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The Phonetics and Phonology of L2 Accentuation Patterns by Taiwanese Mandarin-Speaking Learners of Japanese*

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This study examines the L2 accentuation patterns of Taiwanese Mandarin (TM)-speaking Japanese learners. Factors such as word length, syllable weight, and "familiarity" were controlled in the production experiment. The principal findings were that accent and accent locus were not affected by the prosodic factors. In fact, unaccented tokens were disfavored to a great extent and, more importantly, an L2 accent was preferentially placed on the penultimate syllable, regardless of syllable weight. It is argued that these characteristics are attributable to trochaic feet in Mandarin. It is further argued that the preferred bimoraic pattern of TM syllables is responsible for the failure to acquire the contrast between heavy vs. light syllables in L2 Japanese. These results confirmed that the metrical properties of the L1 (tone language) transfer to the prosodic pattern of the L2 (pitch-accent language).

Key words: second language acquisition, Japanese pitch accent, Taiwanese Mandarin, syllable weight, accent-bearing unit, L1 transfer

1. Introduction

The aim of this study was to investigate the Japanese pitch accent patterns produced by the Taiwanese Mandarin[1] (TM)-speaking L2 learners in Taiwan. The pitch accent of Standard Japanese,[2] a lexical property, is difficult for L2 learners of Japanese, even for tonal language speakers. In the Japanese pitch accent system, a mora followed by a pitch drop is defined as bearing the accent. For example, a word such as *hana* may be accented either on the first mora (*hána* with an HL tonal pattern) or on the second mora (*haná* with an LH tonal pattern), meaning 'girls name' and 'flower', respectively (See Table 1).[3] The pitch drop after the second mora is realized by a following particle such as the *ga* 'nominative case marker' in *haná-ga* (LH-L). *hana* can also be unaccented to mean 'nose', in which case the following particle is realized as a high tone (*hana-ga* (LH-H)), resulting in no pitch drop. In other words, Japanese words are distinguished from one another by (i) the presence of an accent (accentedness) and (ii) accent locus. Thus, there are three accent patterns in Japanese for 2-syllable words (bimoraic and trimoraic), as shown in Table 1.

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[1] Taiwanese Mandarin refers to Standard Mandarin used in Taiwan officially (台灣華語) but does not refer to Mandarin pronounced with a TSM (Taiwanese Southern Min) accent, which is mainly spoken by the older generation (台灣國語).

[2] Standard Japanese refers to the Tokyo dialect, which is spoken in and around Tokyo.

[3] The accent is marked by the acute accent (´).

Table 1. Japanese accent patterns for 2- and 3-mora words

Accentedness	Tonal pattern	Bimoraic words (CV.CV)	Trimoraic words (CV.CVN)
Accented	HL(L)	hána(-ga) 'girl's name-nom.'	sátoo 'surname'
	LH(L)	haná(-ga) 'flower-nom.'	satóo 'sugar'
Unaccented	LH(H)	hana(-ga) 'nose-nom.'	satoo 'leftist party'

It has been reported that a Japanese pitch accent is difficult to acquire even for tone-language-speaking learners who have more complex tonal systems than those used in Japanese. However, L1 tonal characteristics have rarely been observed to be transferred onto the L2 Japanese pitch accent, whereas stress-based language-speaking learners tend to put an L2 Japanese pitch accent on the prosodic position where the stress is preferred in the L1 (Horiguchi 1973, Toki 1980, Iwazawa 1997). In the case of tone-language-speaking learners, the effects of the L1 transfer on an L2 Japanese pitch accent has only been seen when a certain type of syllable structure or segment evokes the occurrence of a certain tone (Onishi 1977, Kanamura 1999, Nozawa & Shigematsu 1999, 2000), but the tonal pattern alone has not been found to be transferred onto the L2 Japanese word accent pattern.

The L1 transfer absence from L1 tonal patterns onto an L2 pitch accent in the previous studies could be accounted for by Archibald's (1997) claim that the L1 transfer of metrical parameters does not occur between L1 and the L2, which have typologically distinct stress systems. Archibald (1997) argued that L1 speakers of non-accentual languages, such as Chinese (a tone language) and Japanese (a pitch-accent language), do not apply metrical parameters in their L2 English stress assignment but tend to memorize the position of the lexical stress word by word while the errors in an English stress assignment by L1 speakers of stress-timed languages are the result of a misapplication of L1 parameter settings onto the L2.

