

Accents in Tokyo and Kyoto Japanese Vowel Quality in terms of Duration and Licensing Potency

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Abstract

This paper offers a phonological analysis of the compatibility between vowel quality and lexical accent in the Tokyo and the Kyoto dialects of Japanese. This work benefits not only from phonological considerations but also from acoustic analysis. Analyses from these two perspectives converge on the claim that the lexical determination of the head position, on which the lexical accent falls, reflects licensing potential at the segmental construction level. In the Tokyo dialect, the vowel /a/ attracts lexical accents, while /u/ on the other hand repels lexical accents, whereas in the Kyoto dialect, /u/ attracts a high proportion of lexical accents. Acoustic measurements of vowel duration suggest that the longest vowel in the dialects in question attracts lexical accents the most, and the shortest vowel, the least. However, we encounter a difficulty in establishing the pecking order of the mid-vowels and high-front vowels in both dialects. A phonological analysis couched in the theory of Phonological Government provides an account of which vowels tend to attract or repel accents, calling upon the notion of licensing relations holding between Phonological Elements.

0. Introduction

This paper highlights the distribution of lexical accent in two dialects of Japanese and its relation to the quality of the vowels with which it co-occurs. On the question of the asymmetric distribution of the five vowels in Tokyo Japanese (TJ) and in Kyoto Japanese (KJ) in relation to accent, I report that 1) in Tokyo Japanese /a/ and /i/ show a tendency to carry lexical accents in native nouns, while /u/ on the other hand, is the least likely to be accented, 2) on the contrary, Kyoto Japanese, attracts lexical accents of the same category to /u/. The most and least frequently-occurring vowels reflect their duration measured acoustically in TJ, as does the most popular (/u/) in KJ. However, the other 3 vowels, namely /i/, /o/, and /e/ fail to show the same correlation. The phonological elements proposed in Government Phonology (GP) (Kaye, Lowenstamm, Vergnaud 1985, 1990, Charette and Göksel 1996, Harris & Lindsey 1995) directly account for such an asymmetric distribution of lexical accents: the headedness of the simplex melodic expressions A and I in TJ and A and U in KJ. The identity of the metrical head of a word-domain thus depends upon the quality of the melodic expression occurring in that domain.

1. Pitch Accent in Japanese

This study focuses on native nouns with inherent lexical accents comprising two (C)V pairs. This word size enables us to explore an abundance of samples, 513 words, with fairly equal distribution of accents, without being affected by metrical operations taking place in Japanese (see Yoshida (1999) for metrical accent assignment). Three (C)V words, unlike native words exceeding four (C)V in length, are plentiful; however, they are subject to changes in accent pattern, resulting in a choice of alternative pitch patterns for each item (Yoshida 1999). All the forms examined are

used in both dialects under discussion, at least as an alternative form (see 5.2. for detailed discussion).

1.1. Lexical Accent in Tokyo Japanese

As previous work has shown (e.g. Haraguchi 1977, 1991; McCawley 1968), words in TJ can be either accented or accentless. If accented, the location of the accent may be either metrically predictable or otherwise lexically designated. A drop in pitch marks the location of the accent, and the pitch patterns are predictable once the location of the accent is identified: all the morae to the left of the accented mora should be high pitched except for the word-initial mora (unless this initial mora is itself accented). The distinction between words without any accents and those with word-final accents becomes clear only after a case-marker such as *-ga* (nominative marker) is suffixed. The data in (1) represent all three accent types occurring in bimoraic words: 2 lexically accented classes and the accentless class of TJ nouns. The common understanding is that lexical accent may be located on any vowel in the word. A bar over segments indicates that the relevant part is high-pitched, and a * denotes the lexical accent.

(1) Contrast: Lexically accented and accentless terms

a. Words comprising two morae (O)N(O)N

	*		*
i)	ha si	‘chopstick’	ha si -ga ‘chopstick -nom.’
	*		*
ii)	ha si	‘bridge’	ha si -ga ‘bridge-nom.’
	—		—
iii)	ha si	‘edge’	ha si -ga ‘edge -nom.’

The next section presents data illustrating pitch patterns of words comprising two morae in Kyoto Japanese.

1.2. Lexical Accent in Kyoto Japanese

Three crucial points distinguish KJ from TJ: 1) the location of lexical accents in corresponding forms, 2) the fact that the initial mora of the word is subject to high-pitch sharing if the pitch is shared in the word in question, and 3) there are two classes of accentless words with respect to pitch sharing. Two classes of accentless words are marked either by the high-pitch shared by all segments within the prosodic domain (2aiii), or the presence of a high-pitch only on the rightmost nucleus of the prosodic domain (2aiv).

