PROSODIC TEMPLATE IN WORD BLENDING: A COMPARISON BETWEEN NATIVE JAPANESE AND ENGLISH LEARNERS OF JAPANESE

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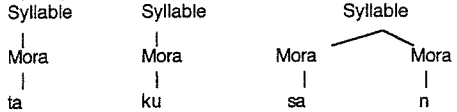
Abstract - Word blending is used to observe the word segmentation of native speakers and learners of Japanese. The results highlight prosodic differences between Japanese and English word-level prosodic templates.

1. INTRODUCTION

The aim of this experiment is to investigate differences in word-level prosodic templates that exist between Japanese and English and to assess the implications that such differences may have for English learners of Japanese. To do this we decided to use the psycholinguistic paradigm of word blending. A blend is defined as a new lexeme formed from parts of two other words in such a way that there is no transparent analysis into morphs (Bauer:1983). Word blending provides a range of linguistic information, since it is affected by a variety of linguistic conditions, both in spontaneous and intentional blending. In phonology word blending has frequently been used to investigate linguistic differences in segmentation strategies of native speaker-listeners. Treiman (1983) first applied intentional blending to observe the internal structure of English syllables. She presented two CCVCC words to subjects who were asked to blend them into one syllable words by taking a part of the first syllable followed by a part of the second syllable. The result proved the existence of onset / rhyme boundary by showing that CC/VCC responses significantly outnumbered other types of responses. Kubozono (1995) followed Treiman's experiment to find the segmentation pattern of Japanese native speakers. He used English monosyllabic words and observed a preference of Japanese speakers to split CVC sequences into CV/C, as opposed to English speakers' preference to split at the onset/rhyme boundary.

This result reflects the particular syllable structure of Japanese. Japanese does not easily adopt the syllable structure which is commonly used in non-CV syllable languages. First of all, the syllable internal boundary, onset / rhyme, does not fit with the phonological organization of Japanese, which is based upon the CV syllable, the unit size of which is counted as a "mora". CV syllables account for 70% of Japanese syllable structures (Otake:1993), and the rest are CVN, CVQ and CVV syllables. That is, a coda position is filled by nasal and a part of a geminate consonant. Consonant clusters are allowed only in the shape of Cj in the onset position. The fact that Japanese orthography corresponds with CV structure also emphasizes the moraic segmentation. Therefore the notion of the mora plays an important role as sub-syllabic unit in speech segmentation of Japanese. For example, a Japanese word "takusan"(many) has the following structure:



Kubozono (personal communication) attempted to show that the syllable as well as the mora constrains word segmentation in Japanese. He extended the former experiment to multimoraic Japanese words, and found that mora boundaries which coincide with syllable boundaries are favored by Japanese speakers as a switch point in word blending.

Another prosodic unit which has been widely discussed in recent Japanese phonology is the bimoraic foot.(Poser:1990, Ito:1990) Although Japanese does not have a system of word stress like English, phonologists have nevertheless proposed a prosodic unit that is called " the bimoraic foot". As evidence for the bimoraic foot Poser(1990) presented hypocoristic formation, kinship-term formation, Geisha client name formation, mimetic formation, onomatopoeia and noun-noun compounding which

all favor bimoraic units. For example, Japanese names take bimoraic form in hypocoristics and do not accept any other forms as follows:

masahiro → masa-chan/maa-chan # masahi-chan
yoosuke → yoo-chan # yo-chan # = ill formed

Another process which produces bimoraic units is found in the systematic truncation or shortening of loan words. a)herikoputaa (helicopter) → heri
demonsutoreeshon (demonstration) → demo
rokeeshon (location) → roke

Ito (1990) interpreted these truncations as an example of the use of a bimoraic template from the viewpoint of prosodic morphology. She posed some restrictions on this formation of truncation. For instance, the following patterns are not formed (# ill-formed patterns):

b) maikurohon (microphone) → #mai maiku
sandoicchi (sandwich) → #san sando
demonsutoreeshon (demonstration) → #demon demo

The syllable structures of these ill-formed patterns are expressed as follows:

2-mora: LL, #H 3-mora: HL, LLL, #LH
4-mora: HH, HLL, LLH, LLLL, #LHL

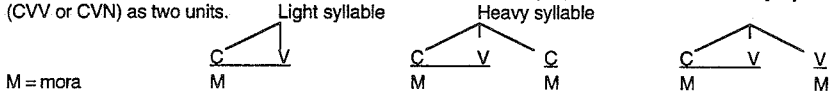
Ito proposed the following two formulae and pointed out the ill-formedness of the patterns above:

1) Min (STEM) = F = [μμ] 2) Min (WORD) > σ

The minimal prosodic stem is the bimoraic foot 1) and the prosodic word must be minimally disyllabic, i.e. longer than one syllable 2). Therefore the words in a) are acceptable but the ones in b) are not. The location of STEM is supposed to be the left edge of the word (Left Edge Requirement), since Japanese is a suffixing language (Ito:1990). Ito limits the application of the bimoraic minimality template in Japanese only to derived forms (truncated hypocoristics or shortened loan words) and not underived lexical items, i.e. Japanese monomoraic words, me (eye), ki (tree) etc. Her proposal has significant implications for the interpretation of word formation by blending.

2. HYPOTHESIS

If learners have acquired moraic segmentation, their responses should show the same pattern as Japanese native speakers, which is to segment light syllables (CV) as one unit and heavy syllables (CVV or CVN) as two units.



A syllabic and moraic segmentation will yield the same result for light syllables. However, heavy syllables will be split into two units by a moraic segmentation strategy. They will be presented as one unit by a syllabic segmentation strategy, or possibly split at the onset-rhyme division if the syllable is split into sub-syllabic components. More importantly, the place where the split of heavy syllables occurs would provide valuable information in the light of bimoraicity.

3. METHOD

1) Materials

Twenty seven pairs of real Japanese words were chosen based on their syllable structure, heavy (H) or light (L). Henceforth, we will call these pairs H-L stimulus pairs. Heavy syllables were limited to CVV and CVN. The words were familiar to the learners so that they would not have difficulty in retaining the words in their (short-term) memory during the task. The Kanji component in the words were not fully taken into consideration because it was highly unlikely that second language learners picture the kanji character instantly when they hear Japanese words. In addition, choosing a non-kanji component which has CVV or CVN syllable yields words that are extremely difficult and unfamiliar to learners. The pairs of stimulus words were matched up carefully so that they would not have the same mora component near the segmentation point. However, phoneme overlapping, such as "ka" and "ke", or "ha" and "na" was not taken into consideration and included in No.3. This affected the response pattern of the blending, which will be discussed in the results.

1. LLL+LLL	2.LLL + LH	3. LH +LLL	4. LLL + HL	5. HL + LLL
kuruma + shigoto	ichigo + mikan	mikan + ichigo	tegami + kanji	booshi + sakana
atama + oshiri	shigoto + kaban	gohan + sakana	okane + toofu	denki + kuruma
sakana + oto	atama + kinoo	tokei + okane		ringo + kodomo

6. HL + LH	7. LH + HL	8. LL + HH	9. HH + LL	10. H + LL
ringo + mikan	kinoo + seito	haru + koukou	koukou + haru	ten + kasa
denwa + satoo	mikan + ringo	ame + konban	konban + ame	too + hiru
seito + jikan	satoo + denwa			kin + sora

2) Subjects

Nineteen Australian students whose level of Japanese is advanced and twenty-one native speakers of Japanese participated in the experiments. The students are all studying Japanese at Griffith University. Their ages range from 19 to 25, and they have lived in Japan for a year. The background of native Japanese speakers varies slightly. They are students or residents in Brisbane, and the period of their stay in Australia ranges from one month to 7 years. However, there was no particular tendency in their responses that was related to the length of their stay. Therefore all the responses were taken as valid data.

3) Procedure

The subjects were auditorily presented with pairs of words and were asked to make a new word by attaching the first half of the first word they would hear to the last half of the second word. The subjects were requested to repeat the new word twice after pronouncing the stimulus pair twice. They were also told that the new word would be meaningless and there were no right answers to each question.

For analysing the responses, the blended forms were coded into "light"(L), "heavy" (H) and " split heavy"(Δ) constituents. The"split heavy" constituent refers to an originally heavy syllable that is split into two components as a result of the word blend.

eg. mikan + ichigo -> mikago

L H LL LΔL

The dash indicates the point of word blending. In this case the blended word has the structure consisting of 2 light (CV) syllables, the second of which is a 'split heavy' derived from moraic segmentation of the original heavy syllable, plus a light syllable from the second word of the blend.