Although both Japanese and TM utilize pitch as a phonetic correlate of the suprasegmental features, the prosodic systems have several differences. The Japanese pitch accent is distinguished by only two tonal height levels (high and low), whereas the TM has 5 pitch levels and 4 different tonal contours; Tone 1: high and level, Tone 2: mid-rising, Tone 3: low falling-rising, Tone 4: high falling. The Japanese pitch accent is assigned to prosodic words of one or more mora, but tone is only assigned to monosyllabic words. Moreover, the minimal accent/tone-bearing unit is the mora in Japanese, but is the syllable in TM. To the best of my knowledge, there have been no studies which have specifically examined the L2 pitch accent patterns of TM-speaking Japanese learners, and it is therefore unknown if the properties of the TM L1 tonal system affects L2 Japanese accentuation. Consequently, the purpose of

this paper is to examine if TM (a tone language) speakers demonstrate any L1 transfer onto the L2 Japanese accent patterns, which are from a typologically different stress system.

Unfortunately, previous experimental results may have been confounded by a "familiarity" effect as the participants were already familiar with the test words used, e.g., kooén 'park,' ténki 'weather,' and others. (Nozawa & Shigematsu 1999, 2000, Liu 2006, Liu 2009). Therefore, it is surmised that the results did not the truly reflect the "actual" L2 learner accentuation patterns because they may have been previously exposed to the target words. Further, even though it is well known that both syllable weight and word length play an important role in accent assignment, no systematic investigation has been conducted for TM-speaking Japanese learners, so this study aims to better understand the following issues in the L2 accentuation patterns of TM-speaking Japanese learners:

1) Do syllable weight and/or word length affect L2 accentuation patterns?
2) Is there a preferred pattern in the L2 production of Japanese in this study? If yes, what is the motivation for the accentuation pattern in the L2 production in Japanese?
3) Do L1 linguistic properties play a role in L2 accentuation patterns?

2. Methodology

The present experiment aims to examine how TM-speaking Japanese learners produce Japanese word accent by recording TM-speaking Japanese learners' production of Japanese words with different syllable structure and word length. The accent location in the production data was identified via the transcription by native Japanese speakers and acoustic study.

2.1 Materials

Two wordlists were created for this study. The first had thirty polysyllabic words with light syllables only (i.e., CVCV, CVCVCV, CVCVCVCV) and the second had 50 polysyllabic words with a heavy syllable (i.e., CVNCV, CVCVN, CVNCVCV, CVCVNCV, CVCVCVN). To minimize the familiarity effect, the test words chosen were rare, infrequent native words (Yamato words) and loanwords borrowed from languages besides English and Chinese (excluding both newly adopted Mandarin loanwords and Sino-Japanese words). See Tables 2 and 3 for some representative examples.

Table 2. Light syllable-only words

Word length	Roman transcription	Gloss	Japanese characters	Chinese translation
2 moras	gara	'pattern'	がら／ガラ／柄	花樣
3 moras	karute	'medical sheet'	かるて／カルテ	病歷簿
4 moras	parasoru	'umbrella'	ぱらそる／パラソル	雨傘

Table 3. Test words with a heavy syllable

Word length	Roman transcription	Gloss	Japanese characters	Chinese translation
3 moras	bonbe	'cylinder'	ぼんべ／ボンベ	氧氣筒
	totan	'iron sheet'	とたん／トタン	鐵板
4 moras	konsome	'consomme'	こんそめ／コンソメ	清湯
	kuranke	'patient'	くらんけ／クランケ	患者
	buruzon	'jacket'	じゃけっと／ジャケット	夾克

Note: CVN syllables are underlined.

2.2 Participants

Eight TM-speaking Japanese learners (six males and two females) were recruited for this study, with an average age of 20 at the time of the experiment. All participants were beginning learners of Japanese at National Tsing Hua University, Taiwan, and had taken undergraduate Japanese courses for two semesters (i.e., three hours per week, 36 weeks in total). Besides English and Japanese, none had learned any other foreign languages. It is important to reiterate that TM was the primary (and/or the only) language spoken by the participants, and those who were bilingual had only limited proficiency in Taiwanese Southern Min (TSM), a second major language spoken in Taiwan.[4] Participants reported no history of speech, language, or hearing problems. All received minimal compensation for participating.

