MORAIC NASAL AND TONAL MANIFESTATION IN OSAKA JAPANESE: IMPLICATIONS FOR THE REPRESENTATION OF MORA

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ABSTRACT

A moraic nasal and a CV mora were compared as regards their tonal manifestation. A moraic nasal in accented and post-accented position was found to have stronger energy than a moraic nasal in word final position. A four-mora word composed of either /CVNCVN/ or /CVCVCVCV/, where /N/ represents a moraic nasal, had almost identical duration and F0 configuration within the same accent type. However, a boundary between /CV/ and /N/ was found to be more ambiguous than that between /CV/ and /CV/ both in spectral pattern and in the timing of the onset of F0 change. In slow speech, the second mora (both CV and N) tended to be prolonged regardless of the accent type.

1. INTRODUCTION

Previous work on the perception of mora and pitch accent in Japanese has shown that in a bi-moraic word /ama/, accented either on the first or the second mora, a shift of the original fundamental frequency (henceforth F0) contour caused a change in linguistic and paralinguistic categories within a certain range [1]. In the same experiment, however, listeners' response was markedly different for bi-moraic words composed with a moraic nasal. In words like /aN/ and /heN/, the acceptable range of shift for the F0 contour was much greater.

One possible explanation, phonetically oriented, is that a moraic nasal may be significantly different from a CV mora in its pitch manifestation. Since a moraic nasal in Japanese only occurs in syllable final position and preceded by a vowel, it may form a coherent unit of accentuation with the vowel in its acoustic manifestation.

Further possibility may arise from the difference in articulatory type. The Japanese moraic nasal is known to vary greatly in its exact phonetic nature. In word final position, as it is in /aN/, it may become more or less a nasalized vowel. Since it has been reported that the timing of vowel articulation and phonatory control is less constantly maintained compared to that of consonant articulation and phonatory control, the difference might arise from a difference in articulatory types [2].

A phonologically oriented explanation may be that the two types of test words differ in their higher constituent. /ama/ is counted as bi-moraic as well as bi-syllabic while /aN/ is mono-syllabic. We may expect that the relative timing of mora and F0 is less important within a syllable.

Very little is known about the exact acoustic characteristics of the moraic nasal in relation to pitch manifestation. In Standard Japanese, only a syllabic-mora, a mora that can form a syllable by itself, bears pitch accent. In Osaka Japanese, however, even non-syllabic moras such as vowel mora and nasal mora can bear pitch accent. I follow Kubozono, adopting the terms "syllabic" and "non-syllabic" moras [5]. This is one of the reasons why the independence of the mora is claimed more strongly for Osaka Japanese. In the present paper we report the results of a pilot study that has

compared the moraic nasal and the CV mora both in accented and post-accented positions using Osaka speakers.

2. EXPERIMENT

The following words served as test words. They are all four-moraic words with or without moraic nasals (/N/). In this position, the first /N/ is said to be realized as [m] assimilating to the following consonant.

/koŃbaN/	"tonight"
/káNbaN/	"signboard"
/kaNpaN/	"deck"
/komádori/	"kind of bird"
/kámatano/	"Kamata's"

These words were embedded in a carrier sentence "sorewa ___ desu (it is ___)" and read 4-5 times by two native speakers of Osaka Japanese at two speaking rates (slow and fast). The recorded data was digitized and processed by Mac Speech Lab and LUPP (Lund Prosodic Parser) using a Macintosh II.

3. RESULTS

3.1. F0 and time dimensions

Typical F0 contours for /koŃbaN/ and /komádori/ of a male speaker are shown in Fig. 1. When the utterances were lined up at the onset of the vowel [o] in /ko/, the F0 contours for the two words were found to be almost identical within the same speaking rate. In fast speech, the entire F0 except for the utterance final position, was raised to a higher pitch range. Within the same speaking rate, the two F0 contours tended to have the same duration, use the same pitch range and have the same timing of F0 rise and fall. Similar observations were made for /káNbaN/ and /kámatano/. There was a tendency for the timing of the F0 rise in /koŃbaN/ to come slightly earlier than that of /komádori/ in fast speech. In slow speech, there was a tendency for the second mora to be prolonged regardless of the accent type. Note that the duration of the second [a] in /kámatano/ is longer than that of the first [a] which is accented (Fig. 2).

