2.2.2, the role of Japanese pitch accent and heavy syllable in L2 learners’ perception, it is plausible to assume that all five of these sentences would cause L2 learners some level of confusion. As Matsuzaki (2000) suggests, the attribution of special morae to learners’ perception should be taken into consideration.

In conclusion, using minimal-pairs to teach Japanese pitch patterns is important. The following are important considerations when teaching the distinctive function of Japanese accent patterns: 1. Teach accentual minimal-pairs in all lexical categories (verbs, adjectives, etc.) and in conjugated forms, 2. Teach accentual pattern with intonation (e.g., rising intonation at the end of the sentence for interrogatives), 3. Teach minimal-pairs (differing one sound in the same position), and 4. Teach similar sound-pairs or sets including those with special morae.

This researcher has observed, with experience, that these accentual pattern-based confusions occurred in the classroom. Each time these confusions occurred, it was necessary to provide feedback quickly and explicitly. To use these techniques effectively, knowing how instructors should implement them in classroom activities would be advantageous. The next section will review more pedagogical framework to achieve this goal.

2.3.3 To Foster Self-Monitoring Skills

Acquisition of all aspects of Japanese pitch accent does not occur in a short period of time. One strategy that language instructors can use to improve learners' linguistic abilities is to foster learners' self-monitoring skills rather than spoon-feeding. Specifically, fostering L2 learners' sense of Japanese pitch accent will be more effective than giving learners feedback about their ill-formed accentual production each time they make a mistake.

Ikeda & Teteoka (2007) report that *peer learning* is one technique that can improve learners' self-monitoring skills. Peer learning is a technique with which learners cooperate with classmates to make significant contributions to what they are learning. Class activities using peer learning have been implemented in foreign language teaching. The results of peer learning have been reported as relatively effective in improving four language skills: peer reading (Tateoka, 2005), peer response (writing) (Ikeda, 1999), peer listening (Yokoyama, Fukunaga,

Mori, Wang, and Shorina, 2009). Peer learning is also said to be effective in improving learners' self-monitoring skill in pronunciation (Ogawara, 1998). As to the speaking (pronunciation in this case), Bang (2010) presented his study on a peer-monitoring activity. By implementing peer-monitoring, this study sought to develop learners' self-monitoring skills. It was explained that sharing the pronunciation learning process and constructing their knowledge regarding pronunciation would eventually foster learners' self-monitoring skills. Bang concluded that the learners collaboratively construct utterances; and this procedure developed learners' potential for self-monitoring.

The manner of *feedback* is another strategy that language instructors need to consider to improve learners' self-monitoring skills. Matsuzaki (2002) investigated learners' minds during repetitious pronunciation practice. This case study targeted two Korean L2 learners of Japanese. Pronunciation training was conducted for three months (20-30 minutes x three or four times per month). In the training sessions, intonation, accent, characteristics of special morae, and devoicing were practiced. To improve learners' self-monitoring skills both learners and teachers had to evaluate learners' production as either 'good' or 'bad' after each production. Learners also had to evaluate their own production in detail and identify what was wrong. The results of this self-evaluation of one's production were not always compatible with those of the instructor. Matsuzaki concluded that 1) a repetition model led to little improvement in production 2) self-monitoring skills could be improved by instruction, and 3) incorrect knowledge suppresses improvement for self-monitoring skill. However, this does not mean a repeating model is an ineffective technique of teaching pronunciation. The repeating model is a necessary practice, especially for learners at an elementary level. Matsuzaki (2002) states that once learners form

Japanese sound systems, having learners pronounce items before giving model sounds is effective.

2.4 Research Questions

Previous studies have mostly discussed what Japanese pitch accent is and how L2 learners perceive and realize it. These studies also provided insights about how to teach Japanese pitch accent. Regarding suggestions and limitations that previous studies provided, this dissertation conducts two experiments: Study 1 and Study 2.

Study 1 further investigates evidence of Japanese pitch accent perception by the participating Japanese learners across the five language proficiency levels. Study 2 investigates whether learners' perceptual and production ability for Japanese pitch accent could be improved with Japanese pitch accent training. Specifically, study 1 and Study 2 investigate the following:

1) Does perceptual ability improve as learners become more advanced?

2) What are learners' perceptual abilities in each condition: light- or heavy syllable conditions or each accentual pattern?

3) What is the tendency of learners who were not originally adept at perceiving pitch accent (such as what they perceive and what they do not)?

4) Do learners improve their perceptual and production ability for Japanese pitch accent after training?

5) Do learners improve their production ability for Japanese pitch accent after training, with and without accent information being provided?

CHAPTER THREE

STUDY 1: EVIDENCE OF JAPANESE PITCH ACCENT PERCEPTION BY LEARNERS

3.1 Method: Identification Test

The *Identification Test* in *Study 1* conducted an "accent listening test." The accent listening test examined whether learners of Japanese (L2 learners) were able to identify the accent location (pitch fall) in words when they heard Japanese words. In this study, "Learners of Japanese" refers to learners who were native speakers of American English, taking Japanese language courses at the university level when the study was conducted. Considering limitations of previous studies that conducted "accent listening tests," Study 1 further investigated L2 learners' perceptual evidence for perceiving Japanese pitch accent. Therefore, L2 learners who were in 1st year, 2nd year, 3rd year, 4th year, and 5th year of Japanese language courses participated in this study. To compare the trend of L2 learners' perception to that of native speakers of Japanese (L1 speakers), Study 1 also tested the perception of L1 speakers. This "accent listening test" examined learners' ability to identify the accent location in words that were composed of regular morae (henceforth referred to as *light syllable words*) and in words that were composed of the combination of regular and special morae (*heavy syllable words*). As mentioned in Chapter 2, perceptual studies yielded how pitch accent and syllable position affected L2 learners' ability to identify Japanese special morae. For example, Ishizawa (2011) reported that a heavy syllable (a regular mora + a special mora) was significantly easier to identify when it was accented and in the word's initial position than when it was unaccented or in the word's medial position. Consequently, this study included heavy syllable words as test stimuli and investigated whether L2 learners improved this ability to perceive accent location. Since there were not many studies that tested this across learners of varying proficiency levels of the Japanese language, further studies were needed. By examining L2 learners' results across five different proficiency

levels, Study 1 aimed to investigate how learners acquired the perceptual ability for identifying the accent location in words that did or did not contain special morae.

3.1.1 Participants

One-hundred nineteen L2 learners of Japanese who were native speakers of American English and were taking or have taken Japanese language courses at a university participated in this study. Sixteen native speakers of Japanese (L1 speakers) also participated in this study. All L1 speakers were educated in Japan until they were at least eighteen years old. Seven L1 participants were native speakers of Tokyo Japanese, and other L1 speakers were from the following prefectures: *Aichi* (2), *Niigata* (1), *Miyagi* (2), *Okayama* (2), *Osaka* (1), *and Fukuoka* (1). All L2 learners were divided into five groups according to the Japanese class level that they were taking when this study was conducted. L2 learners who had been learning Japanese for more than five years were put into the 5th year group. Table 3.1 presents the participants' detailed information. No participants reported hearing impairments.

Table 3.1

Participants Groups for Identification Test

Group	N	
L1	16	(F:12, M:4)
5th year	5	(F:0, M:5)
4th year	26	(F:12, M:14)
3rd year	24	(F:9, M:15)
2nd year	31	(F:13, M:18)
1st year	33	(F:10, M:23)

Note. F = female; M = male. *Level* indicates the designation of the regular Japanese language courses participants took while this study was conducted.

3.1.2 Stimuli

The stimuli consisted of 48 real four-mora Japanese nouns. These 48 noun stimuli were composed of four types of accentual patterns: no-accented, initial accented, and two types of medial accented patterns (12 of each pattern). To reiterate, "accent" represents the location in a word where the pitch falls. For example, a four-mora word "LHHL"[9] has the accent on the third mora. "L" and "H" indicate morae that are realized with low pitch and high- pitch, respectively. The following four types of accentual patterns were used in this study:

- *No- accent (type 0),* which has no accent, realized with LHHH (e.g., *gakusee* 'student'),
- *1st accent (type 1),* an accent on the first mora: HLLL (e.g., *ka'makiri* 'mantis'),
- *2nd accent (type 2),* an accent on the second mora: LHLL (e.g., *hima'wari* 'sunflower'),
- *3rd accent (type 3),* an accent on the third mora: LHHL (e.g., *tamane'gi* 'onion').

Twenty-four of the four-mora items were *light syllable words* composed with regular morae such as /ma/, /ta/, and so on. The other 24 four-mora items were *heavy syllable words*, which contained a combination of a regular mora and a special mora, such as long vowel, geminates, moraic nasal /n/, and diphthong (e.g., /saa/, /katt/, /pan/, and /kao/). Stimuli were chosen to have similar vowel environments where the pitch falls across all accentual patterns for light syllable words. Stimuli were also chosen while considering the positions of special morae within heavy syllable words. Since special morae cannot receive an accent and geminates cannot be located on the first or the last mora of words, it was impossible to create the same environment across the accentual patterns.

All 48 stimuli were randomized and pronounced by a 31 year-old female native speaker of Tokyo Japanese. Words were listed in isolation from one another. The recording was

[9] When a word is described with a pitch using *L* and *H* it is notated in accordance with the moraic unit.

conducted with a cardioid microphone in a soundproof room. These recorded stimuli were entered into a computer and analyzed acoustically with the software *Praat*. Each stimulus had its fundamental frequency (*F*0) measured approximately at the middle of four vowels. Table 3.2 provides the acoustical measurement of F0 (Hz) of all 48 stimuli.

Table 3.2

Fundamental Frequency (F0) of the Forty-eight Stimuli in the Identification Test

Light Syllable Stimuli (Hz)									
Type 0	1	2	3	4	Type 1	1	2	3	4
nagagutu	167	246	250	236	*kamakiri*	311	216	175	148
yakisoba	172	NA	274	263	*nanohana*	311	223	175	155
tatumaki	165	232	246	229	*kuzunoha*	316	214	159	155
sibukawa	197	256	246	224	*zenikane*	308	217	162	147
hitogomi	NA	267	269	259	*wakasama*	309	234	169	139
usugiri	170	261	247	236	*asemizu*	265	212	161	142
Type 2	1	2	3	4	Type 3	1	2	3	4
himawari	226	322	157	149	*wagamama*	161	248	262	136
kudamono	201	293	189	142	*asiato*	168	300	300	153
megusuri	225	314	199	129	*kanazuti*	217	276	281	133
nonezumi	192	281	182	146	*tamanegi*	209	285	297	155
kikurage	NA	319	154	146	*azumaya*	185	251	272	127
tamamusi	213	306	187	140	*sibakari*	179	252	276	174
Heavy Syllable Stimuli (Hz)									
Type 0	1	2	3	4	Type 1	1	2	3	4
kappatu	186	NA	236	245	*settai*	323	NA	155	158
gakkoo	160	NA	274	280	*sekkai*	307	NA	161	158
singoo	265	256	246	240	*sinboo*	333	188	162	156
sekinin	183	261	244	248	*zankin*	265	206	158	150
koozoku	280	279	270	256	*zuutai*	296	252	160	138
syuuten	273	270	262	259	*syooyaku*	327	278	147	149
Type 2	1	2	3	4	Type 3	1	2	3	4
roketto	179	314	NA	151	*gatten*	167	NA	286	137
pokketo	176	309	NA	153	*ketten*	188	NA	308	149
rasingi	188	319	164	142	*sainan*	255	271	275	145
jimuin	201	287	161	142	*sansaro*	251	262	265	156
mozoosi	186	280	224	151	*sansuu*	239	254	255	143
tikyuugi	NA	309	195	147	*jyoohin*	249	255	261	148

Note. 1, 2, 3, and 4 indicate the mora. Each number describes the fundamental frequency (*F*0). Pitch contour did not appear for NA due to vowel devoicing.

Figure 3.1 illustrates pitch contours of light syllable stimuli used in this study. This describes which accentual patterns of recorded words were consistent in terms of *F*0.

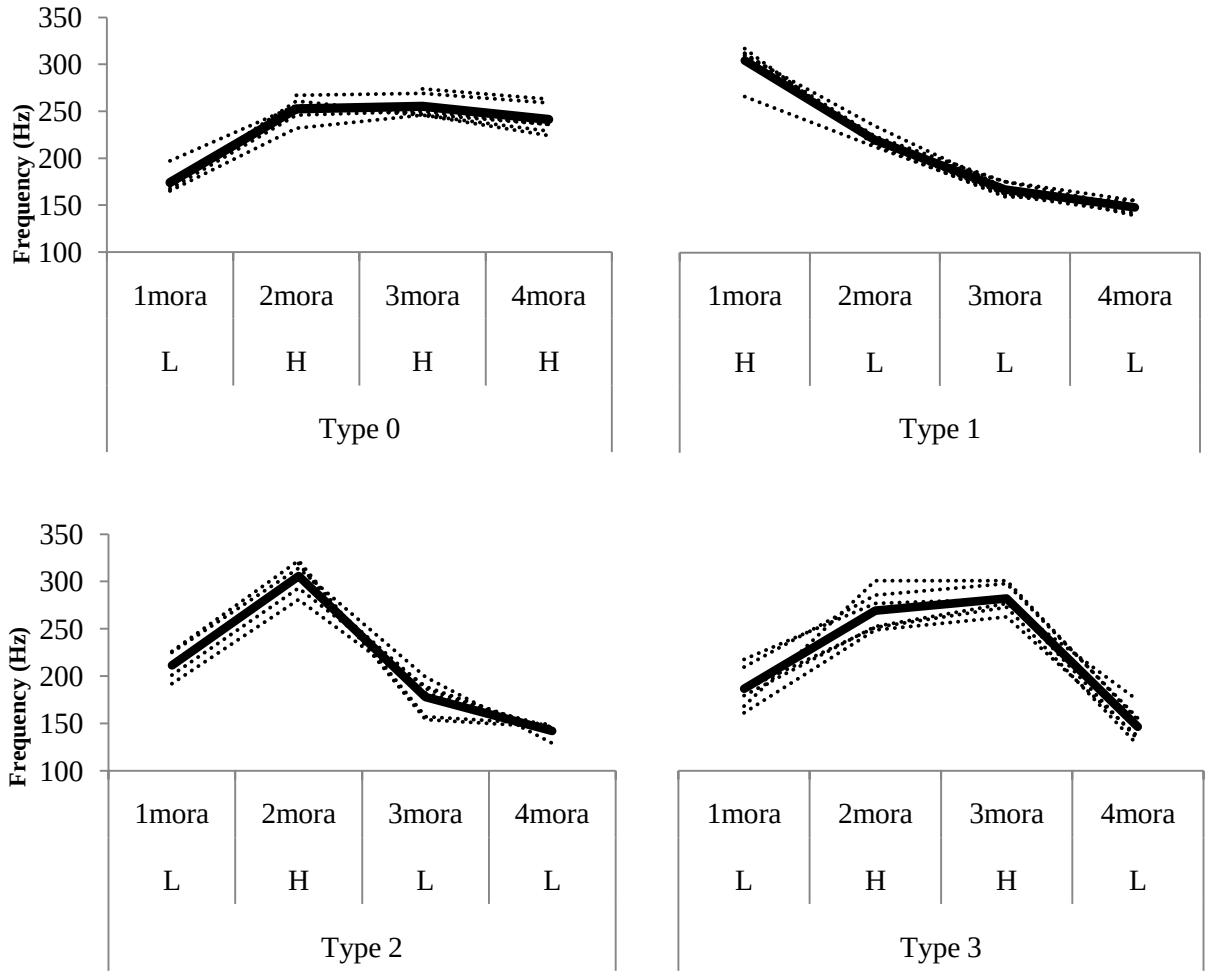


Figure 3.1. Four accentual patterns of pitch contour of the light syllable stimuli in the identification test. *F*0 of each stimulus used in this study (dashed line) and their average *F*0 (solid line) were indicated.

3.1.3 Procedure

All 48 light and heavy syllable stimuli were randomized and a single audio file was created with the software *Audacity*. Each stimulus was played once and repeated after a one-second pause. This procedure was followed by a seven-second pause while participants indicated answers on their answer sheets. Then, the next stimulus was played. This test took

approximately ten minutes to complete and five practice words were given before the real test began.

The answer sheet had a questionnaire section. L2 participants were asked about their backgrounds in learning Japanese. L1 participants were asked about the Japanese dialects that they used. The answer sheet used for this procedure is included in Appendix A.

After completing questionnaires and reading the directions, participants were asked to begin the test. They were told to indicate the accent mark at the location of the accent with the symbol mark '¬' after listening to each stimulus. Forty-eight stimuli were written on the answer sheet with Japanese *hiragana* orthography. Participants were asked to circle "none" when they thought they did not hear any pitch fall. Tests took place in a quiet classroom. Participants in the same level of Japanese language courses took the test simultaneously.

3.2 Results: Identification Test

Pre- and posttest answers obtained from participants were graded and analyzed, taking the following points into account: 1) overall accuracy rates of all stimuli (total score); 2) performance for light syllable stimuli and heavy syllable stimuli; and 3) four accentual patterns, type 0, type 1, type 2 and type 3.

3.2.1 Overall Accuracy Rate

Figure 3.2 illustrates the overall accuracy rates for the six participants groups. As shown in Figure 3.2, there was an increase in perception of Japanese pitch accent for each level. This suggests that as learners become more advanced, their ability to identify the location of the accent becomes higher.

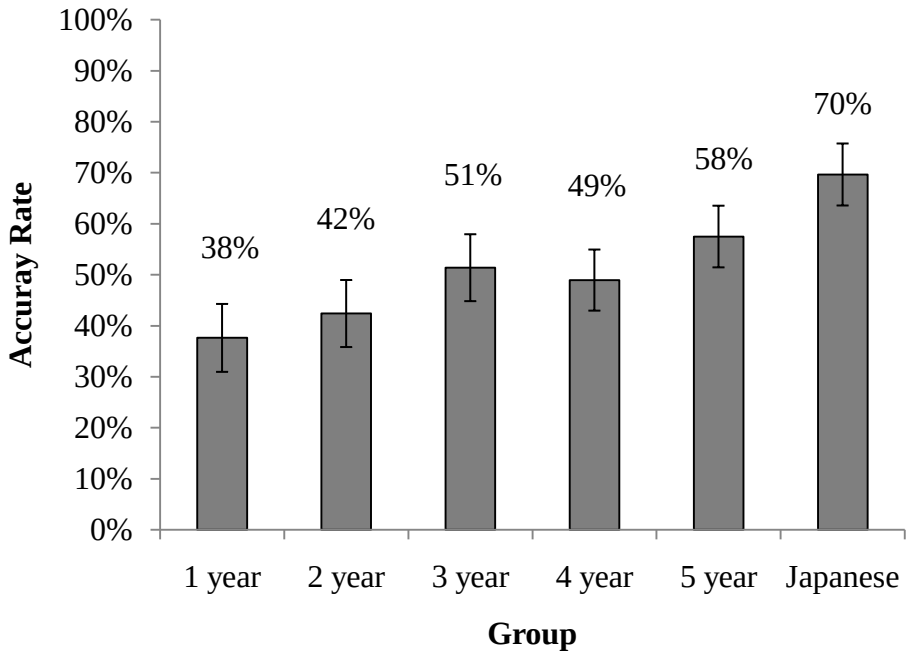


Figure 3.2. All participant groups' mean accuracy rates of total scores (all stimuli) for identification of accent location of each word.

Due to the unbalanced numbers of participants in each group, the overall total accuracy rate was analyzed using a Univariate Analysis of Variance (1st year, 2nd year, 3rd year, 4th year, 5th year, and L1). Significant differences were found between the six groups [$F(5, 129)=7.078$, $p<.001$]. Next, contrasts between L1 group and each L2 group were analyzed. Contrast results showed that L1 group's identification accuracy rate was significantly higher than 1st year [$p<.001$], 2nd year [$p<.001$], the 3rd year [$p=.003$], and the 4th year [$p=.001$]. This indicated that 1st year (38%), 2nd year (42%), 3rd year (51%), and 4th year (49%) scores were significantly lower than L1's score (70%). As to the 5th year, their scores were not significantly different from the scores of L1 group [$p=.214$]. Regarding the gradual increase in accuracy rate from novice learners to advanced learners, results suggested that learners could improve their perception of Japanese pitch accent as they progressed with their language study. Interestingly, the 3rd year group's score (51%) was higher than that of the 4th year group (49%).

To further investigate how learners perceive the accent location across the level, a Univariate Analysis of Variance was conducted with Level (1st year, 2nd year, 3rd year, 4th year, 5th year) as factor (excluding L1 group's results). It found a significant difference in the total accuracy rate among the five L2 groups [$F(4, 118)= 3.374$, $p<.012$]. A *post hoc* comparison (Bonferroni) showed that the 3rd year group's score (51%) was significantly higher than the score of the 1st year (38%) group [$p=.042$]. Even though the 5th year group had a higher score (58%) than the 3rd year (51%), a *post hoc* comparison found no significance, perhaps because of the limited number of participants in the 5th year group (n=5).

For the results from native Japanese participants, participants' scores were polarized into two groups: those who scored high and those who scored low accuracy rates, as Table 3.3 illustrates.

Table 3.3

L1 Participants' Results of the Identification Test

L1 Participant	Accuracy Rate	Regions of residency
1	100%	*Okayama*
2	100%	*Tokyo*
3	98%	*Okayama*
4	96%	*Aichi*
5	94%	*Tokyo*
6	90%	*Niigata*
7	90%	*Tokyo*
8	88%	*Miyagi*
9	60%	*Tokyo*
10	56%	*Aichi*
11	54%	*Miyagi*
12	52%	*Fukuoka*
13	46%	*Tokyo*
14	46%	*Osaka*
15	25%	*Tokyo*
16	21%	*Tokyo*

Note. L1 participants' results were described from high to low accuracy rate. Regions of residency indicate the prefectures where each participant originally was from and is currently living.

Based on the researcher's observation while giving the accent listening test and talking with the participants, L1 participants who scored relatively high accuracy rates probably would have been able to answer the accent test correctly without listening to the recorded stimuli. Some of the participants commented that they knew the answers before hearing the stimuli. They comprehended the task after reading the direction and the test did not seem difficult for them. Some L1 participants who were not Tokyo Japanese speakers commented that some words were pronounced with different accent types in their regions. Thus, they were able to tell the differences of the accentual patterns by hearing the words. In my opinion, participants who scored low accuracy rates probably could not provide answers for the test if they were asked to indicate the accent locations without hearing the stimuli. They relied solely on what they heard and commented this test was difficult. After the test, these participants were asked to pronounce some stimuli for which they missed the correct answer. According to my perceptions, these were words pronounced with the same accentual patterns that Tokyo Japanese speakers would produce. Furthermore, asking the accent location by hearing words is not a natural task in real life. Therefore, some L1 participants did not perform well on this test because they were not used to the test format.