2.3 Recording

Each test word was written in Hiragana, Katakana, and/or Chinese characters with a Chinese translation. The participants were asked to put the target word in the carrier

[4] TSM was the first language of most the Taiwanese before 1949. After World War II, the ROC government began to promote Mandarin as the national language. Matsuo (2006) reported that 99.6% of Taiwanese students were fluent in Mandarin, whereas only 26.7% were fluent TSM speakers. Therefore, the younger Japanese learners in Taiwan are mostly TM speakers while most TSM speakers come from the older generation.

sentence only once; for example, 'Kore wa __ desu (This is __).' All words were recorded, but if there was mispronunciation or hesitation, participants were asked to read the sentence again. The recordings were done in a sound-proof room at the Phonetics Lab of National Tsing Hua University, Taiwan, using a Zoom Handy Recorder H4 and a NADY HM-5U head-worn microphone with a 44.1 kHz sampling rate. Participants were asked to read randomized sentences from a computer screen. Overall, 640 tokens were recorded for analysis (= 8 speakers × 80 target words).

2.4 Transcription procedures

Three phonetically trained native speakers of Standard Japanese listened to the recorded tokens and transcribed the pitch (or tone) of each mora as either high or low, e.g., makomo = HLL, boNbe = LHH. Only the words judged as having the same pitch (or tonal) patterns by all three transcribers were used for analysis.[5] Consequently, 26 tokens were eliminated in this "screening" process. Likewise, to analyze only the words that the participants were unfamiliar with, a familiarity rating was conducted after the recording, and tokens eliminated if rated as 'having been seen or heard before' or 'familiar with this word.' As a result, 70 additional tokens were eliminated, yielding a final total of 544 tokens for analysis.

2.5 Slope and accent locus

CVN syllables in L1 Japanese are *always* accented as CV́N.CV (HL.L). However, in L2 production, CVN syllables often have either a high falling tone (HL) or a high level tone (HH), with the latter being absent in L1 Japanese. Using the criterion that the accent should fall on moras that have a high tone before a pitch drop, the accent loci were counted. Therefore, we treated forms such as CVŃ.CV (HH.L) as accented tokens in this study because there is still a pitch drop, even though it is "misaligned" as shown in (1).

(1) Two tonal patterns for the accented CVN syllable produced by TM learners

a. when CVN = HL	b. when CVN = HH
H L L	H **H** L
| | |	| | |
C**V́**N.CV	CVŃ.CV

[5] Patterns without the so-called "initial lowering rule" are attested, e.g., HHL. However, these "errors" in L2 production are not included in the data analysis since the main concern of this study is accentedness and accent loci.

The problem here is that our transcribers were not able to distinguish the contrast between CV́N.CV (HL.L) vs. CVŃ.CV (HH.L), which is not found in L1 Japanese accent patterns. As a result, we conducted an acoustic study to be able to examine this particular problem more closely. Seven native speakers of Standard Japanese (3 males and 4 females aged 24 on average) recorded the test words following the above procedures, and one of the three transcribers transcribed the recorded tokens. The L1 data were subsequently analyzed as follows. First, the F0 values of the peak and the endpoint for each CVN token were measured (see Figure 1) using Praat software. Then, the slope values for the CVN syllables from each speaker were determined using the formula proposed in Kumagai et al. (1999) (see (2)). The mean slope value for the CVN syllables from the seven speakers was taken as the reference point for measuring the accentedness in the L2 TM production.

(2) Slope = $(\log2F_{0end} – \log2F_{0peak}) / (Time_{end} – Time_{peak})$ (where Time = sec.)

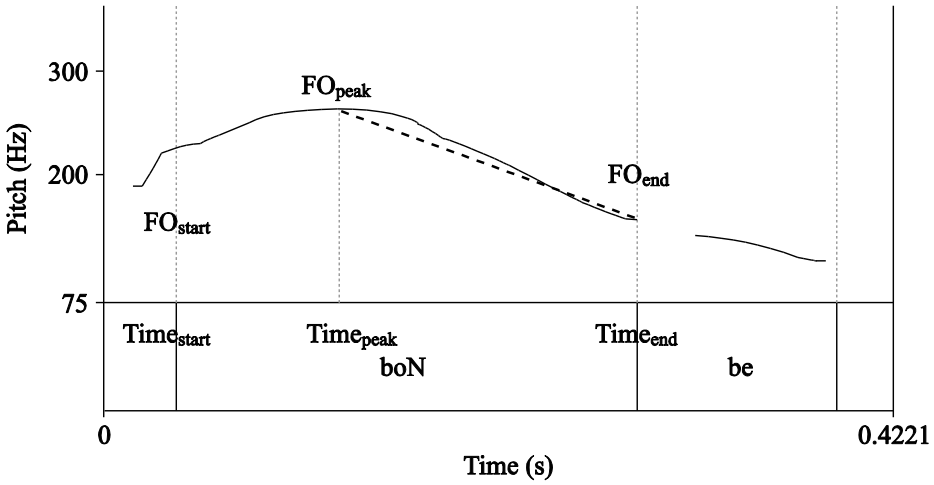


Figure 1. Measurement points for the calculation of CVN syllable pitch slope (Adapted from Kumagai et al. (1999))