Depending on the original H-L stimulus pair, the range of response patterns are limited. The primary focus of the data analysis was given to the occurrence of non-syllabic segmentation, that is, moraic segmentation which occurs only by splitting heavy syllables. The number of occurrences was classified by the type of heavy syllable and the proportion of occurrence was calculated in each H-L stimulus pair. Notice also, that the part which precedes the blend point (marked by the dash) corresponds to what has been called a bimoraic foot. The bimoraic foot, which is defined as a unit made up of two morae is also thought to be a significant prosodic template as was nated previously. The bimoraic foot, it is argued, constitutes a minimal prosodic template for "derived stems".

Although the made-up blends of this experiment lack any meaning-based morphological structure, it is quite possible that the left hand element is influenced by the phonological restrictions on derived stems and that the second element is treated as defacto suffix.

Thus: mika ——— go

(derived stem) (suffix)

In the analysis of the results, we therefore focus on two issues:

(a) The question of moraic vs. syllabic segmentation (b) Evidence of the bimoraic stem constraint

4. RESULTS

(a) Moraic / Syllabic segmentation

Let us summarize the ratio of syllabic versus non-syllabic segmentation:

Table 1: The total number of responses by syllabic vs. non-syllabic segmentation

	Syllabic segmentation	Non-syllabic segmentation
Native speakers	60% (334)	40% (233)
Advanced learners	70% (357)	30% (156) ( ) = Actual number of occurrence

The difference between native speakers and learners was statistically significant. ($F= 6.87 > F1.38 = 4.08$, $p = .05$) Overall the occurrence of syllabic segmentation was greater than non-syllabic segmentation. However, moraic segmentation (non-syllabic segmentation) predominantly emerged in particular H-L stimulus pairs. (See Graph1- Pair type1 was excluded as it has no other choice than syllabic segmentation.) They are H-L stimulus pairs, No. 6 and 7 in native speakers' responses and No. 5, 6 and 9 in learners' responses. In native speakers' responses moraic segmentation was observed in the following patterns:

H-L stimulus pairs	moraic segmentation		syllabic segmentation	
	response pattern	No. of responses	response pattern	No. of responses
6. HL + LH	Δ - H	14	H - H	29
	H- Δ	13		
	Δ -Δ	7		
7. LH + HL	LΔ - L	30	L-L	14
	L - Δ L	14	LH-L	5

No. 6 and No.7 contain a heavy syllable in both the first and second stimulus word. Most patterns which have moraic segmentation are 3-mora long. This is considered to be an attempt to keep the new word the same length as the stimulus words.

Advanced learners have acquired moraic segmentation well and do not split one mora. Out of 19 learners, 16 answered that they used kana to store the word in their memory and only 3 said that they relied on sound. However, in spite of their fluency and the accuracy in speaking, the result showed a clear contrast with that of the native speakers. In learners' responses, the length of the blended word is not always the same as the stimulus words. In addition, moraic segmentation occurred for a quite different reason than in the case of native speakers.

Let's have a look at the pattern of moraic segmentation by the learners in each H-L stimulus pair.

H- L stumulus pairs	moraic segmentation		syllabic segmentation	
	Response pattern	No. of responses	Response pattern	No. of responses
5. HL + LLL	Δ-L	29	H-L	21
	Δ-LL	3	H-LL	4
6. HL + LH	Δ-H	29	H-H	24
	Δ-Δ	4		
9. HH + LL	Δ-L	23	H-L	15

All of these H-L stimulus pairs have a heavy syllable at the word initial position. It is obvious that non-syllabic segmentation occurred at the word initial position by splitting a heavy syllable into two morae, which is totally opposite to the preference of Japanese speakers to preserve a bimoraic unit in word initial position.

(b) Bimoraic constraint

It is significant from the viewpoint of bimoraicity that the first two morae are well preserved in native speakers' responses. The pattern of responses is tabulated based on the number of morae taken from the original word pair. For example, the response which consists of "the first two morae from the first word + one mora from the second word " is expressed as 2+1. (2+2 indicates 2 mora from the second word)

The Pattern of Responses by Native Speakers / The Pattern of Responses by Learners

	2+1,+2	1+1,+2		2+1,+2	1+1, +2
1. LLL+LLL	39	24	1	6	51
2. LLL+LH	34	29	2	8	49
3. LH+LLL	24	39	3	0	57
4. LLL+HL	22	20	4	0	38
5. HL+LLL	50	13	5	25	34
6. HL+LH	42	19	6	24	33
7. LH+HL	35	28	7	0	57

* The shaded area indicates the majority of responses.