3.2.2 Moraic Types

L2 learners' performance for each moraic type was depicted in Figure 3.3. First, a two-way ANOVA of Mora (light syllable words, heavy syllable words) and Level (1st year, 2nd year, 3rd year, 4th year, 5th year) was conducted, and found significance of Mora [$F(1, 114)=.558$, $p<.001$], but no significant Mora x Level interaction [$F(4, 114)=.620$, $p=.649$]. A dependent t test with Mora as a factor showed a significant difference between L2 learners' accuracy rates for light syllable words and heavy syllable words [$t(118)= 8.397$, $p<.001$]. As Figure 3.3

illustrates, L2 learners identified the accent location significantly better in words which consisted of regular morae (51%) than in words which contained special morae (39%).

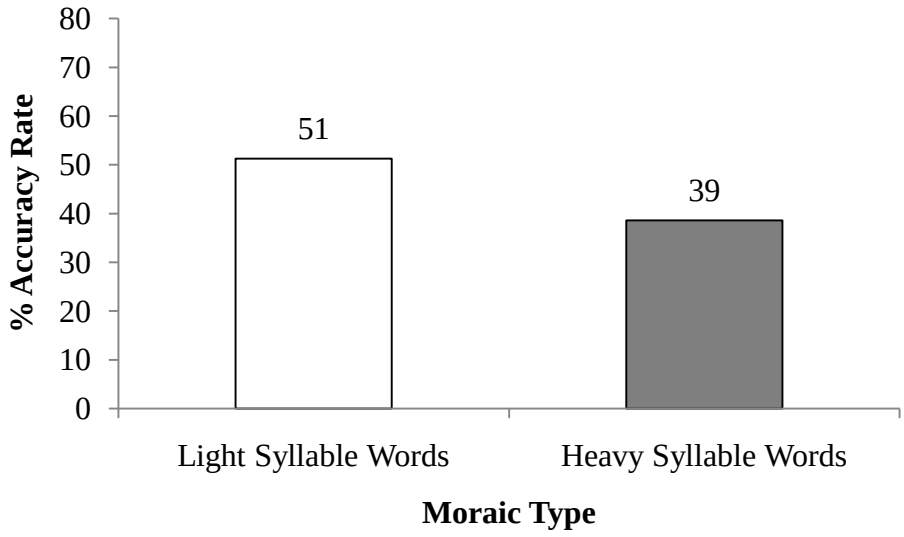


Figure 3.3. The mean accuracy rates of L2 participant groups' results by moraic type.

As displayed in Figure 3.4, all L2 groups scored higher for light syllable words (1st year: 43%, 2nd year: 49%, 3rd year: 60%, 4th year: 54%, 5th year: 63%) than for heavy syllable words (1st year: 32%, 2nd year: 36%, 3rd year: 43%, 4th year: 44%, 5th year: 53%).

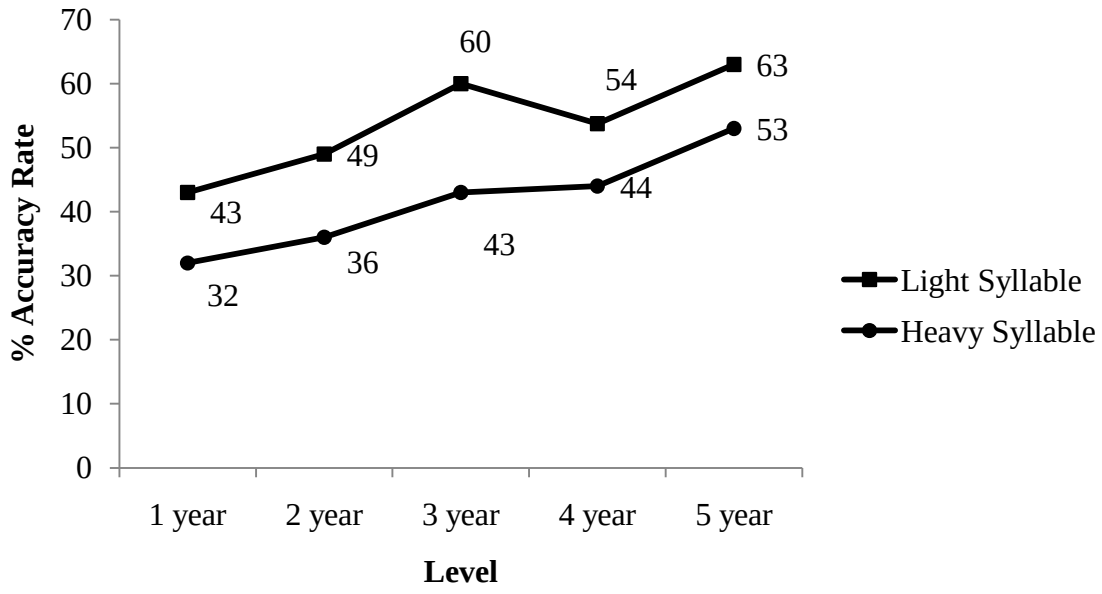


Figure 3.4. Mean accuracy rate of each L2 participant groups' results by moraic type.

This result showed that L2 learners identified the accent location significantly more easily in words consisting of light syllables than in words containing special morae across all proficiency level groups. This result indicates that the existence of special morae in words interferes with learners' ability to identify the accent location. This result may have arisen from the characteristics of Japanese special morae. Toda (2003) stated that acquisition of special morae is more difficult than light syllables not only for L2 learners, but also for L1 infants for several reasons. For instance, a special mora does not appear at the beginning of words, does not bear an accent nucleus, and has various allophones, etc. This result suggests that instructing students about Japanese moraic units may be a crucial to teaching Japanese pitch accent.

3.2.3 Accentual Patterns

Figure 3.5 shows L2 learners' average accuracy rate scores for each accentual pattern. L2 learners' score of 72% for type 0 stimuli was the highest among the four accentual patterns, followed by type 3 (46%), type 2 (39%), and type 1 (22%). First, the overall results of L2 learners were analyzed using a two-way ANOVA of Accentual Pattern (type 0, type 1, type 2,

type 3) and Level with Accentual Pattern as the repeated measure. There was a significant main effect of Accentual Pattern [$F(3, 342)=107.913$, $p<.001$] and a significant Accentual Pattern x Level interaction [$F(12, 342)=2.202$, $p=.011$].

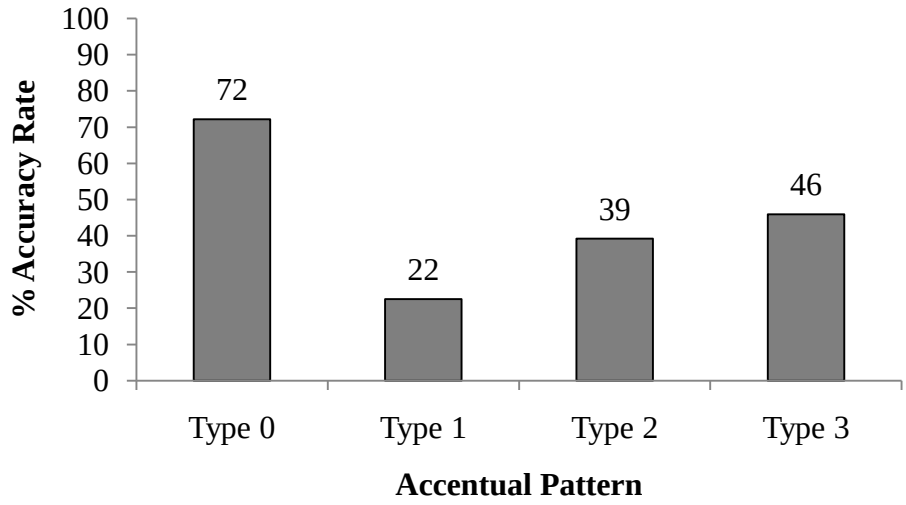


Figure 3.5. Mean accuracy rate of L2 participant groups' results by accentual patterns.

A one-way ANOVA with Accentual Pattern (type 0, type 1, type 2, type 3) showed a significant difference among the scores of four accentual patterns [$F(3, 47)=24.564$, $p<.001$]. A *post hoc* analysis (Bonferroni) revealed that the score for type 0 (72%) was significantly higher than the scores of other accentual patterns [$p<.001$]. Conversely, the score for type 1 (22%) was significantly lower than scores of other accentual patterns: type 0 [$p<.001$], type 2 [$p=.041$], and type 3 [$p=.002$]. The score for type 2 (39%) and type 3 (46%) were not significantly different from each other.

In Figure 3.6, line plots indicate the accuracy rate for each accentual pattern by each L2 level group. It appears that type 0 is the easiest pattern. This is followed by type 3, type 2 and type 1 for most of the L2 levels.

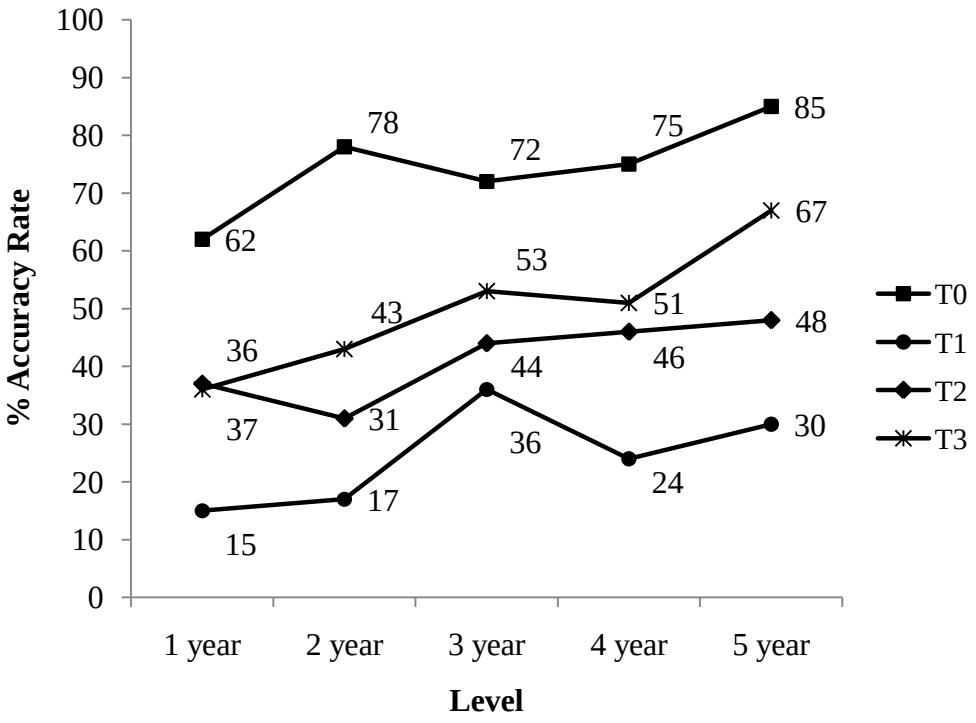


Figure 3.6. Mean accuracy rate of each L2 participant group's result by accentual patterns.

A one-way ANOVA was conducted for each accentual type, with Level as the factor. There was a significant difference between scores for all accentual patterns: type 0 [$F(4, 118)=2.678$, $p=.035$], type 1[$F(4, 118)=4.102$, $p=.004$], and type 3 [$F(4, 118)=2.741$, $p=.032$]. However, there was no significance for type 2 [$F(4, 118)=2.144$, $p=.080$]. A *post hoc* comparison (Bonferroni) showed that the scores of the 2nd year of type 0 (78%) was significantly higher than the scores of the 1st year group (62%) [$p=.05$]. The score of the 3rd year group of type 1 (36%) was significantly higher than that of the 1st year group (15%) [$p=.004$] and the 2nd year group (17%) [$p=.016$].

Next, a one-way ANOVA with Level as a factor showed a significant difference between all five levels: 1st year [$F(3, 47)=3.438$, $p=.025$], 2nd year [$F(3, 47)=6.160$, $p=.001$], 3rd year [$F(3, 47)=4.861$, $p=.005$], 4th year [$F(3, 47)=6.692$, $p=.001$], and 5th year [$F(3, 47)=8.105$, $p<.001$]. A *post hoc* analysis showed that the 1st year's score for type 0 (62%) was significantly higher than

the score for type 1 (15%) [p=.020]. The 2nd year group's accuracy score for type 0 (78%) was significantly greater than scores for type 1 (17%) [p=.003] and type 2 (31%) [p=.036]. The 2nd year's type 3 (43%) was also significantly higher than type 1 (17%). The 3rd year's score for type 0 (72%) was significantly higher than its type 1 (36%) [p=.009], and neared significance for its type 2 (44%) [p=.054]. Similarly, the 4th year's score for type 0 (75%) was significantly higher than their scores for type 1 (24%) [p=.001] and type 2 (46%) [p=.014]. Their scores for type 3 (51%) was nearly significantly different from its type 1 score (24%) [p=.053]. The 5th year's score for type 1 was significantly lower than its type 0 (85%) [p<.001] and type 3 scores (67%) [p=.002].

These analyses revealed that scores of type 0 and type 1 were significantly different from each other for all of the L2 learner groups. This means that learners' perception for type 0 was remarkable. Conversely, perception for type 1 was the most difficult pattern to identify the pitch fall. This may have been due to the acoustic phenomena with which type 1 words are realized. Theoretically, a type 1 word has an accent on the first mora. Therefore, a four-mora, type 1 word will be realized with HLLL. However, considering the acoustic characteristic of *F*0, such as *initial rise* or *declination*, type 1 will be perceived as more complex than HLLL. Initial rise is the phenomenon that *F*0 rises at the beginning of the phrase boundary (Kawakami, 1956; Ayusawa, 1995). Declination is the phenomena that *F*0 decreases towards the ends of words. Therefore, type 1 words are realized or perceived with a rise at the beginning and *F*0 perpetually decreases after the pitch peak (see Figure 3.1[10]). Learners who have not established understanding of the Japanese sound system may have difficulty perceiving the accent location in type 1 words.

[10] However, Figure 3.1 describes pitch contours which were measured its *F*0 value at the middle of each vowel, thus this figure does not describe an initial rise.

3.2.4 Distribution of Score

Lastly, Figure 3.7 displays the distribution of the total accuracy rate of each participant. This shows an intriguing trend that learners' identification accuracy varies across each group.

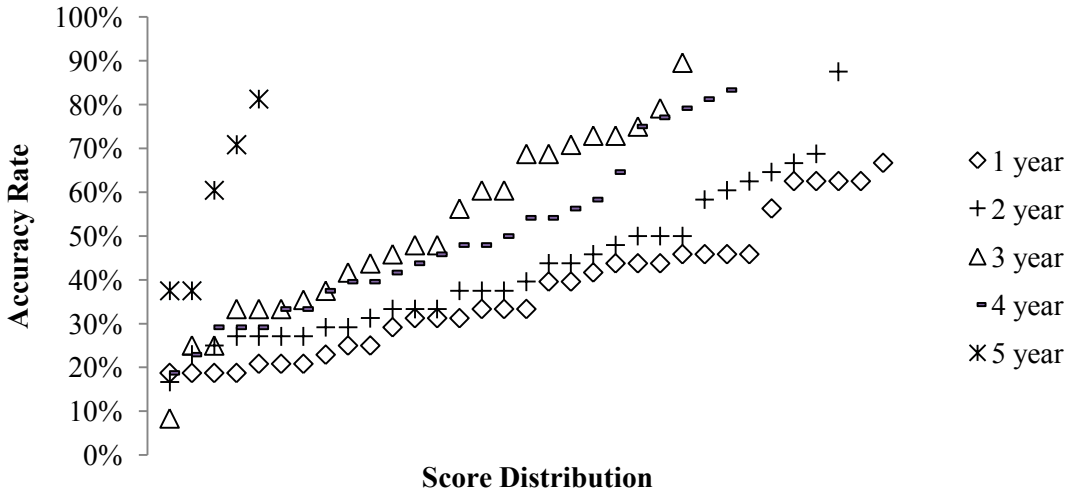


Figure 3.7. Distribution of total accuracy rate of each participant in all L2 levels.

This indicates that some learners did not improve their ability to perceive Japanese pitch accent, despite the fact that they had Japanese instruction for a longer period than novice learners. A "discrimination test" was used to further investigate learners' perceptual abilities of Japanese pitch accent. The details of this test are described in the next section.

3.3 Method: Discrimination Test

The result of the identification test in Study 1 indicated that advanced learners recognized the accent location more precisely than novice learners did. This result suggests that learners can improve their ability to perceive Japanese pitch accent as they continue studying the language. The identification test found intriguing evidence that total accuracy scores varied at each level of learners. Regardless of proficiency level, some learners in each group scored relatively high while others scored relatively low. As mentioned previously, perceiving Japanese pitch accent is crucial for listening and speaking Japanese accurately. Therefore, the question of whether

learners who scored poorly on the identification test can perceive the pitch difference in Japanese words needs investigation in future research. If learners are unable to recognize what the pitch fall sounds like they will have problems in speech, such as misunderstandings by native Japanese speakers. There are two possible answers to explain why some learners cannot recognize the accent location: 1) learners may not know what the Japanese pitch accent sounds like; 2) learners know what the "pitch fall" is but cannot detect the exact accent location in words. This is an important distinction to investigate because the answer has implications for what needs to be taught so learners can improve their perception of Japanese pitch accent.

To examine this distinction, a *discrimination test* was conducted. In this task, two types of "accent listening tests" were conducted: *identification task* and *discrimination task*. The identification task was presented in a fashion similar to the "accent listening test" in Study 1. The discrimination task aimed to investigate whether or not participants, who were originally not adept at identifying the accent location, could distinguish between different accentual patterns. Based on the identification task results, participants were divided into two groups: top (participants who scored high) and bottom (participants who scored low). The performance of these two groups in discriminating between the accentual patterns was investigated.

3.3.1 Participants

Thirty-eight native speakers of American English who were taking a second or third year level of Japanese language course at a university participated in this study. Twenty-three participants were taking the second-year course, and fifteen participants were taking the third-year level Japanese language course when this study was conducted. No participants reported hearing impairments.

For the analysis, grouping was carried out to examine how participants who were or were not originally adept at perceiving the accent location could distinguish between different Japanese accentual pattern pairs. The grouping of the top and bottom groups was based on the results of all participants' identification task scores. The hierarchical cluster analysis generated two participants' groups. Participants who scored more than 63% in their identification task were categorized in the top group (n=13); participants who scored less than 55% in their identification task were categorized in the bottom group (n=25). No participants scored in between these numbers.

3.3.2 Stimuli

For the identification test, 40 four-mora words were utilized in isolation. This identification task had three different kinds of items: 1) 8 items comprised of a repetitive monosyllabic sound: *ta-ta-ta-ta*, 2) 12 items of 3 non-words: *ne-he-no-ho, no-ta-me-se,* and *te-ro-ma-ni*, and 3) 20 items of real Japanese words. To reduce difficulty in perception, these non-words were composed without special morae. Real words that did not contain special morae were chosen as well. Each item had the same number of accentual pattern stimuli. For the discrimination test, 48 pairs were tested. There were two kinds of pairs in this test: repetitive monosyllabic word pairs and non-word pairs. Repetitive monosyllabic pairs such as *ta-ta-ta-ta* and *ta-ta-ta-ta* or same non-word pairs such as *ne-he-no-ho* and *ne-he-no-ho* were tested repetitively in ten accentual combinations: (type 0&0, type 0&1, type 0&2, type 0&3, type 1&1, type 1&2, type 1&3, type 2&2, type 2&3, and type 3&3). These stimuli were pronounced by a 31-year-old female native speaker of Tokyo Japanese. Recording was conducted with a cardioid microphone in a soundproof room.

3.3.3 Procedure

This study had an identification part and a discrimination part for comparing results. The identification part was conducted according to the same procedure used for the *identification test* in Study 1. During the discrimination task, participants were asked to circle "same" when they thought they heard a pair that was in the same accentual pattern, and to circle "not same" if they believed what they heard was in a different accentual pattern. Tests took place in a quiet classroom. Multiple participants took the test simultaneously. The test took approximately twenty minutes to complete. This test is included in Appendix B.

3.4 Results: Discrimination Test

3.4.1 Identification versus Discrimination Task

Accuracy scores for the top and the bottom groups at the identification task and discrimination task are presented in Figure 3.8. As can be seen in the line plots, learners in both groups had higher scores for the discrimination task than for the identification task. The top group scored 79% on the identification task, while the bottom group scored lower with an average of 36%. Both groups had relatively high accuracy rates for the discrimination task: top group (90%); bottom group (84%).

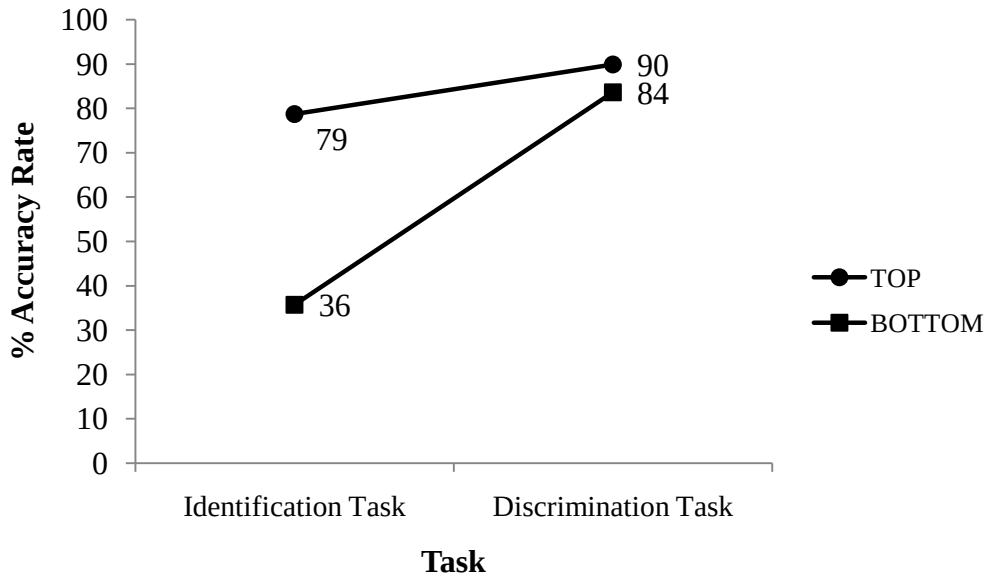


Figure 3.8. Identification- and discrimination-task results.