The slope values for each Japanese subject are presented in Table 4. The average slope value obtained from the seven speakers was −1.13.[6] Accordingly, CVN syllables with a slope value higher than −1.13 were defined as carrying an HH tone pattern and having the accent on the nasal coda (i.e., CVŃCV (HHL). CVN syllables with a slope value lower than −1.13 were considered having an HL tone pattern and an accent on the vowel (i.e., CV́NCV (HLL). A total of 191 tokens with accented

[6] The value obtained in this study was lower than that found in the study conducted by Kumagai et al. (1999) (−1.68). This might be due to the difference in the number of subjects (two vs. seven in our study) and the various speech rates.

CVN syllables were produced by the TM learners, and the average slope value for all accented CVN syllables were −1.08. As a result, 65 tokens were judged as having HL tones and 126 as having HH tones.

Table 4. Japanese speakers' threshold values for the accented and unaccented CVN syllables

Speaker	Range of slope value		Threshold value
	Accented	Unaccented	
J1	–4.87 - –2.54	–1.43 - 0	–1.68
J2	–4.58 - –2.05	–1.18 - 0	–1.32
J3	–1.90 - –0.33	–0.81 - –0.04	–0.74
J4	–2.03 - –0.18	–1.20 - 0	–0.83
J5	–3.35 - –0.56	–1.78 - –0.09	–1.35
J6	–5.18 - –0.68	–1.25 - 0	–0.91
J7	–2.80 - –0.81	–1.09 - 0	–1.05
Average			–1.13

2.6 Lexical strata

It is well known that the Japanese lexicon has four strata: Yamato/native words, Sino-Japanese words, loanwords, and mimetics. According to Kubozono (2006, 2008), each lexical stratum has its own accent pattern. He found in his corpus that 93% of the loanwords (N = 778) were accented, whereas accentuation was found in only 29% (N = 2220) of the native words. Kubozono argued that this may be because loanwords have more heavy syllables than native words. In our study, it was speculated that the lexical strata might be a possible factor in L2 accentuation patterns as loanwords were 84% of the test words (= 67/80). Therefore, it was decided that stochastic skewness was not a problem in this experiment as our participants all had small lexicons, so it is unlikely that these beginner L2 learners could have formed any reliable accentuation generalizations. In addition, "familiar words", which might show differences in accentuation between the two lexical strata, were eliminated, as mentioned in 2.4. To further minimize this "lexical frequency" effect, in the recording, the target words were represented in both hiragana and katakana and glossed in Mandarin. Since differences in lexical strata do not affect the L2 production of accent patterns for the above reasons, these were not distinguished in the study's results.

3. Results

This section firstly shows the ratios of the accent patterns on the light/heavy syllable test words to examine if there appears a preferred accent pattern in the present production data, and if the word length and/or syllable structure affect the accent placement. This section also shows the ratios for the HL and HH patterns in the accented CVN syllables.

3.1 Overview

Figure 2 shows the results for the light syllable-only word accent patterns. TM-speaking Japanese learners were found to place the accent on the penultimate mora 67% of the time on average, regardless of word length. Most penultimate accent placements were found in 2-mora words (73.3%), followed by 4-mora words (69.2%) and 3-mora words (58.6%). For longer words, the chances of the antepenultimate mora being accented were found to be as follows: 28.6% for 3-mora words and 20% for 4-mora words.