(2) Contrast: Lexically accented and accentless terms

a. Words comprising two morae (O)N(O)N

	*		*
i)	ka ki	‘hedge’	ka ki -ga ‘hedge -nom.’
	*		*
ii)	ka ki	‘oyster’	ka ki -ga ‘oyster -nom.’
	—		—
iii)	ka ki	‘persimon’	ka ki -ga ‘persimon -nom.’

- iv) a \overline{si} ‘reed’ a si $\overline{-ga}$ ‘reed –nom’

2.5 Vowels and Distribution of Accents

The study focuses on the quantitative distribution of the five vowels in *Yamato* (native) words, in relation to accented positions in the word. An exhaustive list of native words is available from Osaka and Tokyo Accent Database (Sugito 1996), which contains 65,928 words with pitch information. The advantage of using this database for the present study is that it includes information concerning whether or not individual entries existed in the Heian period (AD 794-1192). This assists in the collection of genuine native terms, which is crucial to exclude an abundance of Sino-Japanese words that were nativised in terms of their phonological forms, including their accentuation, which occurs absolutely predictably on the initial vowel (Yoshida 1999). This is due to the fact that the majority are: 1) (C)VN, where no accent is expected on an N, a so called ‘moraic N’, 2) (C)VCV form where the second vowel is highly predictable being an epenthetic vowel¹, or 3) (C)VV where the VV is a diphthong, where the second V is never accented.

2.1. Distribution of Vowels

The classification of native words according to vowel quality is done in an attempt to establish whether the quality of the vowel shows any relevance to the pitch accent in TJ. Tables (1a-c) show the distribution of vowels and lexical accents in native nouns comprising two ((C)V)s. Three accentual patterns are possible: the accent on the initial V, V₁, the accent on V₂, or accentless. Table 1 allows readers to refer to the distribution of vowels, regardless of accent location.

(3) *Vowel distribution for all accent types (native (C)V₁(C)V₂ nouns).*

a. Initial Accent

	V ₁	V ₂	Total
/a/	71	41	112
/i/	30	59	89
/u/	37	26	63
/e/	5	28	33
/o/	37	26	63
Total	180	180	360

¹ The epenthetic vowels for this type of words are usually /u/ or when preceded by a front vowel, /i/ (Ito & Mester 1996, Tateishi 1990, Yoshida 2003), on which accents hardly land in TJ.

b. Final Accent

	V ₁	V ₂	Total
/a/	70	68	138
/i/	34	63	97
/u/	54	12	66
/e/	2	24	26
/o/	26	19	45
Total	186	186	372

c. Accentless

	V ₁	V ₂	total
/a/	42	39	81
/i/	31	50	81
/u/	31	7	38
/e/	7	25	32
/o/	36	26	62
Total	147	147	294

We see fewer accents falling on /u/ for V₂ position, and on /e/ for V₁. The likelihood of an accent falling on each vowel on V₁ and V₂, is as follows. The majority of word-final accents cluster on /a/ (38%) and /i/ (25%), while the two mid vowels /o/ (20%) and /e/ (8%) attract fewer accents. Not many lexical accents appear on /u/ (13%).

Now, although we know how likely it is for each of the 5 vowels to attract an accent, it should be noted at the same time that the numbers of tokens of each vowel occurring in the samples are not evenly distributed. In fact, we see immediately an uneven distribution of vowels: both word-initial position and word-final position take /a/ or /i/ more frequently than the other vowels. This suggests that simply comparing the numbers of accented vowels does not necessarily show the real tendency underlying the accent distribution. The proportion of accented vowels should instead be calculated in relation to the total number of the vowel in question.

2.2. Accent Ratio per Vowel

In order to test the ‘accentability’ of all 5 vowels in TJ and KJ, this section examines the ratio for each accented vowel out of the total number of tokens of that vowel.

2.2.1. Accent Ratio per Vowel in Tokyo Japanese

Below are the tables showing how all the vowels are distributed for the 3 accentual patterns in TJ. Both vowels are extracted from all (C)V₁(C)V₂ native nouns, giving a total of 1,026 (513x2=1,026) in all 513 samples.

(4) *Tokyo Japanese: Accented /x/ vs .total /x/*

	Accented /x/	Total /x/	Ratio
/a/	139	331	42.0 %
/i/	93	267	34.8 %
/u/	49	167	29.3 %
/e/	29	91	31.9 %
/o/	56	170	32.9 %
Total	366	1026	

42% of all /a/s are accented whereas only 29.3% of all /u/s are found with accents.