The results were analyzed using a two-way ANOVA of Task (identification, discrimination) and Group (top, bottom), with Task as the repeated measure. There was a significant main effect of Task [$F(1,36)=204.911$, $p<.001$], Group [$F(1,36)=67.648$, $p<.001$], and a significant Task x Group interaction [$F(1,36)=78.642$, $p<.001$]. To investigate these effects, an independent *t* test was conducted. Recall that learners had a 25% chance of attaining a correct answer (out of four choices: type 0, type 1, type 2, and type 3) for the identification task, whereas learners had a 50% chance of attaining a correct answer (out of two choices: same, not same) for the discrimination task. This being the case, we would expect that learners' accuracy rate would be higher for the discrimination task. Therefore, only an independent *t* test, which calculates for each task with Group as factor, was conducted. As expected, the score of the top group for the identification task (79%) was significantly higher than the score of the bottom group (36%) [$t(36)=9.832$, $p<.001$]. Surprisingly, the top group's score for the discrimination task (90%) was also significantly different from the bottom group's score (84%) [$t(36)=2.325$, $p=.026$]. Even though participants in the top group scored significantly higher on the discrimination task than

participants in the bottom group, the high score of the bottom group at discrimination (84%) suggested that they can differentiate different accentual patterns. As Figure 3.8 shows, this study suggested that although learners were not adept at identifying the exact location of pitch fall, they were able to recognize the pitch difference of Japanese nouns in perception.

3.4.2 Discriminating Different Accentual Pairs

Figure 3.9 illustrates accuracy rate for discriminating different accentual pattern pairs. L2 participants were successfully discriminated different accentual pattern pairs. Type 0 & 3 pairs and type 2 & 3 pairs had relatively lower scores (both 80%) than did other pairs: type 0 & 1 (94%), type 0 & 2 (93%), type 1 & 2 (89%), and type 1 & 3 (96%). For type 0 and type 3 words, both accentual patterns maintain higher pitch in words. Type 0 has higher pitch for three morae (LHHH) and type 3 has higher pitch for two morae (LHHL). Due to the occurrence of declination, this may have confused learners. Type 2 and type 3 patterns are categorized as medial accentual patterns. Therefore, identifying exact accent location may have been confusing for learners.

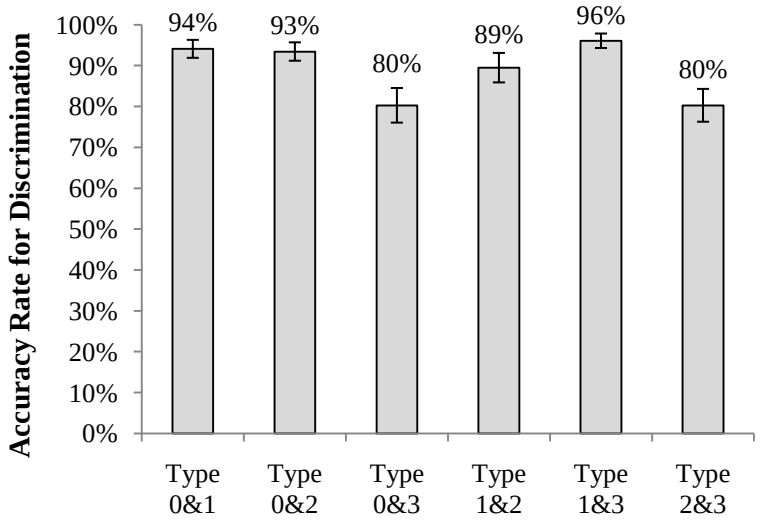


Figure 3.9. Accuracy rate for discriminating between different accentual pattern pairs

However, even though a one-way ANOVA with six accentual pairs found significance [$F(5,23)=3.129$, $p=.033$], *post hoc* analysis (Bonferroni) found no specific significant differences. This result could be interpreted as evidence that accuracy rates for each pair were not different from each other. L2 learners were able to distinguish different accentual patterns for all pairs to about the same extent.

3.5 Summary of Study 1

Study 1 examined L2 participants' perception for Japanese pitch accent. This study revealed learners' perceptual ability for identifying the accent location in words. The gradual increase in accuracy rate among novice to advanced learners was observed in the results. This suggested that learners could improve their perception of Japanese pitch accent as they progress through language study. As to the overall accuracy rate, the third year L2 group scored significantly higher than did the first year L2 group. This study also showed that participants in all L2 groups identified the accent location significantly better in words consisting of light syllables than in words composed of heavy syllables. Regarding accentual patterns, results showed that no-accent stimuli (type 0) were significantly easier to identify than 1st accent (type 1), 2nd accent (type 2), and 3rd accent (type 3) stimuli. By contrast, 1st accent stimuli were significantly more difficult to identify than no-accent, 2nd accent, and 3rd accent stimuli. The scores in two medial accentual patterns, 2nd accent and 3rd accent stimuli, did not differ from each other. The result also showed an intriguing trend that learners' identification accuracy varies across each group. To investigate further about the participants who scored low in the identification test, a discrimination test was conducted. The result suggested that participants who were not adept at identifying accent location in words can still distinguish different accentual pattern pairs.

Study 1 indicated that learners are able to perceive Japanese pitch accent and suggested that learners have potential to improve in perception for Japanese pitch accent. To investigate this further, Japanese pitch training was conducted in Study 2, which seeks to facilitate learners' improvement in perception and production of Japanese pitch accent by conducting training.

CHAPTER FOUR

STUDY 2: EFFECTS OF JAPANESE PITCH ACCENT TRAINING

Study 2 was conducted to examine whether Japanese pitch accent training can facilitate learners' perceptual and production ability of Japanese pitch accent. First, all participants in the Experimental Group (EG: trainees) and the Control Group (CG: non-trainees) took the pretest of perception and production during week 1. Next, only those participants who were in EG took six training sessions outside their regular Japanese language courses. Each training session lasted thirty minutes and was conducted twice per week for about one month (in weeks two through five). Training sessions consisted of awareness lectures and exercises for practicing perception and production. Participants in both groups took a perception and production posttest, which had the same content as the pretest, in week 6.

Chapter 4 first explains the nature of the training, then describes methods, participants, stimuli, analyses, and results for both perception and production tasks.

4.1 Nature of the Training

4.1.1 Training Procedure

Japanese pitch accent training was conducted during weeks two through five, between the pretest (week 1) and posttest (week 6) of perception and production. Thirty-one participants who were in the Experimental Group (EG) completed all six training sessions outside their regular Japanese language courses. Participants from the CG did not receive this training. Each training session lasted thirty minutes and was conducted twice weekly for one month. All sessions were conducted by the researcher for this study. For the participants' convenience, each session was offered between five to seven times so that participants could choose the sessions that best fit their schedules. The numbers of participants who attended each session varied from a minimum

of two to a maximum of ten participants. These training sessions were conducted in a computer lab, where Power Point slides (see Appendix E) and audio equipment such as loudspeakers to auditorily present recorded sounds, were used for instruction. No homework was assigned to participants. After completion of all sessions, a *knowledge test* and *training questionnaire* (training evaluation) were administered. The knowledge test (not to be confused with the post-test) examined whether or not participants retained information they learned during training (accent rules, etc.). The training evaluation was administered anonymously to gather participants' opinions about the training process. The knowledge test questions and training evaluation appear in Appendices C and D.

4.1.2 Pedagogical Framework

The Japanese pitch accent training had two main pedagogical objectives. The first was to establish knowledge and prompt better understanding to elicit better output. Matsuzaki (2002) emphasized the necessity of instructing correct knowledge because he found that incorrect knowledge hindered perception. This study's training provided theoretical and phonetic knowledge about Japanese pitch accent. The second objective was to improve learners' *self-monitoring* skill. Self-monitoring is one's ability to monitor and correct her or his own mistakes in pronunciation. This skill is necessary for learners to continue studying prosodic features in pronunciation of foreign languages without an instructor's assistance.

To accomplish the first objective, this study's training used *Processing Instruction* as a pedagogical framework. As advocated by Lee and VanPatten (2003), Processing Instruction was originally designed for teaching grammar. Where traditional instruction tries to manipulate a learner's output by conducting drills, Processing Instruction tries to manipulate input to help learners obtain *intake* from the input. Lee and VanPatten (2003) explained that *intake* refers to

linguistic data in the input that learners attend to and hold in working memory. Previous studies have shown that traditional instruction is effective only for output, while Processing Instruction is effective for both intake and output (see 2.3.1 Processing Instruction). Along with doing mechanical drills for practice, meaningful drills that reflect the concept of Processing Instruction were used mainly in training.

Two procedures were employed to achieve the latter objective: 1) the *peer learning* method was utilized and 2) the manner of the instructor's feedback was manipulated carefully. Peer learning is a method through which learners cooperate with classmates to make significant contributions to what they learn (Ikeda & Teteoka, 2007). As explained in chapter 2, previous studies suggested that identifying and helping to correct classmates' mispronunciation could lead to improved self-monitoring skills (Bang, 2010). Therefore, peer learning was used frequently during training in this study in an attempt to practice production. Second, previous studies suggested that effective instructor feedback is important to improving learners' self-monitoring skill. Matsuzaki (2002) stated that providing and having learners repeat model sounds led to little improvement (note that the word "learners" here does not mean "novice," but instead refers to those already familiar with Japanese speech sound). In training, after participants learned the sense of how these accentual patterns should be realized, the repeating model of practice was not used frequently. Instead, participants were asked first to pronounce words, then the instructor provided the correct model. Participants were also asked to explain verbally how their pronunciation differed from model sounds. For example, a participant answered "I overemphasized pitch change (low-pitch as too low, high-pitch as too high), but in your (instructor's) model sound the pitch change was not that noticeable." Another participant responded, "I know this word has an accent in the middle of the word, but cannot recognize the

exact location," and so forth. At other times, participants were asked to move their hands as they pronounced words (hand up and down when they pronounced high- and low-pitch, respectively) to see if their production corresponded with their intention.

4.1.3 Contents, Activities, and Techniques

Training was conducted six times. A list of training sessions follows (see Appendix E for Power Point slides).

Session 1: What is Japanese pitch accent? Why is it important?

Session 2: Let's practice! Learn Japanese pitch accent rules.

Session 3: Differentiate minimal-pairs (discrimination task).

Session 4: Learn accentual patterns for Japanese verbs.

Session 5: Use the Japanese pitch accent dictionary. Practice accentual patterns at a sentence level.

Session 6: Review and Test.

With the previous section's objectives and instructions in mind, these Japanese pitch accent training sessions encompassed these two areas: A) lectures to deepen the knowledge of Japanese pitch accent, and B) exercises for Japanese pitch accent perception and production.

A) Lecture:

The lecture addressed the following topics: 1) Japanese pitch accent, 2) Japanese prosody, 3) function of Japanese pitch accent, 4) rules of Japanese pitch accent, and 5) usage of resources such as Japanese accent dictionary.

1) To teach Japanese as a *pitch accent language*, English words were used as examples of *stress accent language*. For example, the stress accent was manipulated to differentiate the word "subject" as in noun or verb. The first syllable is stressed for the noun ([ˈsəbdʒekt]) and the

second syllable is stressed for the verb ([səb'dʒekt]). First, to teach that Japanese is not a stress but a pitch language, the homonym *ame*, meaning 'rain' when first mora is accented or 'candy' when second mora is accented, was introduced. To distinguish between high- and low-pitch, it was emphasized not to manipulate the stress but rather the pitch change, as when people sing songs.

2) To teach Japanese prosody, *rhythm* and *intonation* were introduced. As to the rhythm, the difference between rhythms of English and Japanese was discussed. It was explained that English and Japanese use a different rhythmic unit: "syllable" for English and "mora" for Japanese. It was also explained that English is a *stress-timed language*, so stressed syllables bear, or are perceived as taking up, approximately the same amounts of time. By contrast, Japanese is called a *syllable-timed language*, so every *syllable* (mora for Japanese) is perceived as lasting approximately the same amount of time. These different types of rhythmic unit create differences in rhythm of speech between English and Japanese. Participants had exercises for figuring out how many syllables and morae were contained in several English and Japanese words. Then, participants were instructed to count how many morae were contained in their first and last names and to practice introducing themselves to their classmates using Japanese rhythm for speech. When learners introduce themselves to Japanese people in Japanese, they typically pronounce their names using English rhythm, which results in unsuccessful self-introduction.

3) The importance of learning Japanese accent was emphasized by teaching functions of Japanese pitch accent. Japanese accent is used to indicate *syntactic function*, meaning that Japanese accent indicates a word boundary, and *distinctive function*, meaning that Japanese accent differentiates homonyms that are realized in different accentual patterns. For example, Toda (2004) introduced the sentence "*kyookai- ni itta*" in her Japanese pronunciation textbook

by showing that this could be interpreted in one of three different ways: 1) (I) went to church, 2) (I) went to the meeting today, and 3) (I) went to shop today. 2) and 3), *kyo-o* 'today' pitch falls within a word, and goes up for *ka-i-ni* with HLL and LHH means 'to the meeting' and 'to shop' respectively. Since there is a rule that pitch never goes up within a word once it falls, one knows that there is more than one word in *kyookai* for 2) and 3) (see Power Point slide in Appendix E). Regarding the distinctive function, minimal-pairs like *a-me* meaning 'rain' (HL) or 'candy' (LH) were used. As suggested previously (2.3.3.2 Using minimal-pairs.), exercises were designed with consideration of characteristics of special morae, such as practice discriminating the pair *ojisan* LHHH meaning 'uncle' and *ojiisan* LHLLL meaning 'grandfather' and so on.

4) As to the noun-accent rules, four accentual patterns were introduced: non- accented pattern, initial accented pattern, medial accented pattern, and final accented pattern. Then, two rules were taught. One rule was that the first mora always starts with low-pitch unless a word is initially accented. A second rule was that once a pitch drops, it never goes up within a word. Based on phonetic evidence of Japanese pitch accent, the importance of pitch fall (not pitch rise from low- to high-pitch) when listening and speaking was stressed. Although no features regarding verb-accent rules were examined in this study, verb-accent rules were also mentioned during training. It was explained that all verbs are categorized into two groups: *accented verbs*, which have an accent in the word, and *non- accented verbs*, which have no accent in the word. Participants practiced these verbs in the interrogative mode with rising intonation. For example, the Japanese word, "*tabeta*" meaning *ate* in English, belongs to the accent verb group. Since the past- plain form of accented verbs receive an accent on the third mora from the final mora of words, "*tabeta*" is realized with a high- pitch on the first mora and a low- pitch for the last two morae. For example, interrogative phrases containing accented verbs such as "*tabeta?*" meaning "did (you) eat?" must be realized with proper accentual pattern (in this case, pitch fall after the

first mora) and the proper rising intonation at the end of the phrase. These combinations are difficult for learners. Typically, many resulted in pronouncing "*tabeta?*" with L-H-H with further rising pitch at the end, so practice on this was implemented.

5) To search for accentual patterns for words, resources such as Japanese accent dictionaries, regular Japanese dictionaries, and online Japanese dictionaries were introduced.[11] Differing resources use differing types of accent mark symbols. For instance, some dictionaries indicate the number of mora where the accent locates. Therefore, in *たまねぎ③, tamanegi* (onion) the symbol ③ means that the accent locates on the third mora. Other dictionaries use lines beneath or above morae, or pitch fall accent mark "¬." Participants were taught how to interpret the accent marks of these different types. Next, participants had time to practice using the dictionaries and to practice pronunciations with peers.

B) Exercises for Japanese pitch accent perception and production:

For training of perception and production, the activities described below were carried out. These activities for teaching Japanese pitch accent were created based on *structured input activities* for teaching grammar proposed by Lee and VanPatten (2003). González-Bueno (2005) utilized minimal-pairs with the concept of Input Processing for teaching pronunciation. Table 4.1 illustrates a modified version of structured input activities for teaching Japanese pitch accent. These exercises required learners to process both oral input and output. Peer learning activities were also employed along with these exercises.

[11] Japanese pitch accent dictionaries, such as *NHK Nihongo hatsuon akusento jiten, Sin meikai nihongo akusento jiten*, and Sanseido.net Web Dictionary http://www.sanseido.net were introduced.

Table 4.1

Adaptation of Grammar Structured Input Activities to the Teaching of Japanese Pitch Accent

		Structured input activities
	Grammar (Lee and VanPatten, 2003)	Japanese pitch accent
1	Binary Options	1. Learners were asked to choose the correct answer according to what they heard: They heard: *hana' ga kiree desu ne*. ("Flower is beautiful.") Then they had to choose the visual that corresponds to what they heard: a. *hana' ga kiree desune.* ("Flower is beautiful.") b. *hana ga kiree desune*. ("Nose is beautiful.") 2. Learners pronounced one of the minimal-pairs and classmates had to choose the answer according to what they heard.
2	Matching	1. Learners matched the same accentual patterns which were described with various accent marks. These practices were also employed with peer learning.

The following techniques were used during training to conduct these activities: 1) use of a woodblock, 2) visualization of pitch accent, 3) speed control of stimuli, 4) practice while using the same accentual patterns, and 5) use of unique vocalism.

1) The instrument known as a woodblock was used during training. A woodblock produces two different tones, high and low tones. To teach Japanese pitch accent, Mizutani (1989) showed that learners' sense of pitch (high or low) needs to be developed first. To do so, Mizutani suggested using tools such as china bowls or musical instruments to describe pitch. After using a woodblock, repetitive sounds such as *ta-ta-ta-ta* were used before practicing with actual words.

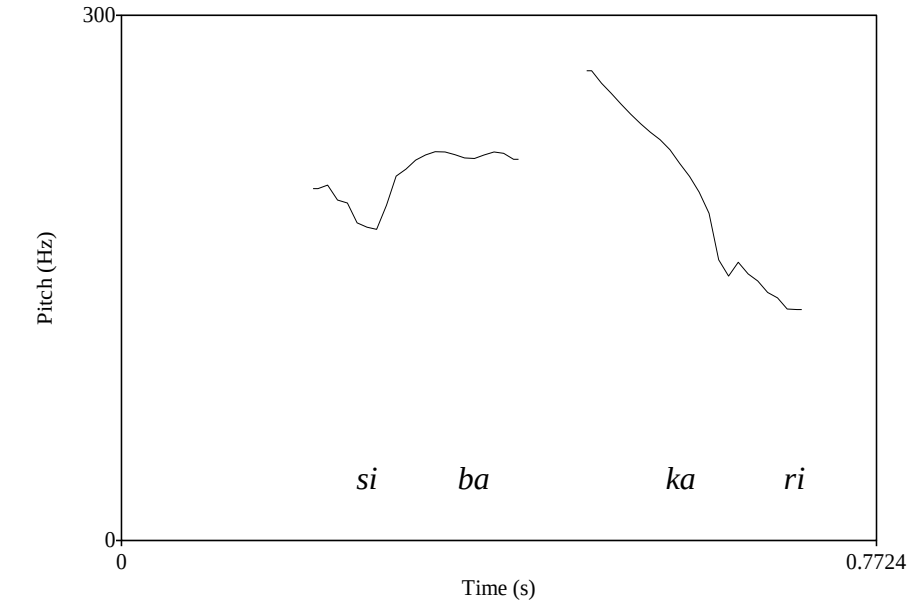
2) Visual aids of accentual patterns were also provided when learners practiced perception and production. Fundamental frequency (*F*0) was measured approximately in the middle of the vowel for each stimulus and these measured pitch contours were used during

training. As depicted in Figure 4.1, both graphs show pitch of the same stimulus *sibakari* meaning 'lawn mowing'. The one above is the actual pitch contour and the one below is the measured pitch contour. Actual pitch contour carries many pieces of phonetic phenomena such as declinations, delayed accent, and initial rise (*F*0 rise at the beginning of the phrase boundary). Previous studies suggested that this complex information is not necessary for pronouncing words and may confuse learners. To avoid confusing participants, this study used simplified measured pitch contour. Hand movements were also occasionally provided. Japan Foundation (2009) and Toda (2004) pointed out that instructors should move their hands from left to right from the learners' viewpoint to correspond to the left to right direction of the Japanese writing style. Using musical notes is another way to visually provide pitch (Mizutani, 1989; Ogawa, 1982; Japan Foundation, 2009).

3) Manipulating stimuli speeds was useful for learners to recognize pitch fall and repeat model sounds. However, care was taken to ensure practice continued until learners could hear the pitch fall and could pronounce words with proper accentual patterns with natural speed.

4) Practicing with the same accentual patterns was also useful for familiarizing learners with what each accentual pattern should sound like.

5) As unique vocalisms, learners were asked to move their hands up and down for producing high- and low-pitch respectively (Japan Foundation, 2009). If this technique did not work, learners were asked to move their necks up and down (Ogawa, 1982; Japan Foundation, 2009). Learners can produce higher pitches when they make sounds with their heads up and lower pitches while they face downwards. For this technique, learners use a common physiologic response to expand or contract their air tubes.



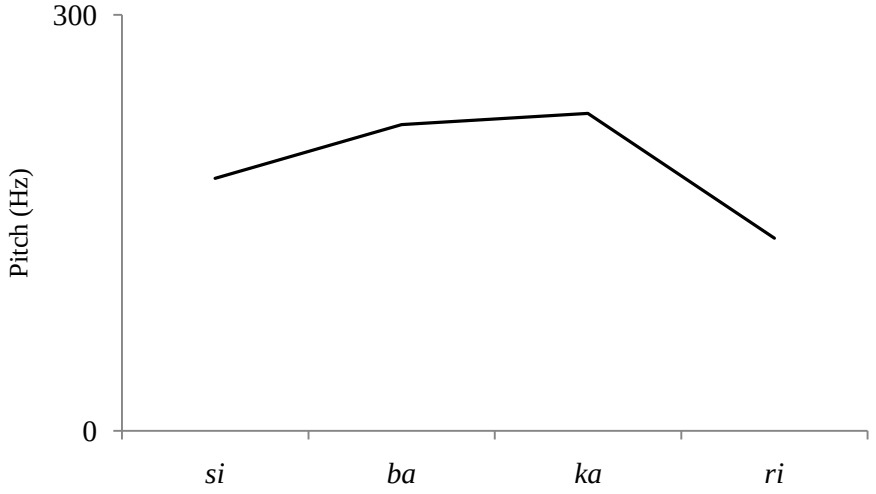


Figure 4.1. Both graphs depict pitch of the same stimulus *sibakari*. The top graph is the actual pitch contour *Praat* shows. The bottom graph describes the measured pitches for each mora. Fundamental frequency (*F*0) of this bottom graph was measured approximately at the middle of the vowel.