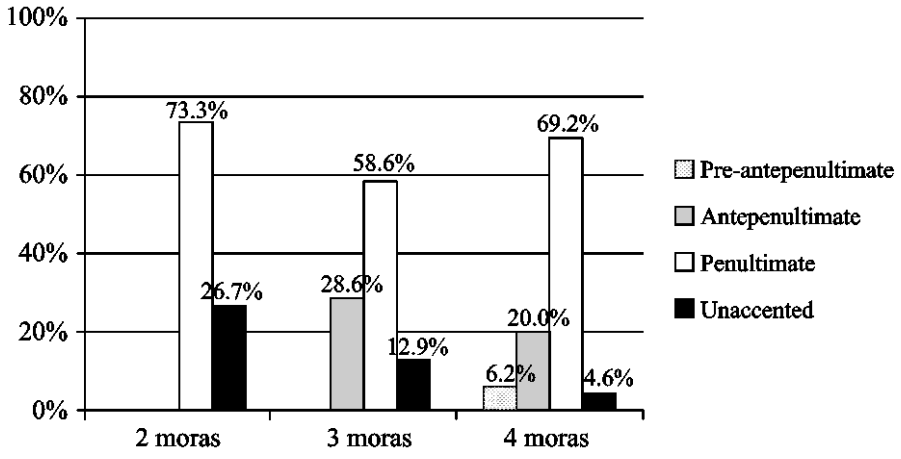


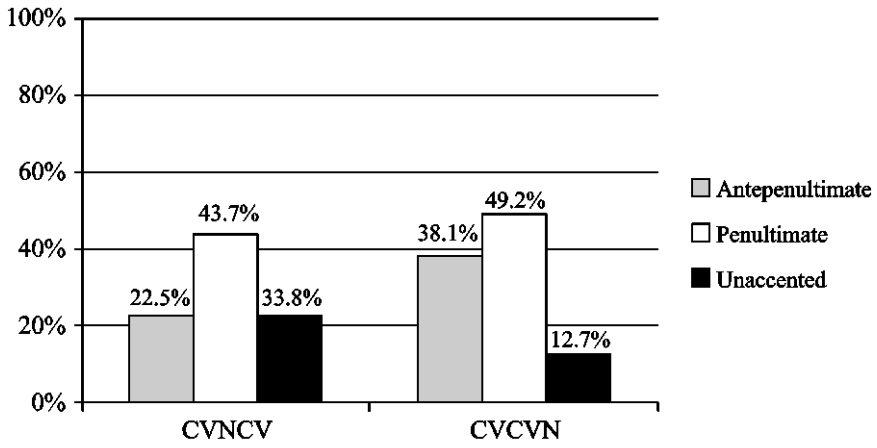
Figure 2. Results of light syllable-only words

The average ratios of the accent patterns on the heavy syllable test words are shown in Table 5, and Figure 3(a-b) presents the results for the 3- and 4-mora words. From Table 5, it can be seen that an average of 49.1% of the penultimate moras were accented. In other words, the four-mora words (with a heavy/CVN syllable) were found to have more penultimate accents than the 3-mora words with a CVN syllable (50.8% vs. 46.5%): CVNCVCV (60.3%) > CVCVNCV (51.4%) > CVCVN (49.2%) > CVNCV (43.7%) > CVCVCVN (40.8%). For CVN syllables, the prosodic location was also found to play a role in accent assignment. If a CVN syllable was in the

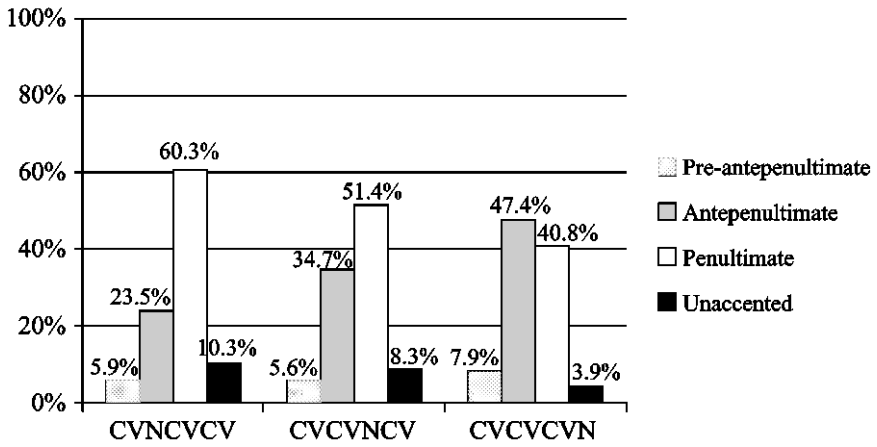
word-initial position in a 3-mora word, that is, CVNCV, 43.7% of the tokens were accented on the penultimate mora, but 33.8% were unaccented. If the CVN was in the word-final position, 49.2% of the CVCVN words were penultimate accented, and 12.7% were unaccented (Figure 3(a)). Finally, as for the CVN in the word-final position of a 4-mora word (Figure 3(b)), that is, CVCVCVN, the accent was preferentially placed on the antepenultimate mora. Overall, the TM speakers preferred to assign an accent to the penultimate mora, followed by the antepenultimate mora if there was a heavy syllable in the word.