If we were to decide the pecking order of the five vowels in terms of their ‘accentability’ in accordance with Table 4, we should take /a/ (42%) as the most popular, followed by /i/ (34.8%), /o/ (32.9%), /e/ (31.9%), and the least /u/ (29.3%). Note that this order does not correspond to the size of the total occurrence of the vowels: more tokens of /u/ are found (167) than token of /e/ (91).

2.2.2. Accent Ratio per Vowel in Kyoto Japanese

Here is the table showing how all the vowels are distributed for the 3 accentual patterns in KJ where two accentless types are conflated to one. Just as for TJ, both vowels are extracted from all (C)V₁(C)V₂ native nouns, giving a total of 1,026 (513x2=1,026) in all 513 samples. In fact in KJ, final accent is far less common than initial accent, which fact allows us to predict the accent location, assuming the word is accented. Yet the quality of the vowel is still important for accentuation, and a word can always opt for being accentless.

(5) *Kyoto Japanese: Accented /x/ vs .total /x/*

	Accented /x/	Total /x/	Ratio
/a/	89	331	26.9 %
/i/	46	267	17.2 %
/u/	75	167	44.9 %
/e/	13	91	14.3 %
/o/	47	170	27.6 %
Total	270	1026	

Striking differences emerge when the ratios of accented /u/ in the two dialects are compared. In KJ, the probability for /u/ to be accented is the highest as opposed to the lowest in the case of its counterpart in TJ. In contrast, the other high vowel /i/ is the second least accented vowel in KJ whereas /i/ is the second highest in TJ.

This distribution of accent in KJ easily overturns the null-hypothesis by the Chi-squared test (χ^2):

$$\chi^2 = \sum \frac{(O - E)^2}{E}$$

The Chi-square value $\chi^2 = 35.25$, with 4 *df* (degrees of freedom) and $p < 0.01$, shows that the distribution of the accents is not random in KJ².

2.3. Possible Analyses and Problems

It is tempting to resort to the fact that TJ high vowels are subject to devoicing when they are sandwiched by, or word-finally preceded by voiceless consonants. This phenomenon is typical of dialects of Tokyo and surrounding areas. Accents are avoided on the devoiced high-vowels in TJ (Haraguchi 1991, Yoshida 1999). This is well applicable to /u/, which obviously repels accents, however, not to the second favourite site of an accent, /i/, which is liable to be devoiced in the same environment. Thus this means of accounting for accent distribution does not capture the asymmetric distribution of accents on the two high vowels.

A framework that employs sole use of phonological features would also fail to account for these accent distribution facts. In TJ, a natural grouping of a low (backish) vowel /a/ and a high front vowel /i/, on one hand in KJ, a feasible generalisation still needs to be found to explain why the different pairs are the most popular landing sites for accents. The grouping is well accounted for however in the theory of phonological Government.

The next section will account for these asymmetries in the two dialects. Significant vowels here are 3 vowels, /a/, which is popular for accents in both dialects, and /i/ and /u/ to show contrastive distribution in KJ and TJ. They are, in Government Phonology terms, simplex Phonological Expressions, which will be explicated in detail in the following section.

3. Phonological Elements – Accents and the Head of the Word Domain

The distribution of accents on the 5 vowels finds an explanation in the theory of Government-Licensing (Charette 2000, Charette & Goksel 1996, Harris & Lindsey 1995, Kaye 1995, Kaye, Lowenstamm & Vergnaud 1990) in which Phonological Elements contract licensing relations between themselves. In fact, the nuclear position that dominates a phonological expression with a potential licenser element has a strong tendency to be the head nucleus of its word domain, that is, the accented V.

(6) Licensing Principle Kaye 1995

All phonological positions save one must be licensed within a domain.

The unlicensed position is the head of the domain.

Of course every phonological domain is subject to this principle, which necessarily includes the word-domain where one nuclear position serves as the head, i.e. the nucleus with the primary accent of the word in question (see also Yoshida 1999).

² TJ accent distribution, however, requires a compromise to the standard by setting the probability of error threshold to $p < 0.17$ to show statistical significance. In this paper, I only present the observed tendency demonstrated in 3.2.1.

3.1. Phonological Elements and Licensing

The 5-vowel-system of Japanese provides a good illustration of how Phonological Expressions (PEs) are composed of the 3 Phonological Elements, A (non-high), I (front/palatal) and U (labial/round), proposed in GP. These three elements are cognitively, as opposed to phonetically, defined objects; moreover, they are univalent units, only one term being considered phonologically significant for each element. In other words, each is monovalent, being present in one class of segments and absent from the complement set (Harris & Lindsey [5]).