These teaching techniques were introduced previously in textbooks for practicing Japanese pronunciation or created especially for this study based on suggestions from previous Japanese accent acquisition studies.

Therefore, as explained above, exercises[12] for practicing perception and production were implemented during sessions in an integrated manner while focusing on this study's pedagogical objectives.

4.1.4 Results of Knowledge Test and Trainees' Evaluation on Training

All 31 participants who had training took the knowledge test (see Appendix C). Since this was a review test for learners, it included a listening section, descriptive, and application questions for nouns and verbs. In keeping with the aim of this study, the results of descriptive and application parts for nouns were summarized. Table 4.2 describes the questions and lists the numbers of people who answered the questions correctly. Descriptive parts required learners to explicitly address what a Japanese accent is. Answers for question 3 were the *syntactic function* and the *distinctive function*. However, learners had to use their own words to explain what these were. Some sample of learners' answers, "it [accent] marks the boundaries of Japanese words," or "[accent] separates words in sentences," were graded as correct answers. As to the distinctive functions, many answered correctly; a typical answer was "it [accent] indicates meaning of a word *ame* and *a'me.*" For the application part, learners were tested on their ability to interpret different types of accent marks. There was examination of whether learners could predict a pitch pattern of a whole word from a provided accent location. As summarized in Table 4.2, a majority of participants answered all questions correctly. Judging from these results, one can conclude that learners retained information they learned during training and could apply these accent rules to determine accentual patterns for words.

[12] Specific exercises can be seen in Power Point slides in Appendix E.

Table 4.2

Knowledge Test Results Summary

Types of Question			N
Description	Q1	Explain what Japanese accent and how it is different from English accent.	28
	Q2	Explain what "accent" means with your own words.	29
	Q3	Provide two reasons why Japanese accent is important.	
		1) [syntactic function]	27
		2) [distinctive function]	29
Application	Q4	Predict pitch patterns of nouns from the accent location	
		a) ao'musi	29
		b) na'nohana	28
		c) nokogi'ri	28
		d) yakisoba	27
	Q5	Find the pitch pattern for words using a Japanese dictionary	
		a) nonezumi ②	24
		b) megusuri ②	24

Note. Number indicates the number of participants answering each question correctly. The total number of participants taking this test was 31.

In addition, 31 participants submitted their answers to the *training questionnaire*. The questionnaire was conducted anonymously and asked learners about their motivation to attend training sessions and their thoughts on learning Japanese pitch accent. Other questions addressed how learners rated the style of the sessions using a scale of 1 (I didn't like it) to 5 (I liked it very much) and how helpful the training was for gaining knowledge, perception, or production, using a scale of 1 (it wasn't helpful at all) to 5 (it was helpful a lot) for all three. Learners were asked for comments on what the instructor and the sessions did well and on what needed improving.

Twenty-six participants stated "[The reason to attend all of the sessions was that I] wanted to learn about Japanese accent." This statement reflects participants' strong motivation to learn about Japanese pitch accent. In response to the question about how much learners liked the training, the average score was 4.35. In response to the question about how this training was

helpful for gaining knowledge, perception, and production, the average scores were 4.68, 4.38, and 4.53. These scores indicated the learners' high overall satisfaction with training.

Numerous additional comments reflected participants' motivation to learn about Japanese pitch accent. Ten participants stated that "sessions should be longer than 30 minutes; or more than 6 times." Four participants said that "[I] needed assignments or website resources to practice at home." Eight participants mentioned "[I noticed that I] need more practice." In addition, eight participants stated, "[I] still have a difficulty in production." These comments showed that awareness increased among participants. From a pedagogical perspective, the training succeeded at raising students' awareness and at motivating students to improve. Student survey results also indicated that students who participated in this study were exceedingly motivated to improve their abilities, which was an important finding for language teachers to acknowledge.

4.2 Method: Perception Task

In this perception task, "perception ability" refers to the ability to identify the location of accent in words. "Accent" is the location of the pitch fall in Japanese words.

4.2.1 Participants

Forty-five native speakers of American English who were taking the second or the third-year level of Japanese language courses at a university participated in this study. Most of the Japanese proficiency levels for these students were categorized as *Novice High* or *Intermediate Low* based on the ACTFL OPI/ WPT guidelines.[13] Participants were divided into an experimental group (EG) and a control group (CG)[14] to examine effects of the training.

[13] Guidelines to assess the functional language ability determined by American Council on the Teaching of Foreign Languages. OPI stands for Oral Proficiency Interview. WPT stands for Writing Proficiency Test.

[14] Since the population was limited in number, information on this study was made available to all second and third year Japanese students to recruit them as participants. Everyone participating in the study showed interest in taking

Participants who were in EG took Japanese pitch accent training sessions, which was the treatment of study 2. These training sessions were conducted by the researcher outside the students' regular Japanese language courses. In other words, EG members took these training sessions in addition to their regular Japanese language courses. CG members took no training sessions but did attend regular Japanese language courses during the treatment period. Table 4.3 presents the participants' detailed information. No participants reported speech or hearing impairments.

Table 4.3

Participants for Perception Task

Group	Level	N	
Experimental Group	2nd year	24	(F:10, M:14)
	3rd year	7	(F:2, M:5)
Control Group	2nd year	6	(F:2, M:4)
	3rd year	8	(F:4, M:4)

Note. F = female; M = male. *Level* indicates the designation of the regular Japanese language courses participants took while this study was conducted.

4.2.2 Stimuli

The stimuli used in study 2 consisted of forty four-mora Japanese nouns. These forty noun stimuli were composed of four types of accentual patterns: no-accent, initial accent, and two types of medial accent patterns (10 of each pattern). As explained in previous chapters, "accent" represents the location in words where pitch falls. For example, the four-mora word "LHHL"[15] has an accent on the third mora. "L" and "H" indicate morae that are realized with low pitch and high pitch, respectively. This study used the following four types of accentual patterns:

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the sessions. Students who had time conflicts affecting completion of training sessions were asked to join the control group. For ethical reasons, training sessions were also provided for these students after completion of all experiments.

[15] When a word is described with a pitch using *L* and *H* it is notated in accordance with the moraic unit.

- *No- accent (type 0),* which has no accent, realized with LHHH (e.g., *gakusee* 'student'),
- *1st accent (type 1),* an accent on the first mora: HLLL (e.g., *ka'makiri* 'mantis'),
- *2nd accent (type 2),* an accent on the second mora: LHLL (e.g., *hima'wari* 'sunflower'),
- *3rd accent (type 3),* an accent on the third mora: LHHL (e.g., *tamane'gi* 'onion').

In addition, 20 stimuli (half of the stimuli) are called *old* stimuli; the other 20 stimuli are called *new* stimuli in this study. *Old* stimuli were composed of nouns with which participants were relatively familiar. Most of these old stimuli were obtained from the beginning levels of Japanese language textbooks.[16] These old stimuli were tested in both pre- and posttest and practiced during training sessions. By contrast, *new* stimuli were composed of nouns that did not appear in the beginning levels of Japanese language textbooks. A set of 20 less frequently used nouns was collected from the NTT database that was based on issues of the Japanese newspaper titled *Asahi Shinbun* [*Asahi* newspaper] from 1985 to 1998. This database describes the word frequency rate 360,000 lexical items. These new stimuli were tested to examine whether or not the results could be generalized. Thus, unlike the old stimuli, new stimuli were used only in pre- and posttests, not during the training sessions. As presented in results of *Study 1: Identification test*, the words containing a special mora affected the perception scores. Words containing a special mora were significantly more difficult for participants to identify the location of the accent compared to words without a special mora (see 3.2.2 Moraic Types). Therefore, none of the 40 stimuli in *Study 2* contained long vowels and geminates that are considered special morae.

All 40 stimuli were randomized, read aloud, and recorded by a 32-year-old female native speaker of Tokyo Japanese. Recording was conducted with a cardioid microphone in a soundproof room. These recorded stimuli were entered into a computer and analyzed

[16] Most students participating in this study used Hatasa, Y., Hatasa, K., & Makino, S. (2000). *Nakama 1*. Boston, MA: Houghton Mifflin Company. Hatasa, Y., Hatasa, K., & Makino, S. (2002). *Nakama 2*. Boston, MA: Houghton Mifflin Company.

acoustically with the software *Praat*. Each stimulus had its fundamental frequency (*F*0) measured approximately at the middle of four vowels. Table 4.4 provides the acoustical measurement of *F*0 (Hz) of all 40 stimuli.

Table 4.4

Fundamental Frequency (F*0) of the Forty Stimuli in the Perception Task*

Old Stimuli (Hz)									
Type 0	1	2	3	4	Type 1	1	2	3	4
gakusee	175	NA	251	248	*mainiti*	295	285	180	148
niwatori	201	245	236	217	*ongaku*	280	243	146	145
hitogomi	NA	254	262	243	*kamakiri*	310	262	202	150
yakisoba	183	NA	255	250	*nanohana*	287	255	185	139
nagagutu	189	245	251	236	*maigetu*	272	266	151	NA
Type 2	1	2	3	4	Type 3	1	2	3	4
nonezumi	185	280	185	146	*tamanegi*	200	243	294	143
megusuri	192	282	167	145	*kanaduti*	197	251	263	149
himawari	215	288	173	151	*asiato*	192	272	261	145
kudamono	218	260	200	148	*sibakari*	203	219	233	132
aomusi	211	276	208	148	*nokogiri*	173	240	237	139
New Stimuli (Hz)									
Type 0	1	2	3	4	Type 1	1	2	3	4
sitasaki	NA	253	248	224	*katakosi*	321	214	152	146
sotogake	179	245	236	227	*tateyoko*	304	215	153	145
tanaita	180	242	251	219	*kuzunoha*	303	238	159	158
mizugoke	176	248	244	220	*asemizu*	255	220	160	148
soragoto	184	226	245	216	*raigetu*	268	225	159	134
Type 2	1	2	3	4	Type 3	1	2	3	4
tateuta	203	286	208	148	*bundoki*	277	288	293	140
narezusi	195	297	174	150	*tatikuzu*	197	NA	288	124
kakejiku	185	307	170	143	*hirugoro*	215	261	276	145
todomatu	204	295	193	142	*kahukubu*	183	NA	298	147
azemiti	179	275	199	153	*ayatori*	170	258	263	152

Note. 1, 2, 3, and 4 indicate the mora. Each number describes the fundamental frequency (*F*0). Pitch contour did not appear for NA due to vowel devoicing.

4.2.3 Test Procedure

The perception pretest was conducted in week 1; the posttest was conducted in week 6. The content of the pre- and posttest were identical. The recorded forty stimuli were randomized; a single audio file was created with the software *Audacity*. Each stimulus was played once and then repeated after a one-second pause. This procedure was followed by a seven-second pause while participants indicated an answer on the answer sheet. Then, the next stimulus was played. This test took about ten minutes to complete, with five practice words inserted as examples before the real test began.

The answer sheet had a questionnaire section (see Appendix F); participants were asked about their background for learning Japanese. After they had completed the questionnaire and read the directions, participants were asked to start the test. They were told to indicate the accent mark at the location of accent with the symbol mark "¬" after listening to each stimulus. Forty stimuli were written on the answer sheet with Japanese *hiragana* orthography. Participants were asked to circle "none" when they thought they heard no pitch fall. Tests took place in a quiet classroom; participants who were in the same proficiency level took the test simultaneously after their regular Japanese course session.

4.2.4 Analysis

Perception pre- and posttest answers obtained from participants were analyzed taking the following points into consideration. Accuracy rates of 1) old (trained) stimuli and new stimuli; 2) four accentual patterns, type 0, type 1, type 2 and type 3. These performances were also analyzed by dividing all participants into two groups, *top* and *bottom*. Figure 4.2 illustrates distribution of total pretest scores of all participants.

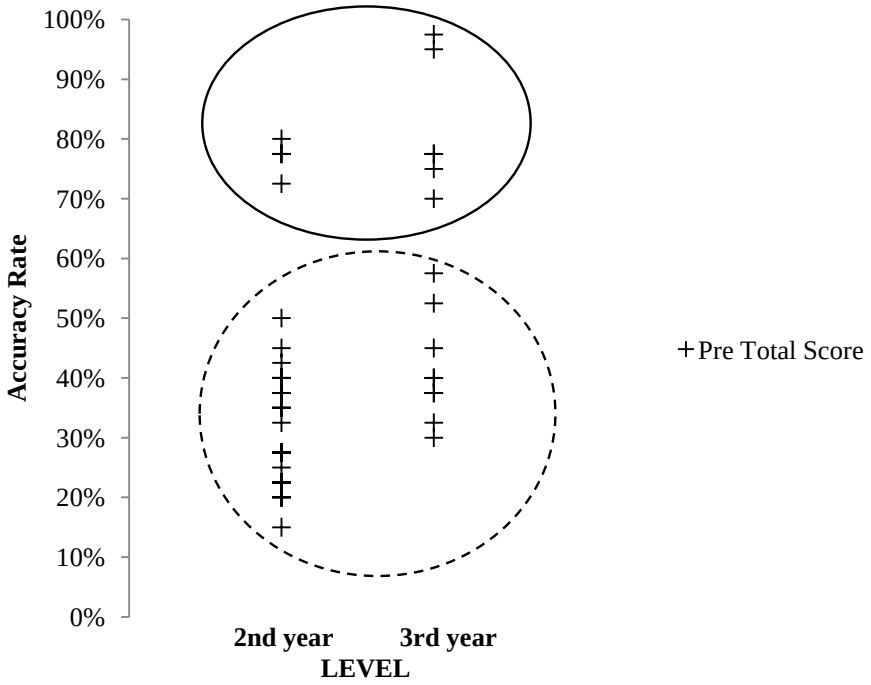

Figure 4.2. Grouping participants into top- and bottom groups. "+" describes the total accuracy rate on the perception pretest for each participant. Participants were grouped into top and bottom groups based on their pretest scores. Based on the cluster analysis results, participants who scored higher than 70% on their pretest were categorized as the top group (solid line). Participants who scored lower than 58% on their pretest were categorized as the bottom group (dashed line).

This grouping was carried out to examine how participants who were or were not originally adept at perceiving the Japanese pitch accent would improve through the training. The grouping of top and bottom groups was based on the results of all participants' pretest scores. The hierarchical cluster analysis generated two clusters: participants who scored more than 70% on their pretest were categorized in the top group and participants who scored less than 58% on their pretest were categorized in the bottom group. No participant scored points between 70% and 58%. The distribution of participants in each group is illustrated in Table 4.5.

Table 4.5

Participants in Top and Bottom Groups for Perception Task

Group	Level	N	
		Top Group	Bottom Group
Experimental Group	2nd year	4	20
	3rd year	3	4
Control Group	2nd year	0	6
	3rd year	3	5

Note. Level indicates the designation of the regular Japanese language courses participants took while this study was conducted.

Using the same analyses conducted for all participant group members, the results of the top participant group and the bottom participant group were analyzed.

4.3 Results: Perception Task

This perception task examined the ability of participants to identify the location of accent in target Japanese words.

Perception test results of trainees (EG participants) and CG participants were analyzed to examine whether perception ability improved because of training. This study found statistically significant improvements in perception ability in several conditions in the EG. No statistical improvement was found in the CG's results under any conditions. Conditions were stimulus types: *old* or *new stimuli* and four accentual patterns: *type 0, type 1*, *type 2*, and *type 3* stimuli. Secondly, results were subdivided further based on participants' original perceptual ability regarding Japanese pitch accent: *top group* and *bottom group*. The result revealed that not only top group trainees but also bottom group trainees were able to improve perception of the Japanese pitch accent location.

Detailed results are illustrated in the order of *all participants group, top and bottom participants group*. Note that all statistical results (dependent *t* test results for the improvement

from pretest to posttest within group) are provided in Table 4.6 for all participants group, and in Table 4.7 and 4.8 for top and bottom participants groups. Other statistical results will be explained in the text. As stated above, no statistically significant improvements were found in the CG's scores from pre to posttest. Therefore, EG's improvement from pre to posttest are the focus of discussion in this section.

4.3.1 All Participants Group

4.3.1.1 Improvement and generalization.

Figure 4.3 illustrates the accuracy rate scores for trained words (old stimuli) and generalization words (new stimuli) for both EG and CG. These results were analyzed using a three-way ANOVA of Test (pretest, posttest), Stimulus (old, new), with Group as factor. A significant main effect of Test [$F(1, 43)= 28.490$, $p<.001$], Stimulus [$F(1, 43)= 18.228$, $p<.001$], and a significant Test x Group interaction [$F(1, 43)= 9.855$, $p=.003$] were found. However, Stimulus x Group interaction [$F(1, 43)= 3.624$, $p=.064$], Test x Stimulus interaction [$F(1, 43)= 1.311$, $p=.258$], and Test x Stimulus x Group interaction [$F(1, 43)= 1.964$, $p=.168$] did not reach significance.

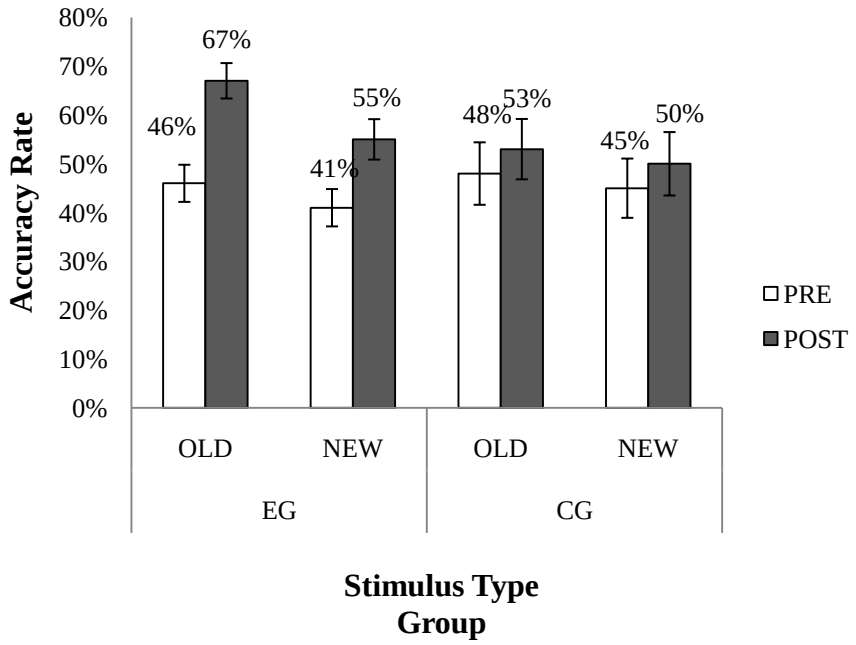

Figure 4.3. All participants' mean accuracy rates of identifying accent location by stimuli. EG's improvement was significantly greater than was CG's improvement for both old (trained) and new stimuli.

To investigate further, two *t* tests were conducted. First, an independent *t* test was conducted for each pre- and posttest stimulus type, with Group as factor. There were no significant differences in the pretest for both old stimuli [$t(43)= -.309$, $p<.759$] and new stimuli [$t(43)= -.491$, $p<.626$]. This indicates that perception ability for both old and new stimuli of learners in both groups was comparable before training. As to the posttest, old stimuli reached significance [$t(43)= 2,141$, $p=.038$]; this means that EG's posttest score for old stimuli (67%) was significantly higher than the score of CG (53%). However, new stimuli did not reach significance [$t(43)= .756$, $p<.454$], meaning that EG's posttest score for new stimuli (55%) was not significantly different from the score for CG (50%). Next, a dependent *t* test was conducted for each group, with Stimulus as factor. A dependent *t* test found significance for both old stimuli and new stimuli only in EG; old stimuli: [$t(30)= 6.744$, $p<.001$], new stimuli: [$t(30)= 5.146$, $p<.001$]. Therefore, EG's posttest score for old stimuli (67%) was significantly higher than its pretest score (46%), and

EG's posttest score for new stimuli (55%) was significantly higher than its pretest score (41%). Contrarily, neither of the stimulus types showed statistically significant improvement for CG. This indicates that training significantly improved trainees' perception to Japanese pitch accent not only in words that they practiced, but also in words they had never encountered.

4.3.1.2 Improvement in accentual patterns and generalization.

The overall total accuracy rates for the EG and CG at the pretest and the posttest of each accentual pattern are displayed in Figure 4.4, and analyzed using a three-way ANOVA of Test (pretest, posttest) and Accentual Pattern (type 0, type 1, type 2, type 3), with Group as factor. A significant main effect of Test [$F(1, 43)= 28.490$, $p<.001$], Accentual Pattern [$F(3, 129)= 44.206$, $p<.001$], a significant Test x Group [$F(1, 43)= 9.855$, $p=.003$], and Test x Accentual Pattern x Group interaction [$F(3, 129)= 3.359$, $p=.021$] were found. Accentual Pattern x Group interaction [$F(3, 129)= .695$, $p=.557$] and Test x Accentual Pattern [$F(3, 129)= 1.389$, $p=.249$] did not reach significance. First, an independent *t* test was calculated for each accentual pattern for pre- and posttest, with Group as factor. An independent *t* test found a significant difference only in post-type 1 [$t(43)=2.486$, $p=.017$]. This means that the EG's posttest score on type 1 (49%) was significantly higher than the score for CG (22%). This suggests the training effect on type 1 was remarkable. Second, a dependent *t* test was conducted. EG's statistical results reached significance for type 1 [$t(30)=6.554$, $p<.001$], type 2 [$t(30)=3.542$, $p=.001$], and type 3 [$t(30)=3.629$, $p=.001$], indicates that trainees improved significantly from pretest to posttest for these three accentual patterns. As to the CG, none of the accent types showed statistically significant improvement.