Table 5. Accent pattern ratios in 3- and 4-mora CVN words

Mora number	Unaccented	Penultimate	Antepenultimate	Pre-antepenultimate
3 moras	23.3%	46.5%	30.2%	(N/A)
4 moras	7.5%	50.8%	35.2%	6.5%
Total	12.9%	49.1%	33.2%	6.5%



(a) 3-mora words with a CVN syllable



(b) 4-mora words with a CVN syllable

Figure 3. Results of test words with a CVN syllable

3.2 HL vs. HH in CVN syllables

Table 6 shows the ratios for the HL and HH patterns in the accented CVN syllables. From Table 6 it can be seen that the TM-speaking Japanese learners produced 62.9% of the accented CVN syllables with an HH tone in (CV) C**V**NCV words, and in only 37.2% of the syllables with an HL tone, that is, for the words that had a CVN syllable with an HH tone, a pitch drop occurred at the right edge of the syllable (see (2b) in Section 2.5). Therefore, the L2 TM accent was placed mostly on the nasal coda. The high HH pattern ratio resulted in more penultimate accents (43.7% and 51.4%) than antepenultimate (22.5% and 34.7%) in both 3- and 4-mora (CV) C**V**NCV words (see Figure 3 (a-b)). As previously mentioned, HH patterns on CVN syllables are not found in L1 Japanese, and these tokens are still treated as accented because there is still a pitch drop (see Section 4.2 for more discussion).

Table 6. HL vs. HH in CVN syllables

Tonal pattern	CVNCV	CVCVNCV	Mean
HL	34.0%	40.3%	37.2%
HH	66.0%	59.7%	62.9%

4. Discussion

The results suggest that TM-speaking Japanese learners have distinct L2 Japanese accentuation patterns, that is, the penultimate position is preferentially accented across the board (i.e., research question (b) in (1)), but word length plays a limited role (i.e., research question (a) in (1)). Likewise, syllable weight was found to not have a limited effect on accent assignment. These results could be attributed to the effect of L1 transfer (i.e., research question (c) in (1)). These points are discussed in more detail in the following section.

4.1 Heavy syllables are *not* an accent attractor

The 3- and 4-mora words with a CVN syllable (see Table 5) results showed that TM-speaking Japanese learners tended to prefer a penultimate accent (49.1%) to an antepenultimate accent (33.2%), unaccented pattern, or pre-antepenultimate accent, suggesting that the participants placed the Japanese pitch accent in a specific location. This raises the question as to whether this preference for the penultimate accent is syllable-based or mora-based. In Table 7, it can be seen that CVN syllables appear to be more accent-favored than CV syllables in the heavy syllable test words (54.3% vs.

31.9%), which was not unexpected as heavy syllables have tended to attract stress/accent in many languages (i.e., Hayes's (1995) Weight-to-Stress Principle, WSP). However, it is important to note that the penultimate position was based on the mora count in 3.1 (Table 5 and Figures 2, 3). If the penultimate position was based on syllable count, there would be a different picture. Consider the differences between the mora-based vs. syllable-based interpretations given below.

Table 7. Ratios of accented CV and CVN syllables

Word type	Accented CVN	Accented CV
CVNCV	66.2%	(N/A)
CVCVN	49.2%	38.1%
CVNCVCV	29.4%	60.3%
CVCVNCV	86.1%	5.6%
CVCVCVN	40.8%	27.7%
Mean	**54.3%**	**31.9%**

(3) Mora-based vs. Syllable-based interpretations: A comparison

	CV.CV́N.CV	CV.CVŃ.CV[7]	CV.CV.CV́N
a. Mora-based	Antepenultimate	Penultimate	Penultimate
b. Syllable-based	Penultimate	Penultimate	Final

The "same" accent on a CVN syllable in CV.CVN.CV could be classified as either antepenultimate or penultimate if the mora-based interpretation is adopted. Notice again that patterns like CV.CVŃ.CV (i.e., L.HH.L) are regarded as accented here, even though this is not found in L1 Japanese. It is surmised that the participants "misplaced" the accent in these tokens (see Section 4.2 for more discussion). Therefore, the data were reanalyzed, and the syllable-based distribution of the accent loci was summarized (Figure 4).

From Figure 4, it can be seen that the heavy syllables failed to attract any metrical prominence (i.e., Japanese accent) in this study. Interestingly, the only exception was the word-final CVN syllable in a disyllabic word (see Figure 4(a)). A possible explanation is that the widely observed cross-linguistic final lengthening effect enhanced the "acceptability" of the CVN syllables. This tendency appeared to be more robust in disyllabic words (49.2%) than in trisyllabic words (40.8%) as rime duration is known to become more compressed as the number of syllables increases. This assumption was confirmed in Zee's (2004) study on the rime duration of

[7] See Section 3.2 for more discussion.

polysyllabic words in Beijing Chinese, in which it was found that the rimes of non-final syllables in tri- and quadro-syllabic words were further reduced in duration. Also, as can be seen in Table 7, only 54.3% of CVN syllables attracted an accent in the sample. Therefore, Figure 4 suggests that the prosodic position (the penultimatesyllable here) was a better "accent attractor" than the heavy syllables. In other words, the WSP (or Kubozono's (2006) version of WSP: "all heavy syllables are accented.") was not strictly obeyed in these results.