Both TJ and KJ exhibit 5 vowels, /a/, /e/, /i/, /o/ and /u/, and null hypothesis would be to set up the same licensing constraints between the two dialects. Notwithstanding this, the actual phonetic values of /u/ in the two dialects are dramatically different: in TJ, an unrounded high back vowel, and in contrast, /u/ in KJ is a rounded high back vowel. As was discussed in earlier sections, the accentual behaviour varies between the two dialects: thus the two dialects deserve separate vowel inventories. Indeed, in loanwords, an epenthetic vowel tends not to be a target of accentuation in TJ, whereas KJ often opts to locate an accent there.

(7) a. Tokyo Loanwords: an epenthetic /u/ (underlined) at antepenultimate V

	<i>Antepenultimate</i>	<i>accent shift</i>	<i>'glos.'</i> (source language)
i)	so N b <u>u</u> re ro	~ so N b <u>u</u> re ro	'sombbrero hat (Spanish)'
ii)	a re r <u>u</u> gi:	~ a re r <u>u</u> gi:	'allergy (German)'
iii)	n/a	pu ro da k <u>u</u> sho N	'production (English)'

b. Kyoto Loanwords – Placing accents on epenthetic /u/ (underlined)

ma k <u>u</u> do	'McDonald (clipped form)'
bi s <u>u</u> ko	'a name of a biscuit'

In accordance with the realization of PEs both in TJ and KJ, I propose the following:

(8) a. **A is a natural head and is the only one element to take a complement in TJ and KJ**

b. **Licensing of a complement in PE balances POTENCY of the licensor**

The vowel inventory of TJ is expressed as (A) for /a/, (I) for /i/, (U) for [ɯ], (A.U) for /o/, and (A.I) for /e/, where underlining represents headedness. The KJ vowel inventory is analysed as (A) for /a/, (U) for [u], (I) for /i/, (A.U) for /o/, and (A.I) for /e/. It should be noted that the constraint in (8a) excludes (I.U) for /y/, which is present in other Japanese dialects e.g. Ishigaki (Ryukyu).

- (9) a. Tokyo b. Kyoto

<u>I</u>	<u>U</u>	I	<u>U</u>
<u>A</u> .I	<u>A</u> .U	<u>A</u> .I	<u>A</u> .U
	<u>A</u>		<u>A</u>

In TJ, simplex PEs are (A), (I) and (U), where A, I and U are interpreted as the vowels /a/, /i/ and /u/, respectively. Note here however, that the phonetic value of /u/ in SJ is actually [ɯ], an unrounded high back vowel. Lacking the salient property of the U-element, this simplex expression U is a non-headed PE. A and I are headed simplex PEs. Section 4.2 below explicates in detail this claim that only U is a headless expression unlike A and I.

Given these ideas concerning the structure and headedness of simplex PEs, a hypothesis is made on the relation between pitch accent and vowel quality in Japanese. A pitch accent, lexical or assigned, is the manifestation of the headship of a word-domain (Yoshida 1999). If the melodic content manipulates a position to take the domain headship, then it seems natural that a position dominating a headed expression should attract the word accent.

- (10) Headedness of a (simplex) PE at the melodic tier projects up to the word level.

Here we have to examine the other dialect in relation to the hypothesis in (10).

When we observe another stratum of words, loan words with vowel epenthesis, we see there is a correlation between the headedness of the PE and accentedness (Yoshida 2003). It is said that the epenthetic vowel /u/ rarely attracts the word accent; for this reason, then, it is appropriate to consider this vowel in the data being tested for accent-repelling elements. On the other hand, the distribution of lexical accents on native nouns would reveal accent-attracting PEs.

3.2. Kyoto Japanese and headship of a word domain

The Kyoto dialect accommodates apparently the same segmental composition of words, but with different accentuation. The vowel inventory resembles that of the Tokyo dialect, /a/, /e/, /i/, /o/ and /u/ in the two dialects, however, the phonetic quality of /u/ in particular is striking to non-Japanese speakers' ears. /u/ in the Tokyo dialect is unrounded [ɯ] as I mentioned before (4.1) whereas /u/ in many Kansai (western) dialects inclusive of the Kyoto is rounded [u]. Recall that the most popular vowel for lexical accent in KJ is /u/, on the contrary to TJ. Under the claim I am making in this paper that the headedness of the PE projects to the prosodic domainhood, the PE for /u/ in KJ must be U. This results in setting another set of PEs for the KJ vowel inventory.

The PEs in KJ are proposed as follows: (U), (A), (I), (A.I) and (A.U), where A is the natural head (see (7a)). The headed expressions U and A project their licensing potential to the prosodic level. The two most popular vowels in KJ to be lexically accented are /a/ and /u/.