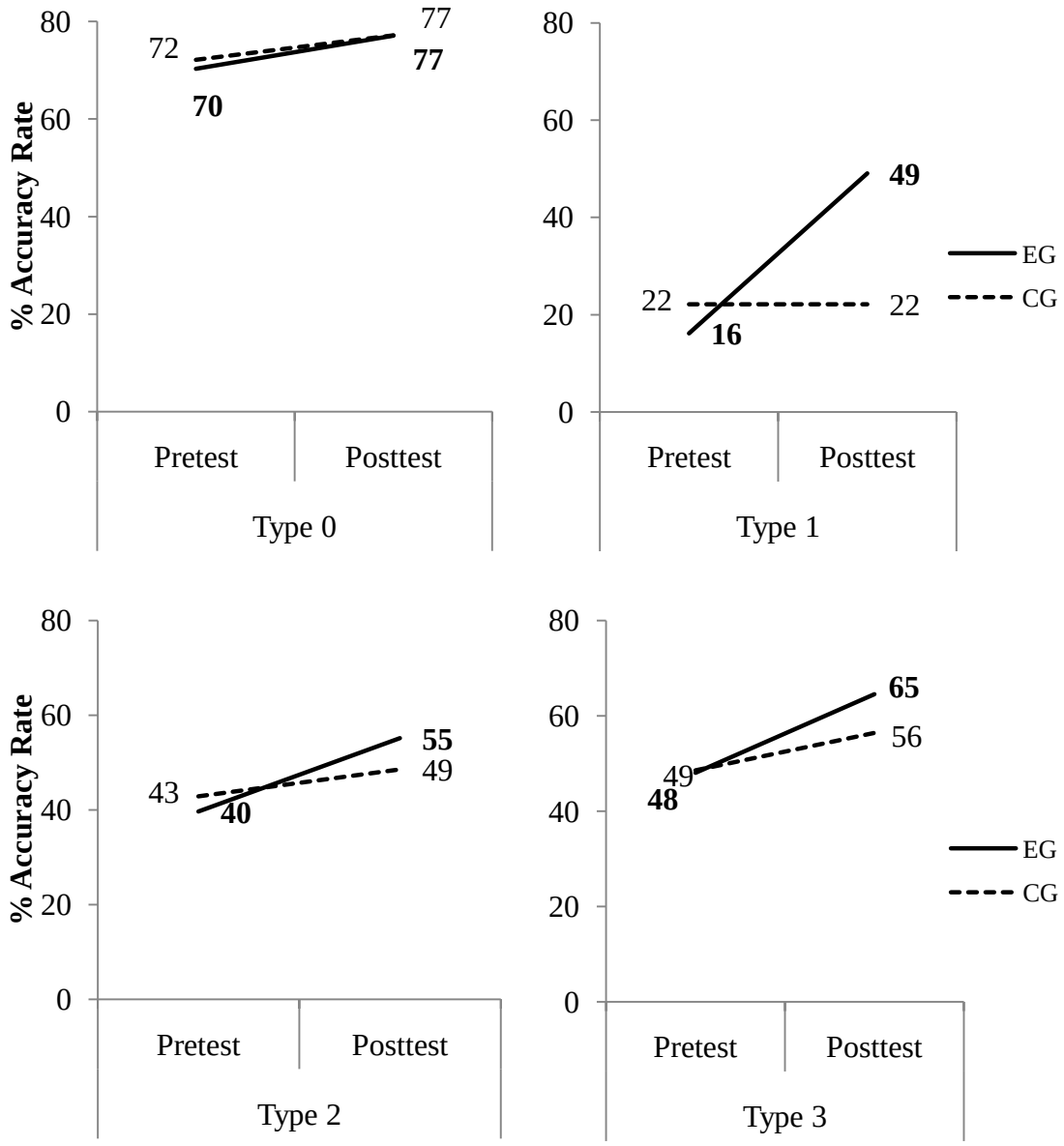

Figure 4.4. Mean accuracy rates of identifying accent location for all stimuli obtained from participants in the EG and CG. Accuracy rates are depicted by accentual patterns: type 0, type 1, type 2, and type 3.

The EG's performance for each accentual pattern is illustrated in Figure 4.4. EG's posttest scores on type 1 (49%), type 2 (55%), and type 3 (65%) were significantly higher than its pretest scores (16%), (40%), and (48%), respectively. Even though EG improved 7% on type 0 from pretest (70%) to posttest (77%), its results did not reach significance [$t(30)=1.496$, $p=.145$].

As shown in Table 4.6, where these dependent *t* test results are summarized, EG's statistical results reached significance on improvement for old stimuli and new stimuli and three accentual patterns (type 1, type 2, and type 3), while CG's results did not reach significance in any of these conditions. This confirms the effect of training.

Table 4.6

Dependent t *test Results for Perception Task of All Participants Group*

	Experimental Group			Control Group	
Stimulus Types	*t* (30)		*p*	*t* (13)	*p*
all stimuli (total)	6.961	***	<.001	1.773	.100
old stimuli	6.744	***	<.001	1.249	.234
new stimuli	5.146	***	<.001	1.363	.196
type 0	1.496		.145	.979	.346
type 1	6.554	***	<.001	.000	1.000
type 2	3.542	**	.001	.834	.419
type 3	3.629	**	.001	.231	.821
old-type 0	1.880		.070	1.662	.120
old-type 1	5.778	***	<.001	1.000	.336
old-type 2	2.786	**	.009	1.249	.234
old-type 3	4.588	***	<.001	.159	.876
new-type 0	.793		.434	.486	.635
new-type 1	5.730	***	<.001	.520	.612
new-type 2	2.552	*	.016	.322	.752
new-type 3	1.507		.142	.455	.657

Note. This table displays results of dependent *t* tests on perception improvements from pre- to posttest of all participants. All significant differences are marked as follows: ***p<.001, **p<.01, *p<.05.

4.3.2 Top and Bottom Participants Group

4.3.2.1 Improvement and generalization.

This section investigated the same data by dividing participants into two groups, top and bottom, to examine whether participants who were originally not adept at identifying the accent location. Figure 4.5 illustrates the accuracy rate scores for trained words (old stimuli) and generalization words (new stimuli) for all four groups: Top-EG, Top-CG, Bottom-EG, and Bottom-CG. These results were analyzed using a three-way ANOVA of Test (pretest, posttest),

Stimuli (old, new), with Group (Top-EG, Top-CG, Bottom-EG, Bottom-CG) as factor. A significant main effect of Test [$F(1, 41)= 15.495$, $p<.001$], Stimulus [$F(1, 41)= 9.362$, $p=.004$], and a significant Test x Group interaction [$F(3, 41)= 4.662$, $p=.007$] were found. A Stimulus x Group interaction [$F(3, 41)= 1.436$, $p=.246$], a Test x Stimulus interaction [$F(1, 41)= .730$, $p=.398$], and a Test x Stimulus x Group interaction [$F(3, 41)= .671$, $p=.575$] did not reach significance.

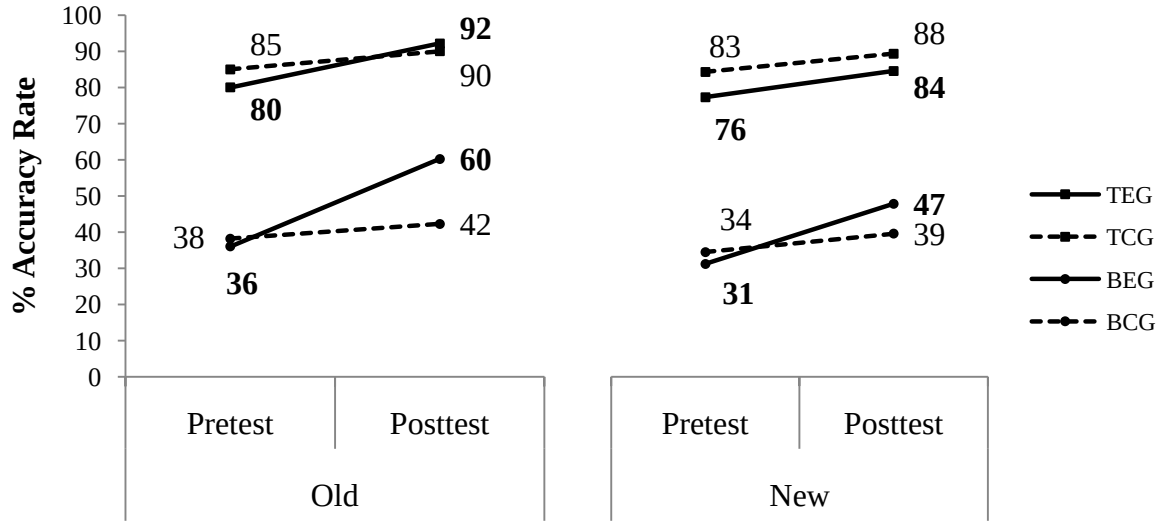

Figure 4.5. Participants in four groups' accuracy rates of old and new stimuli

A one-way ANOVA calculating for each stimulus type, with Group investigated these effects further. There was significance for each stimulus type: pre-old [$F(3, 41)= 33.963$, $p<.001$], post-old [$F(3, 41)= 19.302$, $p<.001$], pre-new [$F(3, 41)= 54.650$, $p<.001$], post-new[$F(3, 41)= 15.144$, $p<.001$]. A *post hoc* analysis indicated that results of Top-groups and Bottom-groups were significantly different from each other, and there was no significance within Top-groups or Bottom groups except for post-old stimuli of Bottom-groups [$p=.014$]. This means that Bottom-EG's posttest score for old stimuli (60%) was significantly higher than Bottom-CG's posttest score (42%). This means Bottom-EG and CG's accuracy rates for old stimuli were comparable

at the start, but trainees' performance was significantly better after training. A dependent *t* test was examined for each group with Stimuli as factor. Top-EG improved for old stimuli from pretest to posttest significantly [$t(6)=3.740$, $p=.010$]; this indicates that their posttest score for old stimuli (92%) was significantly higher than its pretest score (80%). By contrast, Top-CG's posttest score for old stimuli (90%) was not significantly different from its pretest score (85%). As to the new stimuli, Top-EG's posttest score (84%) was not significantly higher than pretest (76%). Top-CG's scores for new stimuli from pretest (83%) to posttest (88%) did not reach significance. Bottom-EG improved for both old and new stimuli significantly from pretest to posttest. As to the old stimuli, Bottom-EG's posttest score (60%) was significantly higher than its pretest score (36%) [$t(23)=3.125$, $p<.001$]. Furthermore, Bottom-EG's posttest score for new stimuli (47%) was significantly higher than its pretest score (31%) [$t(23)=5.250$, $p<.001$]. Similar to Top-CG, Bottom-CG did not reach significance in any of these conditions. This indicates that effects of training extended to novel stimuli and also that training was effective for those who were not adept to become better at identifying the accent location in words before training. This revealed that training improved perceptual ability not only for trainees who were originally adept at identifying the accent location, but also for those who were not originally adept at identifying the accent location.

4.3.2.2 Improvement in accentual patterns and generalization.

The EG and CG's performance for each accentual pattern is illustrated in Figure 4.6. The overall total accuracy rates for the Top-EG, Top-CG, Bottom-EG, and Bottom-CG at the pre- and the posttest of each accentual pattern were analyzed using a three-way ANOVA of Test (pretest, posttest), Accentual Pattern (type 1, type 2, and type 3), with Group as factor. There were significant main effects of Test [$F(1, 41)= 15.495$, $p<.001$], Accentual Pattern [$F(3, 123)=$

22.155, p<.001], a significant Test x Group [F(3, 41)= 4.662, p=.007], and a significant Accentual Pattern x Group interaction [F(9, 123)= 2.547, p=.01] were found. However, Test x Accent interaction [F(3, 123)= .995, p=.398] and Test x Accent x Group [F(9, 123)= .040, p=.157] did not reach significance.

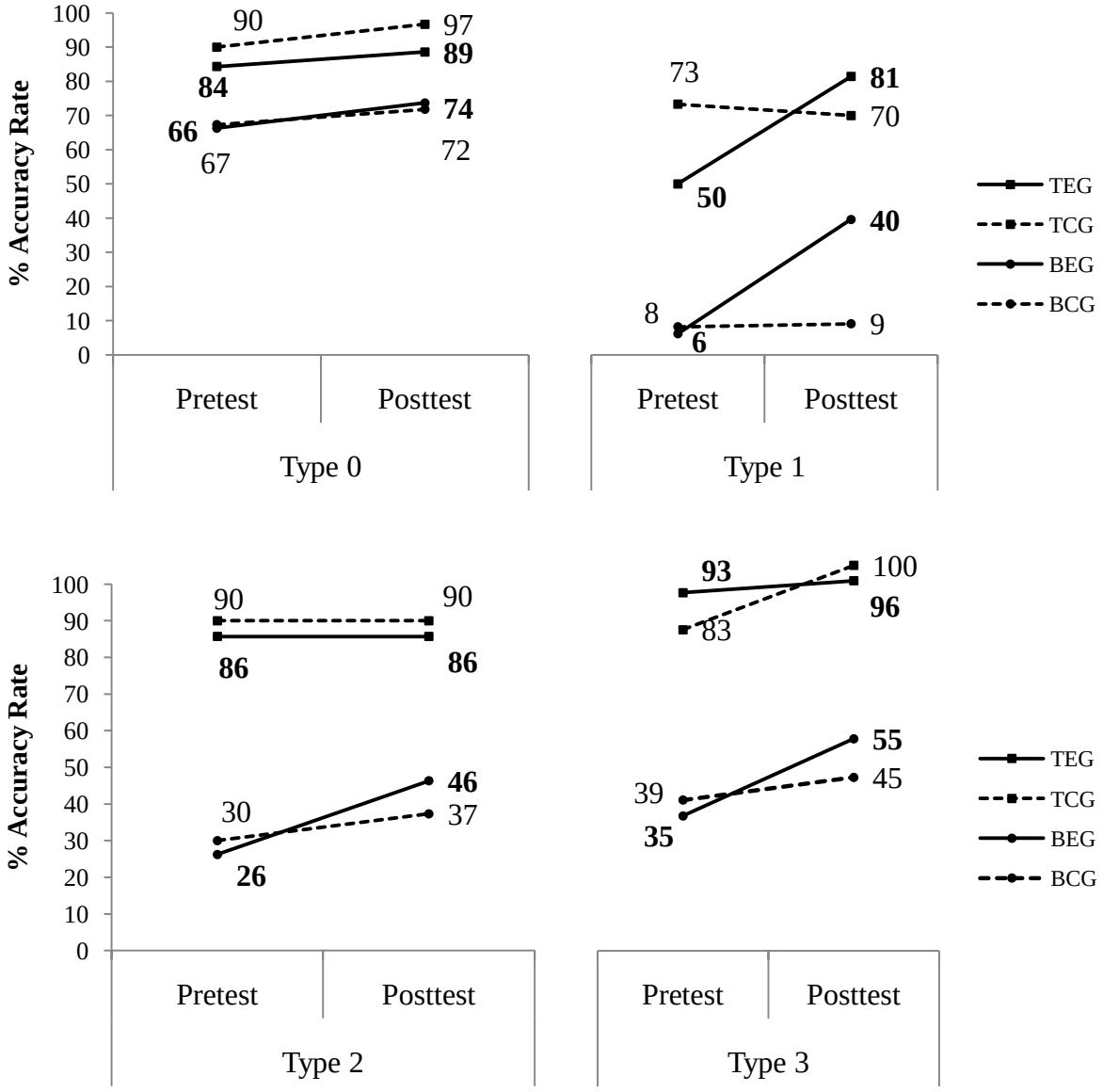

Figure 4.6. Participants in four groups' accuracy rates of all accentual patterns

To further investigate these effects, a one-way ANOVA calculated for each accentual pattern with Group as factor. Significance was found in pre-type 1 [F(3, 41)= 21.472, p<.001], post-

type 1[$F(3, 41)= 11.380$, $p<.001$], pre-type 2 [$F(3, 41)= 29.778$, $p<.001$], post-type 2 [$F(3, 41)= 11.733$, $p<.001$], pre-type 3 [$F(3, 41)= 14.073$, $p<.001$], and post-type 3 [$F(3, 41)= 10.438$, $p<.001$]. A *post hoc* showed that scores of top-groups and bottom-groups are significantly different from each other. A dependent *t* test was conducted for each group with Accentual Pattern as factor. In Top-EG's results, significance was found for type 1[$t(6)=3.930$, $p=.008$]. This indicates that Top-EG's posttest score on type 1 (81%) was significantly higher than its pretest score (50%). However, Top-EG's type 0, type 2, and type 3 results did not reach significance. This means that Top-EG's posttest scores on type 0 (89%), type 2 (86%), and type 3 (96%) were higher but not significantly different from its pretest scores (84%), (86%), and (93%). As to the Top-CG, none of the accent types showed statistically significant improvement. In Bottom-EG, significance was found for type 1 [$t(23)=5.439$, $p<.001$], type 2 [$t(23)=3.943$, $p=.001$], and type 3 [$t(23)=3.990$, $p=.001$]. This indicates that Bottom-EG's posttest scores on type 1 (40%), type 2 (46%), and type 3 (55%) were significantly higher than its pretest (6%), (26%), and (35%) respectively. However, Bottom-EG's type 0 results did not reach significance. This shows that Bottom-EG's posttest score on type 0 (74%) was not significantly different from its pretest score (66%). As to the Bottom-CG, dependent *t* test did not derive statistical significant improvements in any accentual pattern.

Table 4.7

Dependent t *test Results for Perception Task of Top Participants Group*

	Experimental Group			Control Group	
Stimuli Types	*t* (6)		*p*	*t* (2)	*P*
all stimuli (total)	2.815	*	.031	2.000	.184
old stimuli	3.740	*	.010	1.732	.225
new stimuli	1.263		.253	0.866	.478
type 0	.626		.555	1.000	.423
type 1	3.930	**	.008	.378	.742
type 2	.000		1.000	.000	1.000
type 3	1.000		.356	0.378	.742
old-type 0	.000		1.000	1.000	.423
old-type 1	3.032	**	.023	1.000	.423
old-type 2	1.549		.172	1.000	.423
old-type 3	2.121		.078	2.000	.184
new-type 0	.891		.407	1.000	.423
new-type 1	4.804	**	.003	.000	1.000
new-type 2	.400		.703	1.000	.423
new-type 3	.548		.604	.000	1.000

Note. This table displays results of dependent *t* tests on perception improvements from pre- to posttest of top group participants. All significant differences are marked as follows: ***p<.001, **p<.01, *p<.05.

Table 4.8

Dependent t *test Results for Perception Task of Bottom Participants Group*

	Experimental Group			Control Group	
Stimuli Types	*t* (23)		*p*	*t* (10)	*P*
all stimuli (total)	6.374	***	<.001	1.370	.201
old stimuli	3.125	**	<.001	.938	.370
new stimuli	5.250	**	<.001	1.106	.295
type 0	1.349		.190	.713	.492
type 1	5.439	***	<.001	.289	.779
type 2	3.943	**	.001	.841	.420
type 3	3.669	**	.001	.000	1.000
old-type 0	1.941		.065	1.491	.167
old-type 1	4.906	***	<.001	.559	.588
old-type 2	2.598	*	.016	1.047	.320
old-type 3	4.476	***	<.001	.489	.635
new-type 0	.484		.633	.760	.465
new-type 1	4.580	***	<.001	.803	.441
new-type 2	3.395	**	.002	.489	.635
new-type 3	1.701		.102	.559	.588

Note. This table displays results of dependent *t* tests on perception improvements from pre- to posttest of bottom group participants. All significant differences are marked as follows: ***p<.001, **p<.01, *p<.05.

4.3.3 Perceived Accentual Patterns

Table 4.9 describes the percentages of accentual patterns that participants perceived when they heard the nouns. This describes the trends of how learners perceive the Japanese pitch accent.

Table 4.9

Confusion Matrices of Perceived Accentual Patterns

	Perceived Accentual Patterns (%)							
	Experimental Group				Control Group			
	type 0	type 1	type 2	type 3	type 0	type 1	type 2	type 3
Actual Accentual Patterns								
Pretest								
type 0	**70**	2	10	15	**72**	2	10	12
type 1	22	**16**	37	21	16	**22**	38	19
type 2	23	4	**40**	30	24	3	**43**	25
type 3	33	2	16	**48**	30	2	16	**49**
Posttest								
type 0	**77**	2	8	13	**77**	3	8	11
type 1	7	**49**	28	15	16	**22**	34	24
type 2	9	2	**55**	32	17	3	**49**	26
type 3	10	7	18	**65**	27	2	12	**56**

Note. Type 0, 1, 2, and 3 represent the accentual pattern of the stimuli. Numbers in bold-faced type represent the accurate identification. For some accentual patterns, the sum of the perceived accentual pattern rate did not add up to 100% due to the participants' mistakes, such as leaving an answer blank.

As expected, participants had high identification accuracy for type 0 stimuli. That is, it was easy for learners to recognize the absence of an abrupt pitch fall. When participants heard type 1 stimuli, it was relatively more likely that they might perceive them as type 2 or type 3, rather than as type 0. Recall that a type 1 word declines the pitch perpetually toward the end of a word after the pitch peak due to the declination. Therefore, this result indicates that learners were not sure where the exact location of the pitch fall was, but could perceive a gradual pitch decline in the type 1 stimuli. Identification Test of Study 1 demonstrated that identification accuracy for type 0 was significantly higher than the other three accentual patterns. By contrast, identification accuracy of type 1 was significantly lower than the other three accentual patterns. The identification accuracy of type 2 and type 3 were not significantly different from each other. Considering this fact, the identification task for type 2 and type 3 stimuli appears to have been

relatively confusing for learners. The confusion matrices showed that learners mistook type 2 for type 0 and type 3. However, when learners heard type 3 stimuli, they mistook it for a type 3 or a type 0 more frequently than for a type 2. This shows that learners knew that there was no abrupt pitch fall after the second mora when they heard a type 3, but were uncertain about whether the pitch decline after the third mora was a "pitch fall for lexical accent" or a pitch declination occurring toward the end of word.

In sum, these confusion matrices suggested the reason learners successfully perceived the pitch movement they heard in words. The results suggest that participants who were unable to identify the accent location during the pretest were not unable to hear the pitch, but were not familiar with what a pitch fall sounds like. The confusion matrix from the trainees' posttest results shows that the training conducted in this study successfully facilitated learners' sense of how Japanese pitch fall for lexical accent sounded. This is shown with the significant difference seen on the identification task for trainees.