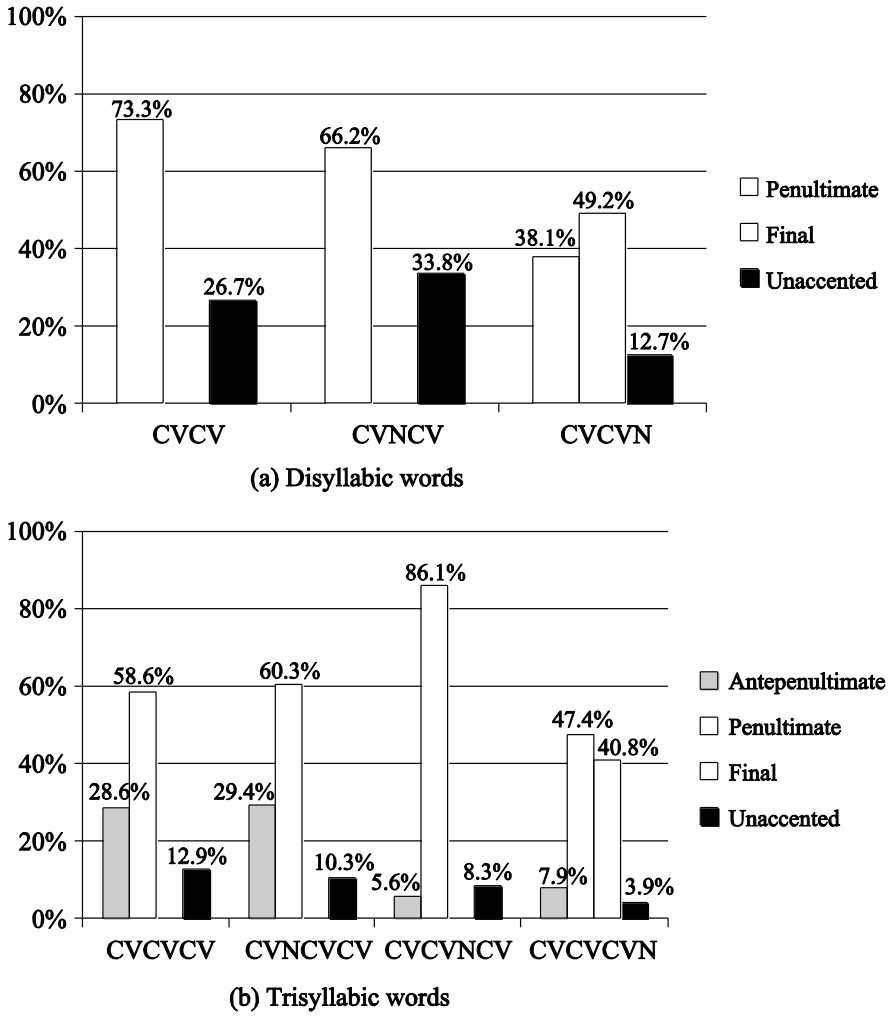


Figure 4. Syllable-based accent loci

4.2 L2 accentuation patterns

As seen in the preceding section, the penultimate syllable was the preferred accent location. This finding conformed to the dominant view that Standard Chinese[8] has

[8] Standard Chinese refers to the official language of China and Taiwan (a.k.a Mandarin, Putonghua, and Guoyu).

trochaic feet, that is, the HL is parsed as (CV́CV) (e.g., Duanmu (2007)). However, the parse CV(CV́CV) or LHL in L2 Japanese, was not expected in Duanmu's analysis because trisyllables in Standard Chinese exhibit an antepenultimate stress (i.e., CV́CVCV). This may be because the trochaic foot (the HL contour) is aligned to the right edge of a word in L2 production, which may also explain why there were significantly fewer unaccented tokens than expected in this study. Furthermore, there was no pitch drop in the accentless words, which could be seen to be a foot type mismatch from native (L1) grammar. The paucity of unaccented words in this study suggests that the participants had limited knowledge regarding the Japanese lexicon, in which 55% of the words were unaccented (Haraguchi 1999). While unaccented words are extremely rare in L1 Japanese loanwords (7%; N = 778, according to Kubozono 2006), the experimental design minimized this possible confusion (see Section 2.6).