In terms of simplex PEs, the popularity of /a/ and /i/ in TJ and /a/ and /u/ in KJ for pitch accents immediately finds explanation as the inherited headedness of a PE to prosodic headship in both dialects. Articulatory qualities³ of /u/ in the two dialects

³ In one of the following sections, acoustic evidence follows in terms of segmental duration (see section 6): KJ /u/ is one of the longest vowels in the two dialects altogether, while TJ /u/ is the shortest of all.

back up the PE (U) to be headed or not: absence of the salient property of the element, roundness, in TJ is captured by headlessness of the PE for /u/ [ɯ], whereas fully rounded /u/ [u] in KJ should be expressed as headed U.

Here one might wonder why vowel inventories that are not too different in the two dialects should be equipped with different PEs. The answer is found in phonological phenomena around complex PEs, namely for /e/ and /o/. The constraint on balancing of licensing potency (7b) will be considered in section 5.

4. Sum of the PEs – Complex PEs and headship

At the segmental level are some phonological phenomena that involve licensing between phonological elements and PEs. Unlike simplex PEs observed above, licensing at the segmental level will be balanced and the licensing potency will not remain the same when projected up to the prosodic domain. Some related issues of segmental operation are discussed in the subsections below to illustrate the balancing of PEs.

4.1. Headedness in Conflict in TJ

The vowels /e/ and /o/ are represented as complex PEs: [e] as A and I, and [o] as A and U. To determine the head element between the two combined elements is a straightforward matter for /o/: this vowel combines the licenser expression A and the headless expression U, with A simply passing on its headedness to the compound expression to license U. For /e/, however, the combination of the two headed expressions A and I creates a headedness conflict. The headedness of both cannot be combined to boost the licensing potential of the complex PE; rather, they suppress each other's licensing potency. The low occurrence of /e/ in the samples provides evidence for this conflict of headedness. Also this is why /o/ is permitted to bear more accents than /e/ does.

The simplex headed expressions A and I attract accents most frequently, followed by the two complex expressions /o/ and /e/; finally, the headless expression U attracts the fewest accents. The PEs that attract an accent are A and I, both of which are headed, whereas a headless PE, U, appears to repel accents.

This suggests that licensing power is consumed when elements are combined, thereby weakening the ability of the head element to transmit potential to support the headship at the prosodic level.

Yet this line of argument leads to another implication in TJ: the headedness of a PE is passed on to become the headship of the word-domain. The PE for /e/ should be headed to account for the higher percentage of /e/ being accented than that of the headless PE U for /u/. The next subsection discusses how the balancing results in KJ.

4.2. Complex PE in KJ and Vowel Harmony in Kyoto Japanese

Recall that the PEs in KJ are proposed as follows: (U), (A), (I), (A.I) and (A.U), where A is the natural head. As I briefly mentioned earlier, TJ and KJ share all the examined 513 two-mora nouns in terms of segmental composition, however, some of the local vocabularies and negation of verbs present vowel harmony processes which are unique to KJ and other neighbouring dialects, with vowel harmony yielding /e/. Noteworthy here is that despite the fact that lexical /e/ is not frequent in KJ either, unlike TJ, KJ favours more the vowel /e/. /e/-harmony processes demonstrate how the

balancing of the PEs work in KJ: the nuclear position dominating the PE (A.I) for /e/, is in many cases a licensed position in the process of vowel harmony. A nuclear position dominating (I) is naturally licensed by another nuclear position dominating (A).

Here is a set of examples demonstrating vowel harmony in a noun. Corresponding Tokyo forms should be contrasted. This harmony is active for loanwords (11a) and Sino-compounds (11b) alike, as well as native *Yamato* words (11c&d).

- | | | | |
|------|----------------------------|-------------------------|--|
| (11) | <i>Kyoto</i> | <i>Standard 'glos.'</i> | |
| a. | h <u>e</u> re | hire | 'fillet (meat)' |
| b. | keN <u>e</u> n <u>e</u> ji | keNninji | 'Ken'nin Temple (in Kyoto)' |
| c. | k <u>e</u> tune | kitune | 'fox' |
| d. | eb <u>e</u> su | ebisu | 'Ebisu (the god of wealth and commerce)' |

In KJ, if a licenser A element is present in the word domain, then the headless expression (I) has to be licensed by that licenser A.