4.3.4 Summary of Perception Task Results

This study tested whether the training outlined above improved trainees' perception of Japanese pitch accent significantly. Trainees not only improved the performance of participants who were originally adept at identifying the accent location in words (top-group participants), but also improved the performance of those not originally adept at identifying the accent location in words before the training (bottom-group participants). This indicates that perception of Japanese pitch fall can be improved with training. The results also showed that the effect of Japanese pitch accent training was not limited to trainees' perception in the trained stimuli, but also extended to novel stimuli that participants had never encountered. The top group trainees made significant improvement in their trained stimuli scores and the bottom-group trainees

improved substantially for both trained and new stimuli after training. Trainees improved in their accentual pattern perception for the 1st accent (type 1), 2nd accent (type 2), and 3rd accent (type 3) stimuli from pretest to posttest. Trainees' posttest score of 1st accent stimuli was significantly higher than that of non-trainees. Significant improvement was also found in the scores of 1st accent stimuli of top group trainees, and in the scores of 1st accent, 2nd accent, and 3rd accent stimuli of bottom group trainees. Furthermore, bottom group trainees' posttest score of 1st accent stimuli was significantly higher than those of bottom group non-trainees, and was not significantly different from the scores of top group non-trainees. Study 1 demonstrated that learners' identification accuracy for 1st accent stimuli was significantly lower than the stimuli realized in other accentual patterns. This study's result revealed the effectiveness of this training for accentual patterns, especially for the most difficult 1st accent stimuli. Contrary to the 1st accent stimuli, the identification accuracy for no-accent stimuli (type 0) was significantly higher than the stimuli realized in other accentual patterns. No significant improvement was found for no-accent stimuli, but trainees' posttest scores for no-accent stimuli was higher than its pretest score. Regarding non-trainees, no statistical improvement was found in their results under any conditions. The training of this study successfully facilitated learners' sense of how Japanese pitch fall for lexical accent sounded, as demonstrated by trainees' posttest results displayed in the confusion matrix. The evidence of these results shows that this training worked effectively for improving learners' perception of Japanese pitch accent.

4.4 Method: Production Task

The *production task* in Study 2 aimed to find out whether training could improve two aspects of learners' Japanese pitch accent production. One aspect was learners' ability to recognize proper accentual patterns when they pronounce nouns without accent information.

Accentual patterns for Japanese nouns are not predictable if the accent location is not provided. Therefore, learners have to memorize or rely on their intuition to understand the accentual patterns. By analyzing participants' improvement results, this task examined whether or not training helped learners realize the proper accentual patterns of words when they are not provided with notation indicating the accent location. This test was interesting because Japanese texts do not provide this accent information. The second aspect that study 2 investigated was whether learners could read the accent information correctly and pronounce words with the proper accentual patterns when the accent information was provided in written text. The ability to do this is also important. For example, when learners look up the Japanese accent in a dictionary, they need to read the accent information correctly to understand the accentual patterns. Therefore, in the production test, two sets of identical stimuli were prepared; one with the accent information (using the symbol "¬" on the accent location) and one without the accent information.

This study also analyzed the data of learners' production for each accentual pattern. The previous section of this chapter revealed the degree of difficulty of each accentual pattern in perception. This analysis was conducted to find the degree of difficulty of each accentual pattern in production.

4.4.1 Participants

A total of thirty-three native speakers of American English taking the second or the third-year level of Japanese language courses at a college participated in this study. These individuals also participated in the *perception task*. In the *perception task* there were thirty-one participants in the experimental group (EG). However, due to technical problems during the recording, productions obtained from four participants could not be used for analysis. Therefore, the

production task used productions obtained from only twenty-seven participants. The control group (CG) consisted initially of fourteen participants, who also took a pre and posttest of the *perception task*. However, only six participants took both the *production task* pre- and posttest. No participants reported any speech and hearing impairments. Table 4.10 presents the participants' detailed information.

Table 4.10

Participants for Production Task

Group	Level		N
Experimental Group	2nd year	20	(F=8, M=12)
	3rd year	7	(F=2, M=5)
Control Group	2nd year	5	(F=1, M=4)
	3rd year	1	(F=1, M=0)

Note. F = female; M = male. *Level* indicates the regular Japanese language courses participants were taking while this study was conducted.

4.4.2 Stimuli

The same sets of forty noun stimuli that were used in the *perception task* were used in the *production task* (see 4.2.2 Stimuli). These forty stimuli consisted of four accentual patterns (ten each). Half of the stimuli were practiced during the training (old stimuli) and the other half were not practiced during the training (new stimuli). To examine whether learners could pronounce words properly when accent information was provided or when it was not, two sets of identical forty stimuli were prepared, one with accent information and one without accent information (see Appendix G).

4.4.3 Test Procedure

Recording was conducted with a cardioid microphone in a soundproof room. Participants were individually recorded and stimuli were entered into a computer. In the production test, all participants were asked to pronounce the forty noun stimuli lists, which were written with

Japanese orthography, *hiragana*. First, participants were asked to read aloud the *forty noun stimuli list 1*. No accent information was provided in this list 1. Participants were directed to read them aloud. They were also told to think about how to pronounce each word before actually producing them in order to control the speed of production. Then, participants were asked to read the *forty noun stimuli list 2*. List 2 consisted of the same forty nouns as list 1. However, in list 2, the accent location was indicated for each word using the accent marking symbol "¬." Although all participants were aware that the symbol "¬" was associated with Japanese accent and indicated the accent pitch fall location, no one had formal knowledge of the symbol's use prior to training. Therefore, they did not know how to produce a proper accentual pattern in their pretests. When participants in both groups mispronounced a word segment, they were instructed to repeat the word until they did so correctly (only for segmental errors such as (C)V, not for an accentual error). When instructed to repeat, the research provided no correct modeling. The posttest was conducted in the same way as the pretest was. However, EG participants were made aware of the Japanese accent through training, and should have understood how to use the provided accent symbols. Those in the EG group were also told to apply the knowledge that they had learned from the training sessions. They were also told not to exaggerate the pitch nor slow down the speed when pronouncing the words. This was done to prevent participants who had training from overusing the pitch or slowing down the speed due to any over-consciousness about the pitch accent.

4.5 Method: Judgment Task for Production

4.5.1 Japanese Judges

"Goodness" rating data were obtained from twenty-seven native Japanese speakers in order to evaluate the trainees' improvement in production from pretest to posttest. All

participants were speakers of Tokyo-Japanese. Eighteen participants were recruited in Yokohama, Japan where Tokyo Japanese is spoken. Nine participants were native Japanese speakers who were temporally in the US attending a one-year exchange program. Two participants were living in Yokohama, but were originally from *Niigata* prefecture. The mean age of the judge participants was 29.5 years old. There were 19 female and 8 male native speakers of Japanese that participated in this judgment test. No participants reported any hearing impairments.

4.5.2 Stimuli Sets

All participants' recorded productions were evaluated by native Japanese speakers to examine whether pronunciation improved through training. To accomplish this, twenty-four word productions were used for the judgment test (see an example of test in Appendix I). These 24 stimuli are also displayed in Table 4.11.

Table 4.11

Twenty-four Stimuli for Production Judgment Test

Type 0	Type 1	Type 2	Type 3
gakusee	*ongaku*	*himawari*	*tamanegi*
yakisoba	*kamakiri*	*kudamono*	*asiato*
nagagutu	*nanohana*	*aomusi*	*sibakari*
sotogake	*katakosi*	*narezusi*	*bundoki*
mizugoke	*tateyoko*	*todomatu*	*tatikuzu*
soragoto	*asemizu*	*azemiti*	*ayatori*

Three subsets (out of five), which had similar vowel and consonant environments, were chosen from each accentual pattern (type 0, 1, 2, and 3) and each stimulus type (old and new). Thus, 3 subsets x 4 accentual patterns x 2 stimulus types made a total of 24 words. Each of the 24 words had four different types of conditions from each participant. One condition was whether the production was made before or after the treatment (pretests or posttest production).

The other condition was whether the production was made with the accent information. Therefore, 3,168 nouns were used in this judgment test (33 participants x 24 words x 4 conditions). These were distributed equally with the use of the Latin square design method and nine audio files were created. Each audio file contained all four conditions (pre-without accent symbol, pre-with accent symbol, post-without accent symbol, and post-with accent symbol) of the same nouns that were produced by the same participant. Each audio file has eight different nouns. These eight words consisted of four accentual patterns; type 0, type 1, type 2, and type 3; of *old* and *new* stimuli. Each audio set had 352 words. These words were randomized and audio files were made with the software *Audacity*. Four additional example words were attached to all audio files and a two-second pause was inserted between each stimulus. The judgment test took approximately twenty minutes to complete.

4.5.3 Judgment Test Procedure

All native Japanese speaker judges completed a human consent form and a small questionnaire (see Appendix H). Japanese judges were then asked to listen to one of these nine audio files and evaluated the pronunciation using a Likert scale. They rated the goodness of each word using a scale of 1 (not Japanese native-like) to 5 (Japanese native-like) as quickly as possible. They were asked to answer the "goodness" of what they heard promptly, using their intuition. No payment was given for participation in the judgment test.

4.5.4 Analysis

With the judgment test data, a three-way ANOVA was conducted to see the improvement in production from pretest to posttest. Improvement from pretest to posttest for productions pronounced without accent information and those pronounced with accent marking information

were analyzed. Also, a three-way ANOVA was conducted to analyze the improvement for each accentual pattern between EG and CG.

4.6 Results: Production Task

4.6.1 Production with / without Accent Symbol

Figure 4.7 illustrates the goodness rating scores for stimuli that were produced without an accent symbol, as well as for stimuli that were produced with an accent symbol "¬" for both EG and CG. These results were analyzed using a three-way ANOVA of Test (pretest, posttest), Symbol (with, without), with Group as factor. A significant main effect of Test [$F(1, 52)= 134.717$, $p<.001$], Symbol [$F(1, 52)= 7.689$, $p<.001$], a significant Test x Group interaction [$F(1, 52)= 28.130$, $p=.008$], Symbol x Group interaction [$F(1, 52)= 4.518$, $p=.038$], and Test x Symbol interaction [$F(1, 52)= 28.420$, $p<.001$] were found. Test x Symbol x Group interaction was not significant [$F(1, 52)= .097$ $p=.757$].

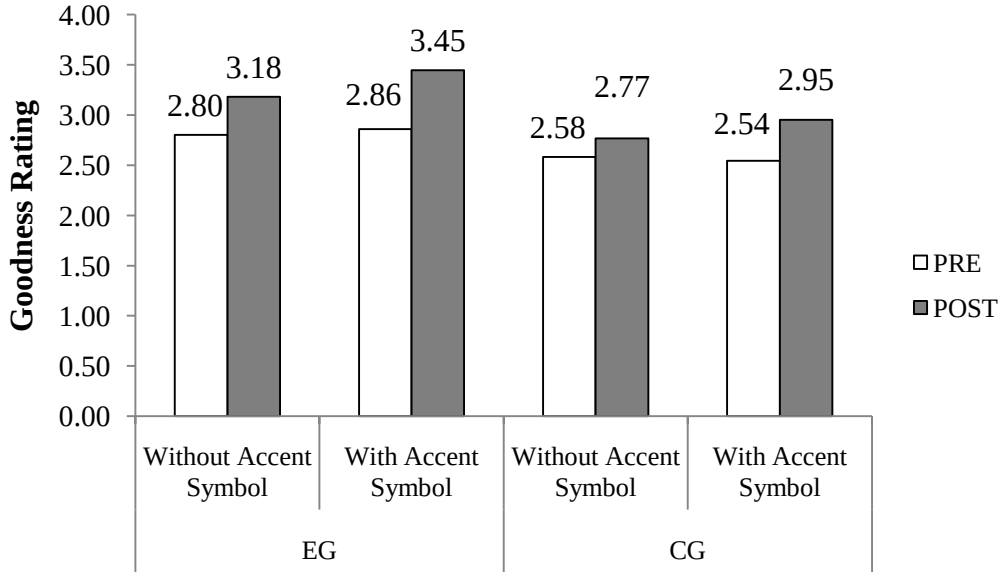

Figure 4.7. Goodness rating for words produced with or without accent symbol. Goodness of learners' production for both conditions: learners pronounced words with and without an accent symbol. Native speakers of Japanese rated goodness of learners' productions using a scale of 1 (not Japanese native like) to 5 (Japanese native like). EG indicates trainees, CG indicated control group participants.

To investigate further, a dependent *t* test was conducted to examine improvement from pre- to posttest. For each condition, trainees (EG-participants) improved significantly from pre- to posttest: without an accent symbol [$t(26)=-10.911$, $p<.001$], with an accent symbol [$t(26)=-12.575$, $p<.001$]. This indicates that the posttest's goodness score of trainees' production, which were produced without accent symbol (3.18), was significantly higher than its pretest (2.80). Trainees' posttest's productions, which were produced with accent symbol (3.45), were also significantly higher than its pretest (2.86). However, the CG also improved in production from pre- to posttest in both conditions: without an accent symbol [$t(26)=-3.071$, $p=.005$] and with an accent symbol [$t(26)=-5.467$, $p<.001$]. This indicates that the posttest's goodness score of CG participants' production, without an accent symbol (2.77) and with an accent symbol (2.95), were also significantly higher than their pretest (2.58) and (2.54), respectively. Next, an independent *t* test was conducted for the improvement from pretest to posttest (posttest score – pretest score). With accent symbol condition, the improvement scores of EG (0.59) and CG (0.41) were not significantly different from each other [$t(52)=1.944$, $p=.057$]. However, without accent symbol condition, EG's degree of improvement (0.38) was significantly greater than that of the CG (0.19) [$t(52)=2.943$, $p=.005$]. This means that trainees' productions, which were pronounced without an accent symbol, improved significantly more than the CG did. Since accent information is not provided in Japanese texts, this ability is important. The exercises provided during training may have contributed to this improvement. As to improvement of "with accent symbol condition," the improvement of the EG was not significantly different from the improvement of the CG, although the statistical result [$p=.057$] was marginally significant. This suggests that more training exercise could lead to further improvement.

4.6.2 Production for Accentual Pattern

Figure 4.8 illustrates the goodness rating scores for each accentual pattern for both EG and CG. These results were analyzed using a three-way ANOVA of Test (pretest, posttest), Accentual Pattern (type 0, type 1, type 2, type 3), with Group as factor. Along with Test [$F(1, 52)= 134.717$, $p<.001$] and Test x Group interaction [$F(1, 52)= 28.130$, $p=.008$] as the previous section explained, a significant main effect of Accentual Pattern [$F(3, 156)= 2.697$, $p=.049$], a significant Accentual Pattern x Group interaction [$F(3, 156)= 7.771$, $p=.001$], Test x Accentual Pattern interaction [$F(3, 156)= 5.155$, $p=.002$], and Test x Accentual Pattern x Group interaction [$F(3, 156)= 5.182$, $p=.002$] were found.

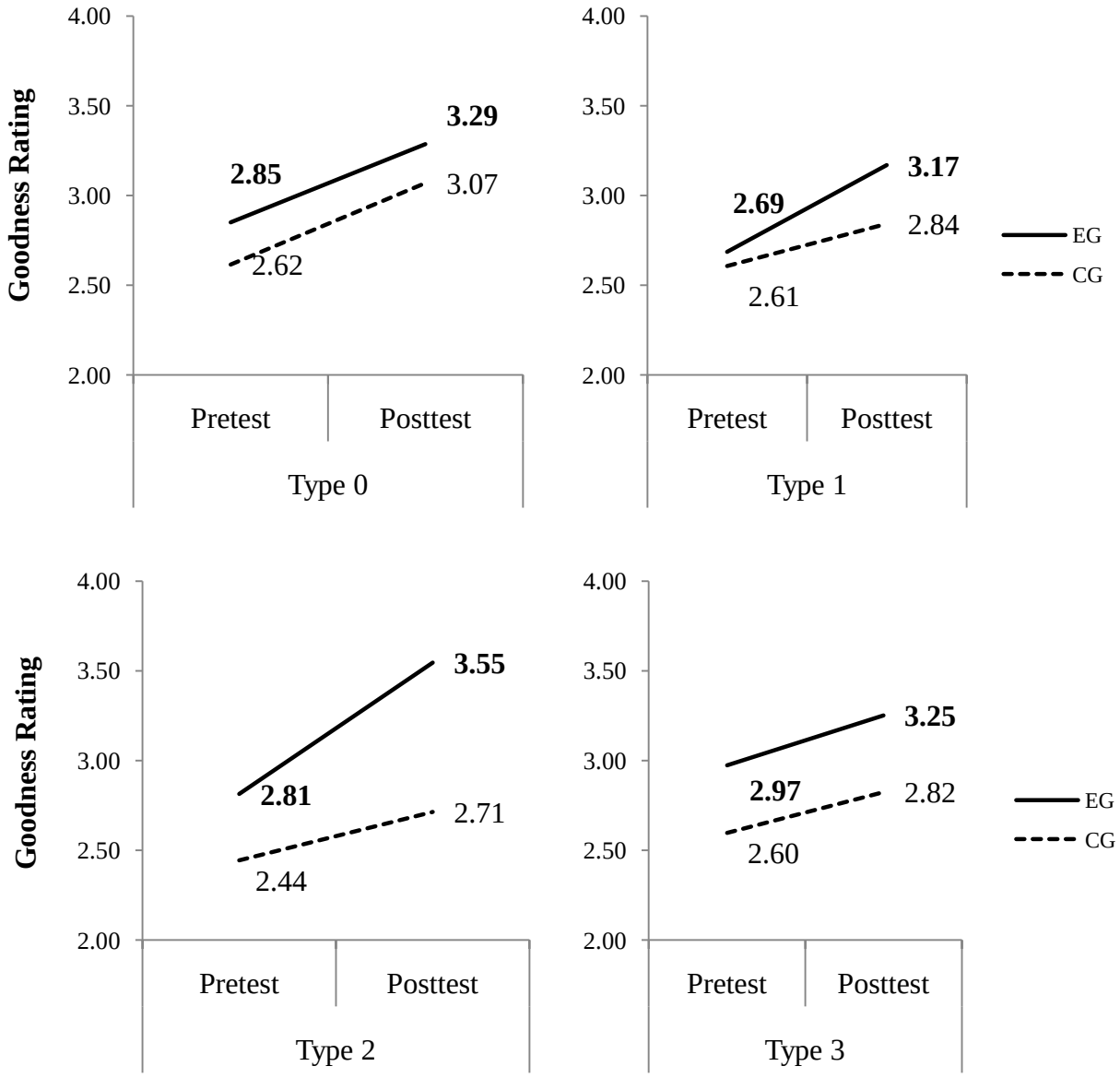

Figure 4.8. Goodness rating for words produced in each accentual pattern. Goodness of learners' production for each accentual pattern: type 0, type 1, type 2, and type 3. Native speakers of Japanese rated goodness of learners' productions using a scale of 1 (not Japanese native like) to 5 (Japanese native like). EG indicates trainees, CG indicated control group participants.

To investigate further, a dependent *t* test was conducted to examine improvement from pre- to posttest. For all accentual patterns, trainees improved significantly from pre- to posttest: type 0 [$t(26)=-7.187$, $p<.001$], type 1 [$t(26)=-10.121$, $p<.001$], type 2 [$t(26)=-11.047$, $p<.001$], and type 3 [$t(26)=-5.241$, $p<.001$]. However, these significant improvements were also observed in the

CG's results: type 0 [$t(26)=-4.931$, $p<.001$], type 1 [$t(26)=-2.368$, $p=.026$], type 2 [$t(26)=-3.185$, $p=.004$], and type 3 [$t(26)=-2.819$, $p=.009$]. This indicates that the trainees' posttest goodness scores for type 0 (3.29), type 1 (3.17), type 2 (3.55), and type 3 (3.25) were significantly higher than their pretest scores (2.85), (2.69), (2.81), and (2.97). Similarly, the CG's posttest's production for type 0 (3.07), type 1 (2.84), type 2 (2.71), and type 3 (2.82) were significantly higher than its pretest (2.62), (2.61), (2.44), and (2.60). Next, an independent *t* test was conducted for each accentual pattern. At the pretest, a significant difference was found in pre-type 2 [$t(52)=2.112$, $p=.039$] and pre-type 3[$t(52)=2.370$, $p=.022$]. No significant difference was found for pre-type 0 [$t(52)=1.260$, $p=.213$], pre-type 1 [$t(52)=.471$, $p=.639$]. This means that both EG and CG-participants' production ability was comparable before training for type 0 and type 1. For type 2 and type 3, EG's scores were significantly higher than those of CG before training. At the posttest, a significant difference was found for type 2 and type 3 between two groups: type 2 [$t(52)=5.585$, $p<.001$], type 3 [$t(52)=2.620$, $p=.012$]. This indicates that trainees' posttest scores for type 2 stimuli (3.55) were significantly higher than those of the CG (2.71). Trainees' posttest scores for type 3 stimuli (3.25) were significantly higher than those of the CG's (2.82). No significance appeared for type 0 [$t(52)=1.267$, $p=.919$] and type 1[$t(52)=1.863$, $p=.068$] at the pretest. Next, an independent *t* test was conducted for the improvement from pretest to posttest (posttest score – pretest score). For type 1 and type 2, trainees' improvement was significantly greater than that of the CG. Trainees' improvement scores for type 1 (0.48) was significantly greater than that of the CG (0.24) [$t(52)=2.238$, $p=.030$]. Similarly, trainees' improvement scores for type 2 (0.73) was significantly greater than that of the CG (0.27) [$t(52)=4.326$, $p<.001$]. Recall that the trainees improved significantly for type 1 stimuli in perception ([$p<.001$] see Figure 4.4). This result implies that the perception improvement may

have transferred to production, or vice versa. The trainees made a substantial improvement for type 2 stimuli. In perception, trainees improved for type 2 and type 3 about the same amount (both [p=.001]), but in production, the improvement was bigger. As for type 1 and type 3, their improvements were not significantly different from the improvement of the CG: type 1 [t(52)= -.159, p=.875], type 3 [t(52)=.522, p=.604].

4.6.3 Summary of Production Task Results

In production, both trainees and CG-participants significantly improved from pretest to posttest for all conditions: production pronounced with/ without accent symbol, and type 0, type 1, type 2, and type 3 stimuli. The factors contributing to the CG's improvement are not certain. Attending regular Japanese classes may have improved their production; the reasons are uncertain. Comparing the degree of these improvements, significant differences were found between the trainee group and the control group. Trainees' improvement for the without accent symbol condition was significantly greater than the improvement of the CG [p=.005]. This result suggested that training fostered the sense of Japanese pitch accent for trainees, since they produced significantly better production in the absence of accent location during the posttest. Recall that Japanese texts do not provide accent locations in words. This finding suggests that learners do not have to memorize the exact accent location of each word, since exercises in Japanese accent improved their sense of pitch accent.