4.3 Accent-bearing unit in L2 production

Another important finding was that the L2 Japanese accent-bearing unit was more likely to be a syllable rather than a mora, as the heavy syllables did not tend to attract an accent, with the only "exception" being word-final CVN syllables in disyllabic words (see Figure 4(a)). This finding indicated that the durational distinction between CV and CVN syllables in L1 Japanese had not been learned by the TM-speaking Japanese participants, which could have been because of L1 interference. Open syllables in TM are invariably bimoraic (or a phonetically long vowel, CV:), as are nasal-ending syllables. In TM, both open and closed syllables are of equivalent phonetic length, so in L2 production, CV and CVN are treated similarly in terms of syllable quantity. This was predicted in the experiment, where it was seen that the CVN syllables were not robust accent attractors.

The comparison of these results for TSM speakers' L2 Japanese accentuation supported our claims. Previous studies on the Japanese L2 accentuation by TSM-speaking learners had indicated that they tended to assign an accent to the penultimate mora of CVCV syllables or on the antepenultimate mora if there was a heavy syllable in the penultimate position of a word (Terakawa 1942, Tsai 1977, Hsieh 1980, Shigematsu 1996). This would likely indicate that TSM speakers are more sensitive to durational distinction as TSM has a robust contrast between long (sonorant-ending) vs. short (checked) syllables. Consequently, it is not surprising to see that syllable weight played a decisive role in the accent/tone assignment in TSM-speaking L2 Japanese students. Overall, the different L2 accentuation patterns for the CVN syllables were probably due to L1 interference.

4.4 L1 metrical parameter transfer

The results discussed in the previous sections suggest that L1 linguistic property transfers occur in L2 prosody even between languages with distinct prosodic systems, that is, between a tone language (L1) and a pitch-accent language (L2). The application of the L1 trochaic foot structure resulted in a preference for an L2 Japanese penultimate syllable accent. Also, feet are quantity-insensitive in the L2 accentuation of Japanese, meaning that light and heavy syllables can occur either in a head or recessive position. Therefore, these results are considered as showing a transfer effect from the L1 TM metrical properties. The systematic arrangement of this study gave a clear picture of the metrical properties in L2 accentuation, which had not been observed in any previous studies. Therefore, the results of this study have confirmed that metrical properties can be transferred from L1s to L2s with different prosodic systems, such as between a tone language and pitch-accent language, which is in contrast to the claims made by Archibald (1997), who argued that metrical parameters cannot be transferred from an L1 to an L2, which have typologically distinct stress systems.

5. Conclusion

This study investigated L2 Japanese pitch accent production in TM-speaking Japanese learners. The major findings are summarized below.

1) TM-speaking Japanese learners tended to place an accent on the penultimate syllable.
2) L2 accentuation was essentially syllable-based in the TM-speaking Japanese learners.
3) Word length was not a robust factor in L2 Japanese accent production.
4) If properly controlled in an experimental setting, as far as accentuation patterns are concerned, beginner L2 learners appeared to be unaware of the distributional skews in the native Japanese lexicon.

TM-speaking Japanese learners were also observed to behave quite differently from TSM-speaking learners according to the WSP. This difference hinges on the different primary languages, namely that TM syllables are equivalently durational (ignoring neutral tone syllables for present purposes), whereas TSM has a salient length distinction between long vs. short (checked) syllables. This supports the finding that L1 interference was robust at least in beginner L2 learners and that the

metrical properties of an L1 tone language can be transferred onto the Japanese L2 pitch accent pattern.

The experimental design reduced possible confounding factors such as the "familiarity" effect or word length. A research question to pursue in the future is whether heavy syllables are preferentially accented in advanced L2 Japanese learners.

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日語為第二語言之語音及音韻重音結構探析

-以台灣日文學習者為例

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此研究主要探究台灣日語學習者之日語重音結構。發音實驗中，控制了字長、音節重量以及熟悉度三個因素。主要研究結果顯示，受試者之重音以及重音落點均不受韻律因素影響。事實上，受試者的表現不偏好非重音。且更重要的是不管音節重量為何，受試者均傾向將重音置於倒數第二音節。本研究認為，此乃受台灣華語之揚抑格音步特點所影響。此外，本研究也發現，台灣華語的雙音拍結構亦是造成台灣日語學習者無法分辨日語重音節和輕音節的主因。研究結果顯示，台灣日語學習者的確將台灣華語的韻律性質（聲調語言）轉移到日語韻律結構（音高重音語言）的學習中。

關鍵詞：第二語言習得、日語音高重音、台灣華語、音節重量、重音承載單位、母語遷移