- | | | | | | |
|---------|-------------|----|-----------------|----|---------------|
| (12) a. | O N O N | b. | O N O N O N | c. | O N O N O N |
| | | | | | |
| | [x x x x] | | [x x x x x x] | | [x x x x x] |
| | h I r I | | k I t U n I | | I b I s U |
| | | | | | |
| | A | | A | | A |

Examples of the morphological harmony set follow these word-internal ones. Across the morphological boundary, the harmony is active only when the A licenser is at the adjacent nucleus.

- (13)
- a. No harmony
 oki-hiN 'get up - not'
 aki-hiN 'get bored - not'
- b. A licenser adjacent
 aka-heN 'open - not'
 oka-heN 'put - not'
- uke-heN 'take - not'
 toke-heN 'melt - not'

Verb stems in (13a) do not have an A licenser at the morpheme-final position which is adjacent to the initial nucleus of the negative suffix.

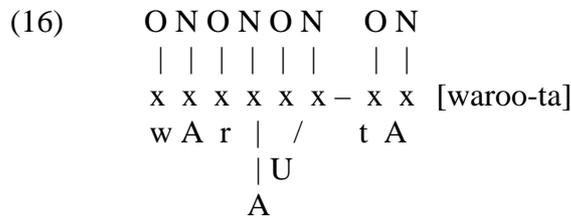
- | | | | | |
|------|----|-------------------|----|-------------------|
| (14) | a. | O N O N - O N O N | b. | O N O N - O N O N |
| | | | | |
| | | x x x - x x x x | | x x x x x x x |
| | | k I h I N | | A k I h I N |
| | | | | |
| | | A | | A |

Although two conditions are detected for this A-licensor harmony, one lexical and another morphological, the process is productive in KJ. KJ /e/ is composed of A and I, where the headed A naturally licenses headless I, (A.I). The process is not found in TJ where /e/ is the combination of (A) and (I). Note the contrast to the TJ sum of both headed A and I, resulting in the low occurrence of the vowel /e/ lexically, marking the loss of potency of licensor A. In terms of accent distribution, in KJ also, the position with the segmental content /e/ is a licensed one, thus the fewest lexical accents are attracted to this position.

/o/ is a frequently accented vowel in KJ. The sum of licensors in this dialect are not exhausted completely and will still remain a strong licensor of the prosodic domain. Here is one instance of an A and U merger process that results in dominating two nuclear positions. The U element originates from an onset, however, this process shows that the merging of elements A and U is productive in KJ. Past form of verbs whose stems end with /aw/ sequence⁴ results in having a long vowel /o:/.

- (15) a. waraw- 'to laugh' waroota 'laughed'
- b. moraw- 'to receive' moroota 'received'
- c. kiraw- 'to hate' kiroota 'hated'

In GP terms, the glide /w/ is viewed as a U element, and forms the PE (A.U). KJ just like TJ, does not license empty domain-final nuclei (KLV 1990, Yoshida 1999), which means that the nuclear position after the onset dominating /w/ has to be filled phonetically:



More evidence needs be explored for the licensing potency of the sum of (A) and (U), however, this merger process at the moment will be discussed only with regard to the vowel /o/, whose duration is relatively long among Kyoto vowels. The following section discusses the relation between the duration of vowels and accents.

5. Vowel Duration and Lexical Accents

5.1. Tokyo Japanese

Okada (1969) reports that the longest vowel in TJ is /a/, and that the shortest is /u/ (17a) in terms of the duration obtained from spectrographic analysis. Indeed, measurements of vowel duration seem to vary from one study to another. In fact, Homma (1973) reports the durational order as o>e>a>i>u. Nevertheless, all studies agree that the vowel /u/ is the shortest. The study below gave the result a>o>e>i>u.

⁴ The stem form is worked out by the test adding a negative suffix '-anai' resulting *warawanai*.

- (17) a. Homma's o>e>a>i>u
 b. Okada's a>o>e>i>u
 c. Yoshida's a>o>e>i>u

The first hypothesis is made on the basis of the correlation between the relative duration and the accentability of /a/ and /u/ in SJ, as follows:

(18) **Hypothesis:**

The longer the duration, the more accents are attracted to that segment.

Pursuing this line of analysis, I used spectrographic tools (SP4WIN Custom) to measure the duration of all five vowels. A set of data below is read twice by a 38-year-old female native speaker. The table below shows the mean duration for each vowel when accented. All the lexical items in the list carry word-initial accents. Samples are selected: voiced consonants for C₂ are avoided, which tend to prolong the duration of the preceding vowel as in the example of /kibi/ 'millet' (65 msec). In the data list, most terms with /i/ or /e/ have a voiced C₂. Note that /kita/ with initial accent does not exist in SJ, unlike its finally accented counterpart meaning 'north', and thus is treated as a nonsense word. Two Sino-words, /kuko/ 'Chinese matrimony vine' and /seki/ 'dam', are used for this purpose.