Trainee improvement for type 1 and type 2 was also significantly greater than the CG's improvement: type 1 [p=.030], type 2 [p<.001]. Since trainees improved significantly for type 1 in the perception task [p<.001], this production improvement for type 1 implies transfer between perception and production. This explanation may apply for type 2 because type 2 stimuli had significant improvement in perception task [p=.001]. However, for type 3, significant

improvement in production was about the same as that of the CG. Type 3 perception, however, improved as much as type 2 did in perception. Specifically, type 2 and type 3 improved similarly in perception, but type 2's improvement in production seems to be more than type 3's improvement in production. This could be due to the characteristic of accentual patterns that may have influenced American L2 learners' production. For example, type 0: LHHH and type 3: LHHL have consecutive high pitched morae in words, where type 1: HLLL and type 2: LHLL do not. This result could be attributed to learners' traces of L1 transfer. To create a foot structure, an accented and an unaccented syllable appear in alternation in English. Maintaining a higher pitch for more than two morae might be difficult for native speakers of American English. However, although the degree of improvement for type 0 and type 3 was not significantly different from that for CG, trainees' posttest scores for type 0 and type 3 were significantly higher than their pretest scores. This makes the previous argument inconclusive; more research is needed to investigate the acquisition of production for accentual pattern. In the production task, learners pronounced all 40 stimuli for recording. However, for the sake of experimental methodology, only 24 stimuli were used for the judgment test. Articulatory difficulties were also taken into consideration when choosing stimulus for production because some words contained segments that were more difficult than others (e.g., [ɾ], or a devoiced vowel between voiceless obstruents, and so on).

In conclusion, this task found a significant improvement in trainees' production from their pretest to posttest. This improvement was not limited to the trainee group; the CG also improved. However, for stimuli that were read without an accent symbol, type 1 and type 2 stimuli, improvement was significantly greater than the CG's improvement. This suggested that the training was effective. The U-shaped behavior (Gass et al., 1993) refers to three stages of

linguistic use. At stage 1, learners conform target like to a norm with new knowledge, but at stage 2 incorrect application of knowledge may occur. However, at stage 3, the correct usage of the target language appears again. Therefore, although trainees and CG-participants' results appear the same, trainees may have started the process to improvement. A long-term longitudinal study is necessary to examine whether or not training was effective for production,

CHAPTER FIVE

Discussion and Conclusion

The results of this study show that adult American L2 learners of Japanese participating in this study were able to significantly improve their ability to perceive Japanese pitch accent through a series of training courses. This study also shows that the trainees in this study had significant improvements in their Japanese pitch accent production abilities.

This study observed how L2 learners acquired Japanese pitch accent. The results of Study 1 suggested that learners could improve their perception ability gradually as they progressed in their language study for a longer period of time. It is not fully understood what contributed to this improvement. However, considering that advanced learners had higher identification accuracy for Japanese pitch accent, the improvement could be attributable to greater exposure to the language, which may help strengthen one's perceptual ability. This study also found there were two types of learners regardless of their Japanese proficiency level: those who were able to identify the accent location by hearing words and those who were not. This suggests that learners who cannot identify the accent location by hearing words do not understand feedback about their inaccurate accentual patterns received from instructors of their normal language course (instruction unaffiliated with this study). This study attempted to investigate what these learners could and could not perceive. Results from Study 1's discrimination test revealed that these learners could still perceive pitch differences that appear in words. However, they were not sure where the accent (pitch fall) was, and how the pitch fall should sound.

Based on these results, Study 2 aimed to improve learners' perception and production of Japanese pitch accent by conducting training. Results showed that trainees improved both in

perception and production. Improvement in perception was significant and was observed in both novel as well as trained words. As to the accentual pattern, *no-accent* stimuli (type 0) were the easiest for learners to identify. This result agreed with other previous studies (Ayusawa, Nishinuma, Lee, Arai, Odaka and Hoki, 1995; Nishinuma, Arai, and Ayusawa, 1996; Ayusawa and Odaka, 1998; Toda, 2001). In Study 2, trainees showed significant improvement for *initial* accent stimuli (type 1). This result also agreed with Ayusawa's (1995) and Toda (2001)'s speculation that type 1 is the most difficult accentual pattern to identify, but is easiest to acquire once learners understand how type 1 sounds. These results indicated that the training conducted in this study was effective. However, since various techniques were implemented in this training, it is not certain which element contributed to the improvement. The training was conducted for a total of three hours of instruction. The results of this study suggest that these techniques may be worth implementing within regular Japanese language curriculum. Lastly, this study suggests that Japanese pitch accent perception could be improved with relatively little training. However, the control group's scores showed no significant improvement in perception, which emphasizes the importance of having some sort of instruction.

Trainees also showed significant improvement in their production of Japanese pitch accent. This significant improvement was also observed in control group participants. However, in terms of degree of improvement from pretest to posttest, trainees' improvement for production that were pronounced without accent information, type 1 and type 2 stimuli were significantly greater the those of CG. The exercises provided during training may have contributed to this improvement. Recall the perception result that trainees improved significantly for most conditions, while no significant improvement was observed in CG. It can be concluded that production is relatively more difficult than perception. As a result, it is not surprising that

improvement is not seen to the same extent. The researcher recorded learners' production during pre- and posttests. To determine accuracy of learners' production, it is necessary to know whether those productions were made with the correct knowledge (e.g., by applying the appropriate accent rules etc.). For example, if a learner produced the word *tamane'gi* (LHHL) with LHLL. It is necessary to know whether the participant meant to produce with LHLL, or if he/ she meant to produce LHHL (correct pattern) but failed to accomplish this. Results from the *Knowledge test*, which tested awareness of accent rules, showed high scores (see Table 4.11). Results were analyzed assuming that trainees remembered the accent rules. The results of the production posttest presented wide variation among participants, and also within condition type (reading a list of words with or without accent location). For example, based on the researcher's impression during the recording, some trainees could successfully realize accentual patterns with the accent information (accent location was indicated by "¬"). On one hand, some failed to realize proper accentual patterns, possibly because they paid too much attention to the location of the accent to figure out the accentual patterns or overused the pitch (e.g., too high or too low, etc.). On the other hand, some trainees made better productions without an accent mark being provided but made poorer productions when an accent mark was present. However, this should not be interpreted to mean that learners did not improve. Gass & Selinker (1993) stated that learners' acquisition of target language is U- shaped. That is, learners' performance does not necessarily go up after initial gains, but appears to go down before going up again and eventually achieving a linguistic target. Trainees who just obtained new information must have been in the stage of trial and error (the dip in the U shape discussed by Gass et al.). Therefore, it could be that trainees whose production scores went down after training are still in the improvement

process. Further investigation, such as a long-term longitudinal study, is needed to determine the effectiveness of this training.

Native speakers of Japanese who judged the goodness of learners' provided some intriguing remarks. For example, some judges commented that certain words, such as *yakisoba* 'grilled noodle', or *gakusee* 'student', was easier to produce for most of learners. By contrast, other words (such as *tatikuzu* 'waste when you cut paper or cloth') were harder. This could be because learners were not familiar with the sounds or had difficulty articulating them. For example, high vowels /i/ and /u/ become devoiced in certain phonological environments, such as between voiceless obstruents (stops and fricatives) or sentence final (Hasegawa, 1995). Therefore, /tatikuzu/ for the vowels in last three morae should be realized as devoiced to be perceived like native Japanese' production. It is difficult to determine what segment is 'difficult' or 'easy' to produce for a participant; it should be controlled for in further studies. One-third of the 27 Japanese judges mentioned that some of the words must have been pronounced by native Japanese speakers. In fact, this production test did not include a single native speaker's production as a distracter. This means that certain learners' productions were indistinguishable from that of a native speaker's by the Japanese judges. Another interesting comment stated that a learner's sounded just like native speakers of Japanese if words' accentual patterns had been realized correctly. So, regardless of segmental errors, words could be perceived as native-like productions. This indicates the importance of the correct realization of accentual patterns.

The researcher was also in charge of teaching the second year of regular Japanese courses, which many participants in this study attended. One may ask whether or not this notable improvement was observed in the regular Japanese course. The answer to this question is yes and no. Recalling the U-shaped acquisition model, acquiring a sense of pitch (especially for

production) is not a task one can complete overnight. Continuous instruction and feedback are necessary. However, considering the fact that instructors need to provide feedback for learners' ill-formed accentual patterns, training was successful. For example, as Study 1 indicated, it is possible that some learners might not be able to understand instructors' feedback before training because they do not know how a pitch fall should sound. Namely, regular feedback is not truly addressing the problem. However, through accent feedback, students were able to understand after training. With this base knowledge that both teachers and students share, it became convenient to keep instructing about the accent in regular class after this study had concluded. The feedback which Matsuzaki (2002) adapted from Yokomizo (1998) to teaching pronunciation was also utilized. The learners in this study could successfully interpret the researcher's feedback in regular Japanese class. Sometimes explicit feedback was provided. For example, "that was an inaccurate pattern" or "your production had a pitch fall, but this word is a no-accent." At other times, implicit feedback was provided. For example, if a student meant *seki* (with an LH pattern ('cough') but produced it with an HL pattern ('seat'), then the feedback may have been "what happened to your seat?" It was ideal that learners were able to understand why they were incorrect.

For one strategy for teaching accentual patterns, Matsuzaki (2005) discussed the teaching priority of Japanese pitch accent. His study examined the tolerance level of native speakers of Japanese for inaccurate accentual patterns produced by learners. He suggested that we have to investigate what to teach and what not to teach. If some inaccurate production is acceptable (that is, does not interfere with intelligibility), then learners do not need to be forced to learn to have perfect production. Not teaching the exact location of a medial accented pattern could arguably be an example of this, since it may be overwhelming for learners to remember. One strategy is

teaching compound words rather than teaching only individual nouns, since compound words have a characteristic where the last component of the compound determines the accentual pattern of entire word (Kubozono, 1995; Matsuzaki, 2008). For example, the words for 'the American,' 'the Japanese' are *amerika-jin*, and *nihon-jin*. *Jin* 'people' is the last component that makes all precedent components type 0. However, this does not teach the pitch pattern of the word of *America* 'America' or *nihon* 'Japan' in isolation. Therefore, after instructing learners on what Japanese pitch accent is in perception and production, these strategies can be used for exercises at sentence and paragraph levels.

From a pedagogical point of view, training must be a teachable procedure accessible to most language instructors. González-Bueno (2001) and Kawano (2009) also stated the need for instruction courses for teachers on how they should teach pronunciation.

Lastly, students were quite diligent in learning Japanese pitch accent during this study's training sessions. Pitch accent is important not only for successful communication, but also appears to be welcomed by students when they are given the option of learning it. Further studies should consider students' needs when learning pronunciation. The positive results achieved in this study point to the applicability of the study's training techniques regular, everyday teaching in the L2 Japanese classroom.

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Appendix A: Study 1 "Accent Listening Test" in Identification Test

東京語アクセント聞き取りテスト Tokyo Accent Listening Test Participant #: _____

1. **Name: _____**
2. **Gender: _____**
3. **Circle the Japanese course you are currently enrolled.**

   初級1 初級2 中級1 中級2 上級

4. **Where and how long have you been studying Japanese?**

Institution	**country**	**month/ year ～month/ year**
		～
		～
		～
		～
		～

5. **Is English your native language? Yes/ No**

6. **Does anyone in your family speak Japanese as a native language? Yes/ No**

7. **What languages do you speak other than English and Japanese? :**
   _____

Direction: You will hear 48 four-mora words. Each word has a single or no accent. An 'Accent' exists when the pitch drops from a higher pitch to a lower pitch. If you hear an accent, draw the symbol '¬' (hook mark) over the higher pitch mora. For example, the word 'しぶとさ' (which has a pitch of LHHL) has an accent on the third mora, because the pitch drops from higher to lower. So a '¬' should be placed over the third mora such as 'しぶと¬さ,' since it is the mora that precedes a pitch drop. If you do not hear an accent in a word, circle 'None'. For example, the word 'ただのり' (LHHH) does not have a pitch fall. You would circle 'none'.

Exercise: You will hear 5 words as practice. You will hear a word, then after one second, it will be repeated once. Then there will be a 7 second pause during which you indicate the accent mark with '¬' or circle none. After the 7 seconds, you will hear the next word.

Ex) しぶと¬さ None
ただのり (None)

練習1. しぶとさ	None	練習4. りょうしん	None
練習2. ただのり	None	練習5. せってん	None
練習3. ないかく	None		

Test:

1. たまねぎ None	17. しんぼう None	33. ぜにかね None
2. うすぎり None	18. せっかい None	34. じょうひん None
3. あしあと None	19. じむいん None	35. ちきゅうぎ None
4. ざんきん None	20. あせみず None	36. しばかり None
5. しぶかわ None	21. らしんぎ None	37. なのはな None
6. くだもの None	22. がってん None	38. あずまや None
7. しゅうてん None	23. めぐすり None	39. せったい None
8. わかさま None	24. ろけっと None	40. こうぞく None
9. ながぐつ None	25. やきそば None	41. ずうたい None
10. かなづち None	26. たつまき None	42. さんさろ None
11. さいなん None	27. しんごう None	43. もぞうし None
12. けってん None	28. かまきり None	44. きくらげ None
13. ぽけっと None	29. せきにん None	45. わがまま None
14. くずのは None	30. がっこう None	46. しょうやく None
15. ひまわり None	31. かっぱつ None	47. のねずみ None
16. ひとごみ None	32. たまむし None	48. さんすう None

ご協力(きょうりょく)ありがとうございました!

Appendix B: Study 1 "Accent Listening Test" in Discrimination Test

1. **Name: _____**
2. **Age: _____**
3. **Gender: _____**
4. **What Japanese course are you currently enrolled? :**

   _____
5. **How long have you been studying Japanese? : _____ years_____ months**
6. **How many hours a week do you spend speaking and listening to Japanese (DO NOT include time spent in Japanese class)? : _____ hours**
7. **Have you studied Japanese in Japan? _____**
   a. **If yes, how long were you there? : _____ years _____ months**
   b. **If yes, where were you in Japan? :**

      _____
8. **Is English your native language? Yes/ No**
9. **Does anyone in your family speak Japanese as a native language? Yes/ No**
10. **What languages do you speak other than English and Japanese? (native level):**

    _____

PART I

Directions: You will hear 40 four-mora words. Each word has a single or no accent. An 'Accent' exists when the pitch drops from a higher pitch to a lower pitch. If you hear an accent, draw the symbol '¬' (hook mark) over the higher pitch mora. For example, the word 'しぶとさ' (which has a pitch of LHHL) has an accent on the third mora, because the pitch drops from higher to lower. So a '¬' should be placed over the third mora such as 'しぶと¬さ,' since it is the mora that precedes a pitch drop. If you do not hear an accent in a word, circle 'None'. For example, the word 'ただのり' (LHHH) does not have a pitch fall. You would circle 'none'.

Exercise: You will hear 4 words as practice. You will hear a word, then after one second, it will be repeated once. Then there will be a 6-second pause during which you indicate the accent mark with '¬' or circle none. After the 6 seconds, you will hear the next word.

Ex) しぶと¬さ None
ただのり None

1	しぶとさ	none	3	かたこり	none
2	ただのり	none	4	ないかく	none

Please turn your answer sheet to the next page to start the session.

1	わがまま	none	21	ながぐつ	none
2	あしあと	none	22	たたたた	none
3	のためせ	none	23	ひまわり	none
4	ぜにかね	none	24	てろまに	none
5	てろまに	none	25	たまむし	none
6	ねへのほ	none	26	ひとごみ	none
7	たたたた	none	27	たたたた	none
8	なのはな	none	28	あづまや	none
9	たつまき	none	29	のねずみ	none
10	くずのは	none	30	ねへのほ	none
11	のためせ	none	31	てろまに	none
12	たたたた	none	32	たたたた	none
13	やきそば	none	33	のためせ	none
14	しばかり	none	34	ねへのほ	none
15	のためせ	none	35	くだもの	none
16	ねへのほ	none	36	たたたた	none
17	たたたた	none	37	たまねぎ	none
18	あせみず	none	38	めぐすり	none
19	てろまに	none	39	たたたた	none
20	しぶかわ	none	40	わかさま	none

You are done with the first part of the test, now go on to the second part of the test.

PART II

Directions: In this section you will hear a pair of words. Some of the pairs will share the same pitch pattern while others will differ in their pitch pattern. The words will be stated only once and followed by a 3-second pause. After this 3-second pause the next words will be stated. If you believe that the pair of words have the same pitch pattern circle 'same.' If you think that the pair of words differ in pitch pattern, circle 'not same.'

Examples:

Ex1) ままままま(LHLL) vs. ままままま(LHHH) same (not same)

Ex2) てろまに(LHHH) vs. てろまに(LHHH) (same) not same

Practice:
Please turn your answer sheet to the next page to start the session.

				circle one	
1	ままままま	vs.	ままままま	same	not same
2	てろまに	vs.	てろまに	same	not same
3	なすみね	vs.	なすみね	same	not same

				circle one	
1	たたたた	vs.	たたたた	same	not same
2	たたたた	vs.	たたたた	same	not same
3	ねへのほ	vs.	ねへのほ	same	not same
4	たたたた	vs.	たたたた	same	not same
5	ねへのほ	vs.	ねへのほ	same	not same
6	ねへのほ	vs.	ねへのほ	same	not same
7	たたたた	vs.	たたたた	same	not same
8	ねへのほ	vs.	ねへのほ	same	not same
9	たたたた	vs.	たたたた	same	not same
10	たたたた	vs.	たたたた	same	not same
11	ねへのほ	vs.	ねへのほ	same	not same
12	たたたた	vs.	たたたた	same	not same
13	たたたた	vs.	たたたた	same	not same
14	たたたた	vs.	たたたた	same	not same
15	ねへのほ	vs.	ねへのほ	same	not same
16	ねへのほ	vs.	ねへのほ	same	not same
17	ねへのほ	vs.	ねへのほ	same	not same
18	たたたた	vs.	たたたた	same	not same
19	たたたた	vs.	たたたた	same	not same
20	ねへのほ	vs.	ねへのほ	same	not same
21	ねへのほ	vs.	ねへのほ	same	not same
22	たたたた	vs.	たたたた	same	not same
23	ねへのほ	vs.	ねへのほ	same	not same
24	ねへのほ	vs.	ねへのほ	same	not same

				circle one	
25	たたたた	vs.	たたたた	same	not same
26	ねへのほ	vs.	ねへのほ	same	not same
27	ねへのほ	vs.	ねへのほ	same	not same
28	ねへのほ	vs.	ねへのほ	same	not same
29	たたたた	vs.	たたたた	same	not same
30	たたたた	vs.	たたたた	same	not same
31	ねへのほ	vs.	ねへのほ	same	not same
32	ねへのほ	vs.	ねへのほ	same	not same
33	たたたた	vs.	たたたた	same	not same
34	たたたた	vs.	たたたた	same	not same
35	ねへのほ	vs.	ねへのほ	same	not same
36	ねへのほ	vs.	ねへのほ	same	not same
37	たたたた	vs.	たたたた	same	not same
38	ねへのほ	vs.	ねへのほ	same	not same
39	たたたた	vs.	たたたた	same	not same
40	ねへのほ	vs.	ねへのほ	same	not same
41	たたたた	vs.	たたたた	same	not same
42	ねへのほ	vs.	ねへのほ	same	not same
43	たたたた	vs.	たたたた	same	not same
44	ねへのほ	vs.	ねへのほ	same	not same
45	たたたた	vs.	たたたた	same	not same
46	たたたた	vs.	たたたた	same	not same
47	たたたた	vs.	たたたた	same	not same
48	ねへのほ	vs.	ねへのほ	same	not same

Appendix C: Study 2 "Knowledge Test" for Trainees

Japanese Pitch Accent Clinic NAME: _____ /100

I. Listen アクセント核. (10)

Write down the location of アクセント核 using '¬'. If there is no アクセント核, leave it blank.

a) おんがく b) ひとごみ c) くだもの d) かなづち

II. Answer the questions below. You must use the key terms provided in [ ]. (30)

1. What is Japanese accent? How is it different from English accent? [stress accent, pitch accent]
2. What is アクセント核(かく)? Explain with your own words. [location, high, low]
3. Why is Japanese accent important? Provide two reasons.
   a)
   b)

III. Predict pitch patterns. (60)

4. Predict pitch patterns of these nouns from the location of アクセント核, and write down the pitch line for whole word. (10)

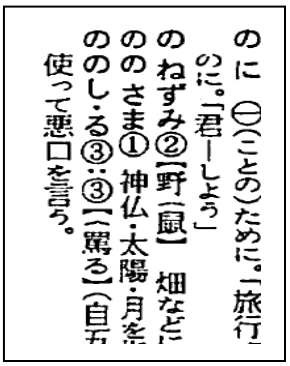
a) あお¯むし b) な¯のはな c) のこぎ¯り d) やきそば

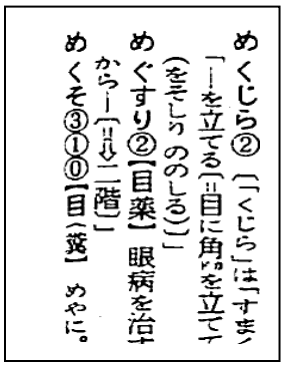
5. Write down pitch patterns of these verbs according to the verb accent rules you learned. These verbs are all *Type A:accented verbs*. (30)

a) よむ b) よんだ c) よまなかった
d) つくった e) つくらなかった f) つくる

6. Find a pitch pattern for words below from a Japanese dictionary (boxes below), write down pitch line. (20)

a) のねずみ
b) めぐすり





Appendix D: Study 2 "Training Evaluation" for Trainees

Thank you for attending my Japanese pitch accent clinic. Please write your thoughts about these Japanese pitch accent sessions. Any comments and suggestions are greatly appreciated.

1) What was your motivation to attend these sessions? Add other items if you like. Please check the boxes for items that apply. Also, rank the order the items you checked. (1= the most important item, 2= the second important item…)

	If important, check here	Rank the order
• To learn about Japanese Pitch Accent	□	___
• To earn extra credits	□	___
• _____	□	___
• _____	□	___

2) You have taken 5 sessions so far; explain your thoughts about learning about Japanese pitch accent.

3) How did you like the nature (style) of the sessions? Circle one.

1. I didn't like it at all 2. I didn't like it 3. I don't know 4. I liked it 5. I liked it very much

4) How were these sessions helpful for you to learn about Japanese Pitch Accent? Write down the number using the scale below for knowledge, listening, and pronouncing.

1. wasn't helpful at all 2. wasn't helpful 3. I don't know 4. was helpful 5. was helpful a lot

For acquire the knowledge: _____
For listening: _____
For pronouncing: _____

Things that the instructor and these sessions did well

Things that the instructor and these sessions can improve

Other Comments etc.