No.8~10 were not counted because the pattern of responses was restricted by the stimulus pairs. Splitting a heavy syllable does not occur much when two light syllables or one heavy syllable are available in the first two mora position.

This explains the slightly higher ratio of moraic segmentation in pattern 2 and 3. They contain one heavy syllable in the second and first stimulus words, respectively. To create a bimoraic stem + affix (2+1) construction, it is necessary to split the heavy syllable in the second element of pattern 3 and the heavy syllable in the first element of pattern 2:

2. LLL + LH -> LL - Δ

3. LH + LLL -> LΔ - L

Each of these response patterns occurred 42% of the time. This was because there were other options which can keep the same number of morae as stimulus words and have syllabic segmentation, such as L-H in No.2 and L-LL or L-L in No.3. In No.2 the total occurrence of the pattern "2+1 or 2" still outnumbered the pattern "1+2 or 1", in the ratio of 54% vs. 46%. In No.3 this was not the case. It is considered that the 1+2 pattern was more common in No.3 as a result of phoneme overlapping. When two blending items have the same phoneme near the switch point of blending, the choice of switch point is likely to be affected.

LH+LLL	2+1	1+2
mikan + ichigo	11	5
gohan + sakana	6	12
tokei + okane	7	13

In Japanese C and V are firmly tied as one unit, kana. However, swapping kana always occur at phoneme level. Terao's (1992) report on speech errors provides the evidence. He found that among 153 CV errors the errors in which both CV were replaced were only 14, and 82 had V in common and 57 had C in common. This tendency is supported by "repeated phoneme effect" proposed by Dell (1984). Dell proposed that when the latter part of elements are the same (ie. C1_a C2_a = in the sequence of consonant-vowel[a]-consonant- vowel[a]), consonants are more often swapped even though they are phonetically distant.

This means that "ha" and "ka" in gohan + sakana, or "ke" and "ka" in tokei + okane are easily swapped. To test this, I conducted a follow up experiment of the stumulus pair LH+LLL using one group which has phoneme overlapping in the middle mora and the other which does not have them. The result showed that the former group had the occurrence of 1+2 twice as often as the latter. It is especially noteworthy that gohan and tokei are divided into goha-n and toke-i more often than the responses in No.3 respectively. This can be counter evidence to the result of H-L stimulus pair No.3. Through these observations, the overview of moraic vs. syllabic segmentation in native speakers' responses will be restated :

> Syllabic segmentation is strongly supported in the phonological environment where a bimoraic unit is available at the word initial position to form a derived stem.

On the other hand, learners picked up one mora from the first stimulus word through the experiment. It resulted in predominance of syllabic segmentation in No. 2, 3 and 7.

H-L stimulus pairs	Response pattern	The number of responses
2. LLL + LH	L - H	45
	LL - H	8
	L - Δ	4
3. LH + LLL	L - L	52
	L -LL	5
7. LH + HL	L - L	56
	L - ΔL	1

None of the H-L stimulus pairs have a heavy syllable at the word initial position. Therefore the first light syllable, which is a mora, was kept and raised the ratio of syllabic segmentation.

5. DISCUSSION

Non-syllabic segmentation in native speakers' responses occurs under certain constraints:

1) To preserve the two mora unit from the first word 2) moraic constraint

If the results of this blending experiment can be considered as derived forms, the predominant non-syllabic segmentation which was observed at second mora position, will be explained as the preservation of minimal prosodic stem at word initial position. This also fits well with the rule "Left Edge Requirement" .

Generally foot types are divided into three:

Iambic - LH, LL,H Trochaic - H, LL Syllabic - σσ

It is said that Japanese is analyzed prosodically with a trochaic template. (McCarthy and Prince:1995) In this experiment this principle was also observed in the shape of "2+1, or +2". English can take both types of foot, but bimoraicity is not required.

The most commonly observed patterns in learners' responses were 1+1 or 1+2. It was an unexpected phenomenon that heavy syllables CVV and CVN were split at the word initial position by English

speakers. It means that both Native Japanese speakers and second language learners are aware of the unit of mora when they process Japanese words. However, the results suggest that the prosodic template remains unchanged even after the recognition of the prosodic unit of a target language. The feasibility of this statement needs to be examined using learners of different levels.

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