(19) **Duration of Accented V₁ (in msec)**

	'gloss'	1 st	2 nd	mean
/kata/	'shoulder'	65	68	67
/kate/	'food'	77	74	76
			/a/	72
/kita/	(nonsense word)	66	50	58
/miso/	'bean paste'	58	64	61
			/i/	60
/kuda/	'pipe'	58	56	57
/kuko/	'Chinese matrimony vine'	46	58	52
			/u/	55
/keta/	(nonsense word)	65	59	62
/seki/	'dam'	56	63	60
			/e/	61
/koto/	'Japanese harp'	65	57	61
/hoko/	'pike'	62	62	62
			/o/	62

In terms of duration, this gives us the following order: /a/ (72 msec) is the longest, followed by /o/ (62 msec), then /e/ (61 msec), /i/ (60 msec), and finally /u/ (55 msec). It is true that the longest vowel /a/ attracts lexical accents, and on the other hand /u/ repels lexical accents. Acoustic measurements of vowel duration suggest that the longest vowel attracts lexical accents most, and the shortest vowel, the least. However, we encounter a difficulty in establishing the order of the remaining vowels,

i.e. /i/ is the second shortest, that is, no longer than /o/ and /e/, but attracts accent more than the two mid-vowels.

This argument on duration of a vowel and accentuation may however conceal a chicken and egg story. The assumption here is that it is the duration of the vowel attracting or repelling accents, however, one might equally well argue that the cause of a certain vowel being long comes from the status of being accented. To evaluate the hypothesis, unaccented vowels were examined.

(20) **The Tokyo Japanese Duration of Unaccented V (in msec)**

	'gloss'	1st	2nd	3rd	mean
	O. = onomatopoeia				
/katakata/	'clickety-clack'	54.4	54.3	54.4	/a/ 54.3
/pitipiti/	'O. for fish being fresh'	55.0	52.1	55.0	/i/ 54.0
/kusukusu/	'O. for giggling'	44.7	44.7	42.0	/u/ 43.8
	'gloss'	1st	2nd	3rd	mean
/teketeke/	'O. for children's footsteps'	45.4	45.4	47.6	/e/ 46.3
/tokotoko/	'O. for fast walking'	50.6	50.8	50.9	/o/ 50.8

Comparison between accented vowels and their unaccented counterparts shows that the former is longer than the latter in general. Actual ordering of the vowels in terms of duration is slightly different, however, between them, and the ordering of unaccented vowels better matches the frequency ordering in terms of accent, that is, /a/ > /i/ > /o/ > /e/ > /u/. This proves that the duration of the vowels determines accentability of vowels, not *vice versa*.

5.2. Duration of Kyoto Vowels

In the same manner, the durations of KJ vowels were measured. The informant was a 40 year old female speaker who was born and brought up in the centre of Kyoto City. The same result is obtained for KJ that /a/ is the longest vowel regardless of the vowel in question being accented or not ((17) & (18)). /u/ is dramatically longer in KJ than in TJ, with or without accent. In KJ, we do not see as clearly the correlation between the likelihood of a vowel for accentuation and its duration, however, at least we are now sure that the contrast in duration between the TJ /u/ and KJ /u/ must be contributing to the asymmetric behaviour of the vowel in terms of accent.

(21) **Kyoto Dialect – Duration of Accented V1 (in msec)**

	'gloss'	1st	2nd	mean
/aka/	'grime'	91	95	93
/kata/	'shape'	79	83	81
/kate/	'food'	84	88	86
				/a/ 86.7
/iki/	'Iki (place name)'	87	75	81
/kita/	'north'	62	71	66.5
/miso/	'bean paste'	62	62	62
				/i/ 69.8
/uki/	'rainy season'	95	96	95.5
/kuta/	'Kuta (a town in Bali)'	88	75	81.5
/kuko/	'Chinese matrimony vine'	75	75	75
				/u/ 84.0
/eki/	'station'	87	83	85
/teki/	'steak'	90	88	89
/seki/	'seat'	70	88	79
				/e/ 84.3
	'gloss'	1st	2nd	mean
/oto/	'sound'	87	83	85
/koto/	'Japanese harp'	81	81	81
/hoko/	'pike'	68	75	71.5
				/o/ 79.2

(22) The Kyoto Japanese – Duration of Unaccented V (in msec)

	'gloss'	1st	2nd	3rd	mean
	O. = onomatopoeia				
/katakata/	'clickety-clack'	70	70	79	
				/a/	73.0
/pitipiti/	'O. for fish being fresh'	53	62	62	
				/i/	59.0
/kusukusu/	'O. for giggling'	64	80	70	
				/u/	71.3
/teketeke/	'O. for children's foot steps'	69	64	61	
				/e/	64.7
/tokotoko/	'O. for fast Walking'	76	62	62	
				/o/	66.7

Our observation here is that the duration of a vowel influences accentuation. However, we cannot obtain as clear a generalisation as we got from the PE analysis in sections 4 and 5.