Appendix E: Study 2 Training Power Points[17]

JAPANESE PITCH ACCENT CLINIC SESSION 1

にほんごアクセントについてかんがえてみよう！

1. What is the Japanese pitch accent?
2. Why is it important?

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INTONATION

1) いい会社(かいしゃ)じゃない？
Don't you think it is a good company?

2) いい会社(かいしゃ)じゃない。
I don't think it is a good company.

3) いい会社(かいしゃ)じゃない。
That's actually a good company!

4

WHAT IS JAPANESE PROSODY LIKE ?

1. Rhythm
2. Accent
3. Intonation

2

ACCENT

- English : stress accent

súbject　　subjéct

- Japanese: pitch accent


あ|め　　あ|め

5

RHYTHM

○ mora
①long vowel・②small「っ」・③「ん」も1モーラです。

1) おとうと → 4 モーラ
2) せんせい → 4 モーラ
3) ニューヨーク → 5 モーラ
4) ちょっと → 3 モーラ
5) サッカー → 4 モーラ

❖ Exercise1 How many morae do you have in your name?

3

ACCENT (アクセント核): IS THE PITCH FALL

❖ Exercise2 アクセントを聞いてみよう♪

Ex. 1) まいにちが×
Ex. 2) にほんごが×

1)がくせいが×　5)こうじょうが×
2)おんがくが×　6)あさってが×
3)スプーンが×　7)コーヒーが×
4)しんぶんが×　8)いもうとが×

6

[17] Some of the exercises and pictures were adapted from Kawano et al. (2004), Toda (2004), and Japan Foundation (2009).

Where is accent (アクセント核)?

1) ●●●× 8) ●●×
2) ●●●× 9) ●●●●×
3) ●●●× 10) ●●×
4) ●●●× 11) ●●×
5) ●●●× 12) ●●×
6) ●●●× 13) ●●●×
7) ●●●× 14) ●●×

7

1. Pitch Accent: changes the meaning of the word

➢きてください！

1) 来てください（きてください）
2) 着てください（きてください）
3) 切ってください（きってください）
4) 切手ください（きってください）
5) 聞いてください（きいてください）

8

2. Pitch Accent: also indicates a word boundary

➢きょうかいにいった。



きょうかい に　きょうかい に　きょうかい に

9

かんがえてみよう！

- What is the unit called to create Japanese rhythm?
- What is the Japanese pitch accent (アクセント核)?
- Why is Japanese pitch accent important?
  1)
  2)
- Do you have 'accent' in your native language? How is it different from Japanese accent?

10

Japanese Pitch Accent Clinic Session 2

アクセントをれんしゅうしよう！

1. Let's listen to the words
2. Let's pronounce Japanese nouns
3. Let's learn the pitch accent rules

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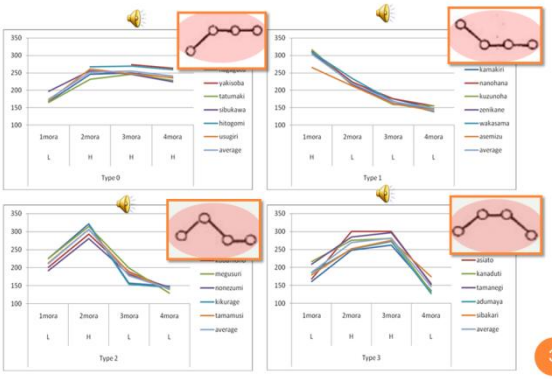
Review

- What is the unit called to create Japanese rhythm?
- What is the Japanese pitch accent (アクセント核)?
- Why is Japanese pitch accent important?
  1)
  2)

2

Let's Listen!



3

アクセントのルール

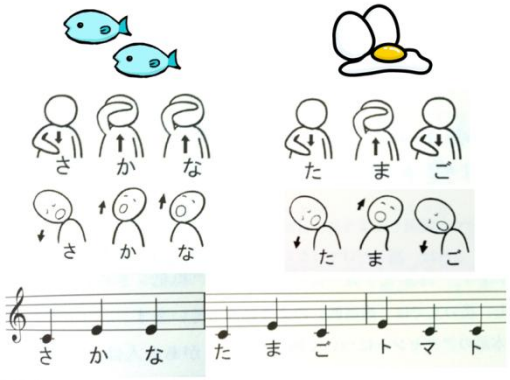
	れい1	れい2
I. unaccented pattern	にほんご が	にほんご が
II. initial accented pattern	まいにち が	まいにち が
III. medial accented pattern	あさって が	あさって が
IV. final-accented pattern	いもうと が	いもうと が

1. Always start with low pitch unless a word is *initial accented pattern*
2. Once pitch drops, it never goes up within a word

❖ Pitch fall is important when listening and speaking a word

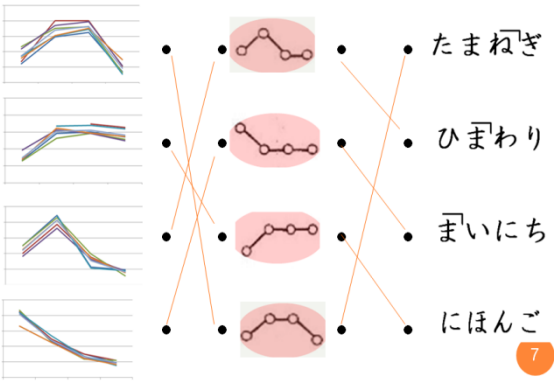
6

Let's Practice!



4

Match the pitch accent pattern



7

Let's Listen and Practice

- がくせい
- にわとり
- ひとごみ
- やきそば
- ながぐつ

- まいにち
- おんがく
- かまきり
- なのはな
- まいげつ

- のねずみ
- めぐすり
- ひまわり
- くだもの
- あおむし

- たまねぎ
- かなづち
- あしあと
- しばかり
- のこぎり

5

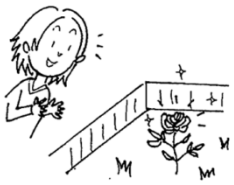
どっちでしょう？

さけが好きです。(鮭)

さけが好きです。(酒)

8

どっちでしょう？



はながきれいですね。(花)

はながきれいですね。

9

Review

- What are the two pitch accent rules?
  1)
  2)
- How many accent patterns exist in Japanese nouns?
- Circle a correct answer
  - When listening and speaking a word, a (pitch fall ・pitch rise) is important

2

かんがえてみよう！

- What are the two pitch accent rules?
  1)
  2)
- How many accent patterns exist in Japanese nouns?
- Circle a correct answer
  - When listening and speaking a word, a (pitch fall ・pitch rise) is important

10

アクセント核を聞いてみよう！

のねずみ	まいにち
おんがく	かなづち
ひとごみ	がくせい
たまねぎ	ひまわり
かまきり	ながぐつ
なのはな	にわとり
やきそば	くだもの
しばかり	あしあと
まいげつ	のこぎり
めぐすり	あおむし

3

Japanese Pitch Accent Clinic
Session 3

アクセントをれんしゅうしよう！

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アクセント型を書いて、発音してみよう！

のねずみ	まいにち
おんがく	かなづち
ひとごみ	がくせい
たまねぎ	ひまわり
かまきり	ながぐつ
なのはな	にわとり
やきそば	くだもの
しばかり	あしあと
まいげつ	のこぎり
めぐすり	あおむし

4

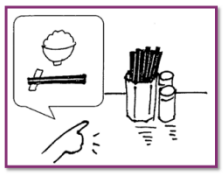
ちょっとひといき 1

- おば・さん
- おじ・さん
- びょう・いん

- お・ばあ・さん
- お・じい・さん
- び・よう・いん

5

どれでしょう？



はしがあります。（箸）

はしがあります。（橋）

はしを歩きます。（端）

8

ちょっとひといき 2

☆カタカナ語

- インターネット
- マイ タウン
- プロトタイプ
- アスファルト

- マライヤ キャリー
- ジョン レノン
- バラク オバマ
- オードリー ヘップバーン
- マイケル ジャクソン

❖[black board/ screen/ ice cream/ E-mail]

6

にわにはにわとりがいる？

1） 庭（にわ）には鶏（にわとり）がいる

2） 庭（にわ）には二羽鳥（にわとり）がいる

A	B	C	D
にわとり	にわとり		
(1・2)	(1・2)	(1・2)	(1・2)

9

どっちでしょう？

かきを食（た）べました。（牡蠣（かき））

かきを食（た）べました。（柿（かき））

7

にわにはにわとりがいる？

にわとり

にわとり

10

Japanese Pitch Accent Clinic
Session 4

Learn Japanese-Verb Accent Patterns

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TYPE A (アクセント核あり)

dictionary	ーます	ーた	ーない	ーなかった
よむ	よみます	よんだ	よまない	よまなかった
はなす	はなします	はなした	はなさない	はなさなかった
たべる	たべます	たべた	たべない	たべなかった
てつだう	てつだいます	てつだった	てつだわない	てつだわなかった
Type −2	ます	Type −3	ない	なかった

4

アクセントルール (VERB)

❖アクセント核はありますか？

1. いく	(ある・ない)
2. はなす	(ある・ない)
3. きる	(ある・ない)
4. きく	(ある・ない)
5. いそぐ	(ある・ない)
6. はたらく	(ある・ない)
7. おしえる	(ある・ない)
8. てつだう	(ある・ない)

2

れんしゅうしてみよう

- Ask questions!

Type - 2
- しらべる?
- 切る?
- 会う?
- つくる?

なかった
- いそがなかった?
- おきなかった?
- てつだわなかった?
- よまなかった?

Type - 3
- はなした?
- およいだ?
- しめた?
- 食べた?

5

Accent Type for Verbs

	Type A アクセント核あり	Type B アクセント核なし
dictionary	あう	いく
ーます	あいます	いきます
ーた	あった	いった
ーて	あって	いって
ーない	あわない	いかない

3

かんがえてみよう

- How many accent types exist in Japanese verb?
- Write down the アクセント核 below

1) つくる

2) つくります

3) つくった

4) つくらない

5) つくらなかった

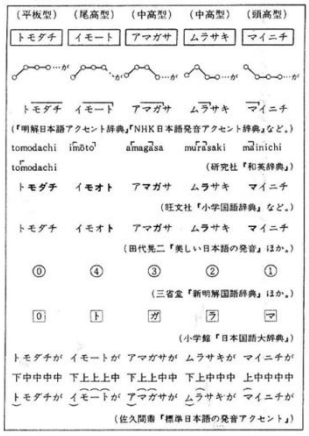
6

JAPANESE PITCH ACCENT CLINIC
SESSION 5

How do you find accent pattern for Japanese words?
Practice nouns and verbs in sentences!

Hirano-Cook 2010

いろいろなアクセント記号 -ACCENT SYMBOLS-



おんがく ①

おんがく

おんがく

❖ れんしゅうしてみよう！

アクセント③ → ●●●●
アクセント① → ●●●●
アクセント② → ●●●●
アクセント0 → ●●●●

4

REVIEW

- How many accent types verbs exist in Japanese?
- 'たべる' is an accented verb. Write down the アクセント核 below

1) たべる

2) たべます

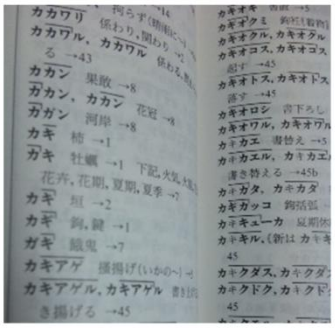
3) たべた

4) たべない

5) たべなかった

2

USING ACCENT DICTIONARY



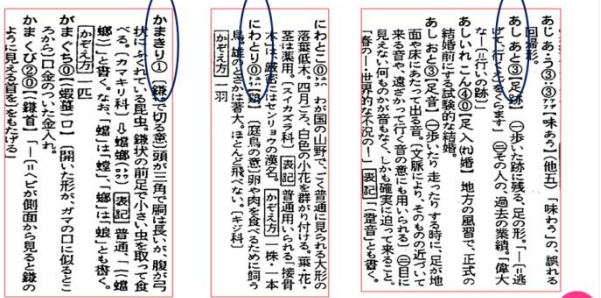
5

FIND OUT ACCENT PATTERNS USING DICTIONARY!

- 日本語アクセント辞典（じてん）
- 国語辞典
- オンライン国語辞典

3

USING 国語辞典（じてん）



❖ アクセント型を調べてみよう!

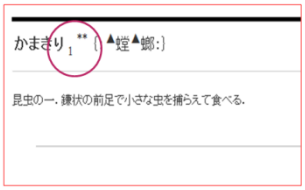
6

USING ONLINE DICTIONARY

1. http://www.sanseido.net/
2. Click 辞書検索
3. Type a word and search!

- 調べてみよう！

1) めぐすり
2) たまねぎ
3) にほん
4) にほんご



7

ACCENTED VERBS

dictionary	ーます	ーた	ーない	ーなかった
よむ	よみます	よんだ	よまない	よまなかった
はなす	はなします	はなした	はなさない	はなさなかった
たべる	たべます	たべた	たべない	たべなかった
てつだう	てつだいます	てつだった	てつだわない	てつだわなかった

Type ー2	ます	Type ー3	ない	なかった

2

読んでみよう!

1) まいにち、しんぶんを読みます。
2) がくせいがにほんごを勉強しています。
3) やきそばにたまねぎを入れます。
4) ひまわりにあおむしがついています。
5) のこぎりとかなづちを使っていすを作った。
6) それは、ながぐつをはいたこどものあしあとです。
7) おばあさんは川へせんたくに、おじいさんは山へしばかりに行きました。

8

ACCENTED VERBS

よむ	よんだ	よまなかった
きる	きった	きらなかった
あう	あった	あわなかった
つくる	つくった	つくらなかった
はなす	はなした	はなさなかった
いそぐ	いそいだ	いそがなかった
およぐ	およいだ	およがなかった
おきる	おきた	おきなかった
たべる	たべた	たべなかった
しめる	しめた	しめなかった
てつだう	てつだった	てつだわなかった
しらべる	しらべた	しらべなかった

3

JAPANESE PITCH ACCENT CLINIC SESSION 6

Review and Quiz
Please turn in questionnaire before you leave ☺

Hirano-Cook 2010

CHECK LIST

1. **Raise awareness of Japanese accent**
   - To be aware of importance of Japanese accent
   - To know what proper Japanese accent sounds like
2. **Simple accent rules**
   - Knowledge improves learners' perception skill
3. **Improve self-monitoring and correction skill**
   - To hear own accent patterns, and better understand teacher's feedback
4. **Perception and production skill**
   - To hear cues of Japanese accent
   - To realize proper accent patterns in production

4

Appendix F: Study 2 "Accent Listening Test" in Perception Task

Japanese Pitch Accent Listening Test

1. **Name: _____ 2. Gender: F / M 3. Age:_____**
4. **In which Japanese course are you currently enrolled? : _____**
5. **How long have you been studying Japanese? : _____ years_____ months**
6. **How old were you when you first started to study Japanese? :_____**
7. **How many hours per week do you spend speaking and listening to Japanese (DO NOT include time spend in Japanese class)? : _____ hours**
8. **Have you studied Japanese in Japan? _____**
   - **If yes, how long were you there? : _____ years _____ months**
   - **If yes, where were you in Japan? : _____**
9. **What languages do you speak fluently other than English and Japanese? : _____**
10. **I am a native speaker of _____**

Direction: First, you will hear 40 four-mora nouns. Each word has a single or no accent. An 'Accent' exists when the pitch drops from a higher pitch to a lower pitch. If you hear an accent, draw the symbol '¬' (hook mark) over the higher pitch mora. For example, the word 'しぶとさ' (which has a pitch of LHHL) has an accent on the third mora, because the pitch drops from higher to lower. So a '¬' should be placed over the third mora such as 'しぶと¬さ,' since it is the mora that precedes a pitch drop. If you do not hear an accent in a word, circle 'None'. For example, the word 'ただのり' (LHHH) does not have a pitch fall. You would circle 'none'. After the noun portion, you will hear 72 verbs. Each verb has a single accent (pitch drop). If you hear an accent, draw the symbol '¬' (hook mark) over the higher pitch mora. There is no intermission between the noun portion and the verb portion.

Exercise: You will hear 5 words as practice. You will hear a word, then after one second, it will be repeated once. Then there will be a 6 second pause during which you indicate the accent mark with '¬' or circle none. After the 6 seconds, you will hear the next word.

Ex) しぶと¬さ None

ただのり (None)

練習

Exercise 1	しぶとさ	None	Exercise 4	きくらげ	None
Exercise 2	ただのり	None	Exercise 5	たつまき	None
Exercise 3	ないかく	None			

Test: Noun

1	たてよこ	None	14	しばかり	None	27	あぜみち	None
2	たないた	None	15	ぶんどき	None	28	かなづち	None
3	のねずみ	None	16	くずのは	None	29	あしあと	None
4	ながぐつ	None	17	やきそば	None	30	あやとり	None
5	くだもの	None	18	たてうた	None	31	ひとごみ	None
6	なれずし	None	19	らいげつ	None	32	まいにち	None
7	めぐすり	None	20	かまきり	None	33	たちくず	None
8	とどまつ	None	21	なのはな	None	34	そらごと	None
9	がくせい	None	22	かたこし	None	35	そとがけ	None
10	あせみず	None	23	かけじく	None	36	まいげつ	None
11	ひるごろ	None	24	かふくぶ	None	37	したさき	None
12	みずごけ	None	25	ひまわり	None	38	たまねぎ	None
13	あおむし	None	26	のこぎり	None	39	おんがく	None
						40	にわとり	None

Appendix G: Study 2 Word Lists in Production Task

1	たてよこ	None	14	しばかり	None	27	あぜみち	None
2	たないた	None	15	ぶんどき	None	28	かなづち	None
3	のねずみ	None	16	くずのは	None	29	あしあと	None
4	ながぐつ	None	17	やきそば	None	30	あやとり	None
5	くだもの	None	18	たてうた	None	31	ひとごみ	None
6	なれずし	None	19	らいげつ	None	32	まいにち	None
7	めぐすり	None	20	かまきり	None	33	たちくず	None
8	とどまつ	None	21	なのはな	None	34	そらごと	None
9	がくせい	None	22	かたこし	None	35	そとがけ	None
10	あせみず	None	23	かけじく	None	36	まいげつ	None
11	ひるごろ	None	24	かふくぶ	None	37	したさき	None
12	みずごけ	None	25	ひまわり	None	38	たまねぎ	None
13	あおむし	None	26	のこぎり	None	39	おんがく	None
						40	にわとり	None

1	たてよこ	None	14	しばかり	None	27	あぜみち	None
2	たないた	None	15	ぶんどき	None	28	かなづち	None
3	のねずみ	None	16	くずのは	None	29	あしあと	None
4	ながぐつ	None	17	やきそば	None	30	あやとり	None
5	くだもの	None	18	たてうた	None	31	ひとごみ	None
6	なれずし	None	19	らいげつ	None	32	まいにち	None
7	めぐすり	None	20	かまきり	None	33	たちくず	None
8	とどまつ	None	21	なのはな	None	34	そらごと	None
9	がくせい	None	22	かたこし	None	35	そとがけ	None
10	あせみず	None	23	かけじく	None	36	まいげつ	None
11	ひるごろ	None	24	かふくぶ	None	37	したさき	None
12	みずごけ	None	25	ひまわり	None	38	たまねぎ	None
13	あおむし	None	26	のこぎり	None	39	おんがく	None
						40	にわとり	None

Appendix H: Study 2 Questionnaire for Native Japanese Judgment

Goodness Rating　　実験日_____

氏名：

年齢：

出身地（居住年数）：_____都道府県_____市・約_____年_____ヶ月

出身地以外の居住地・年数(1)：_____都道府県_____市・約_____年_____ヶ月

出身地以外の居住地・年数(2)：_____都道府県_____市・約_____年_____ヶ月

本実験は約 20 分弱の聞き取り実験です。20 分の間に合計 356 の言葉が流れます。聞こえてくるそれぞれの言葉が日本語らしいか、日本語らしくないか直感で判断して頂き、日本語らしく聞こえた場合は 5、日本語らしく聞こえない場合は 1 のスケールで答えて下さい。アクセント、リズム、スピード、発音といったものを総合的に判断し、難しく考えず、直感で答えを判断して下さい。聞こえてくる言葉は、「肩腰（かたこし）・熟れ寿司（なれずし）・椴松（とどまつ）・水蘚（みずごけ）・裁ち屑（たちくず）・学生・足跡」といった 4 拍語で、無意味語ではなく、すべて意味のある言葉です。言葉が聞こえてから 2 秒のポーズがあり、その後すぐに次の言葉が聞こえてきます。2 秒の間に回答用紙に 5 から 1 のどれか一つ数字に丸をつけて下さい。

回答用紙・例）

		日本語らしくない←---------→日本語らしい				
2	**野ねずみ**	**1**	**2**	**3**	**4**	**5**
3	**葛のは**	1	2	3	4	5
4	**目薬**	1	2	3	4	5

20 分間休憩がありません。オーディオファイルを停止したり繰り返したりせず、最後まで一息で終わらせて下さい。

また、音声のボリュームはできるだけ統一するよう努力いたしましたが、時々大きな音量が聞こえてくる場合がありますので、イヤホンご使用の際はお気をつけ下さい。また、イヤホンを使わない場合は他の音が聞こえない場所で行って下さい。話し声が聞こえる場所を避けたり、テレビなどはお消し下さい。また、実験中は話をしたりせず実験に集中して下さいますようお願い申し上げます。

この度は実験のご協力大変ありがとうございます。

Appendix I: Study 2 Example of Answer Sheet for Native Japanese Judgment

SET_A1: Judge#_____

		日本人らしくない←				→日本人らしい
1	**人混み**	**1**	**2**	**3**	**4**	**5**
2	野ねずみ	1	2	3	4	5
3	葛のは	1	2	3	4	5
4	目薬	1	2	3	4	5
5	分度器	1	2	3	4	5
6	青虫	1	2	3	4	5
7	肩腰	1	2	3	4	5
8	足跡	1	2	3	4	5
9	肩腰	1	2	3	4	5
10	音楽	1	2	3	4	5
11	熟れ寿司	1	2	3	4	5
12	音楽	1	2	3	4	5
13	外掛け	1	2	3	4	5
14	分度器	1	2	3	4	5
15	分度器	1	2	3	4	5
16	音楽	1	2	3	4	5
17	熟れ寿司	1	2	3	4	5
18	足跡	1	2	3	4	5
19	肩腰	1	2	3	4	5
20	音楽	1	2	3	4	5
21	学生	1	2	3	4	5
22	外掛け	1	2	3	4	5
23	青虫	1	2	3	4	5