6. Conclusion

This paper has demonstrated how accent distribution can be accounted for in the theory of Government. The difference between the most and least frequent vowel lies in the headedness of the respective PEs which represent the relevant segments. To parallel that, acoustic studies identify /u/ as the shortest vowel in the system in TJ, a fact which may well be linked to its status as an unfavourable accent site. In KJ in contrast, the duration of /u/ being long is contributing to the frequency with which it bears an accent.

7. Acknowledgements

The author's gratitude goes to Monik Charette, Geoff Williams, Phillip Backley, Jorge A. Gurlekian, Daniel Hurst, Hiroya Fujisaki and Yoshinori Sagisaka for their valuable comments on an earlier version of this research. This work was partly supported by Grant-in-Aid for Scientific Research on Priority Areas (B), "Diversity of Prosody and its Quantitative Description" from the Ministry of Education, Science, Sports and Culture, Japan (No. 12132206). The contents of this paper, together with any remaining faults, are the responsibility of the author alone.

8. References

- Charette Monik, 2000. When p-licensing fails: the final high vowels of Turkish. *SOAS Working Papers in Linguistics* Vol. 10: 3-18.
- Charette, Monik; Asli Göksel, 1996. Licensing constraints and vowel harmony in Turkic languages. *SOAS Working Papers in Linguistics* Vol. 6: 1-25
- Haraguchi, Shosuke, 1977. *The Tone Pattern of Japanese: An Autosegmental Theory of Tonology*. Tokyo: Kaitakusha.
- Haraguchi, Shosuke, 1991. *A Theory of Stress and Accent*. Dordrecht: Foris.
- Harris, John; Geoff Lindsey, 1995. The elements of phonological representation. In: J. Durand & F. Katamba (eds.), *Frontiers of Phonology, Atoms, structures, derivations*. Longman.
- Homma, Yayoi, 1973. An Acoustic Study of Japanese Vowels, *Study of Sounds* 16. Tokyo: Phonetic Society of Japan, pp.347-68.
- Ito, Junko & Armin Mester, 1996. Stem and word in Sino-Japanese. In: Otake, T. & Anne Cutler (eds.), *Phonological Structure and Language Processing: Cross Linguistic Studies*. Berlin/New York: Mouton de Gruyter.
- Kaye, Jonathan, 1995. 'Derivations and interfaces'. In: J. Durand & F. Katamba (eds.), *Frontiers of Phonology, Atoms, structures, derivations*. Longman.
- Kaye, Jonathan, 1997. 'Why this article is not about the Aquisition of Phonology', *SOAS Working Papers in Linguistics* Vol. 7: 209-220
- Kaye, Jonathan; Jean Lowenstamm; Jean.-Roger Vergnaud, 1985. 'The internal structure of phonological representations: a theory of charm and Government'. *Phonology Yearbook* 2: 305-328.
- Kaye, Jonathan; Jean Lowenstamm; Jean.-Roger Vergnaud, 1990. Constituent structure and government in phonology. *Phonology* 7: 193-231.
- McCawley, James D., 1968. *The Phonological Component of a Grammar of Japanese*. Hague: Mouton.
- Okada, Tae, 1969. The Influence of Voiced or Voiceless Consonants on Vowel Duration, *Jimbungaku* 115. Kyoto: The Literary Association of Doshisha University, 68-84 (in Japanese).

- Sugito, Miyoko, 1996. *Osaka Tokyo Akusento Onsei Jiten* [Accent Dictionary of Osaka & Tokyo], Maruzen.
- Tateishi, Koichi, 1990. Phonology of Sino-Japanese morphemes. *University of Massachusetts Occasional Papers in Linguistics* 13, Amherst, MA: 209-235.
- Yoshida, Yuko, 1999. *On pitch accent phenomena in Standard Japanese*. [PhD dissertaion submitted to SOAS, University of London (1995). Circulated by the Department of Linguistics, SOAS (1998)] The Hague: Holland Academic Graphics.
- Yoshida, Yuko Z., 2003. Licensing constraint to let. *Living on the Edge: Festschrift for Jonathan Kaye*. Berlin: Mouton de Gruyter.