3.2. Acoustic characteristics of the moraic nasal

Usually the vowel that precedes a moraic nasal was found to be longer than the vowel that precedes a CV mora irrespective of pitch patterns. This may imply that even when the /N/ is realized as [m] due to the following consonant, the unmarked quality of the moraic nasal which is supposed to be articulated at the uvular region is still there. The difference in vowel duration was most eminent and consistent before an accented moraic nasal. When a moraic nasal was accented (H) or when it appeared immediately after an accented mora as in /káN(baN)/, it was articulated with more energy than in word final position (see Fig. 2).

3.3. Relative timing of F0 and articulatory event

The relative timing of the onset of the F0 rise/fall and articulatory events was examined both from narrow band spectrograms and F0 plotting. As for the CV moras, there was a strong tendency for the onset of F0 rise and fall to occur around the CV-CV boundary both at slow and fast speech.

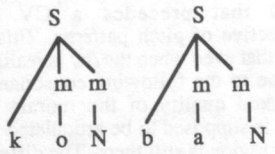
As for the moraic nasals, the situation was less consistent. There was a tendency for a moraic nasal to use separate switch points depending on whether it was accented or post-accented. When it was accented, the onset of the F0 rise usually started during the preceding vowel. When it was in post-accent position, the onset of F0 fall started around the [V-m] boundary. For the male speakers, the onset of the fall tended to go into the vowel as well. On the other hand, none of our data included the instance in which the onset of F0 change started considerably after the onset of [m]. When the moraic nasal is accented, and when it is spoken with fast speaking rate, the onset of the F0 rise started very early in the vowel, sometimes right from the onset.

4. DISCUSSION

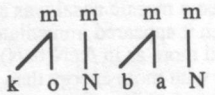
In the current theories of phonology, two fundamentally different approaches have been proposed for the representation of the mora. One is the offspring of metrical phonology in which mora emerges from the branching syllable structure as in (a) [3]. The other approach, proposed by

Hyman, takes a mora as a prior necessary step to syllabification as in (b) [4].

(a)



(b)



Recent analysis of speech error and language game showed that neither syllable boundaries nor the notion of rhyme played an apparent role in Japanese[5][6]. The results of these studies also indicated that the nature of the mora in Japanese is like the one proposed by Hyman in which an onset and a nucleus are represented as exclusively forming a coherent single unit [4].

The results of the present study are also favourable for such representation since a CV mora and a moraic nasal showed close similarity in their tonal manifestation. There was a strong tendency for the four-mora test words to have the same duration and same F0 configuration regardless of their segmental and syllabic compositions within the same accent type. It seems that the mora is the most obvious unit by which Japanese utterances are regulated. The observation that the CV-CV boundary rather than the C-V boundary tended to be used as the switch point for F0 control, may be additional evidence for making a CV mora a coherent unit.

However, drawing clear boundary between the moraic nasal and the preceding mora may be less easy in some instances. While for a CV mora, the onset of F0 change tended to be timed with the CV-CV boundary, the timing of the moraic nasal and the F0 onset was less consistent. This was most evident in fast speech when the moraic nasal was accented. In this position the onset of the F0 rise often started right from the onset of the vowel while the CV mora respected their boundary. It may imply that the association of mora and tone is less important within a syllable. Alternatively, it may mean that it is difficult to manifest pitch accent on the moraic nasal when time is shortened.

Another observation was the tendency for the second mora (both CV and N) to be prolonged in slow speech regardless of the accent type. This indicates that each mora is not proportionately prolonged in slow speech but rather that there is some kind of temporal organization at a higher level which takes place regardless of pitch accent. Further experiments are in preparation to test some of the findings in the present study.

REFERENCE

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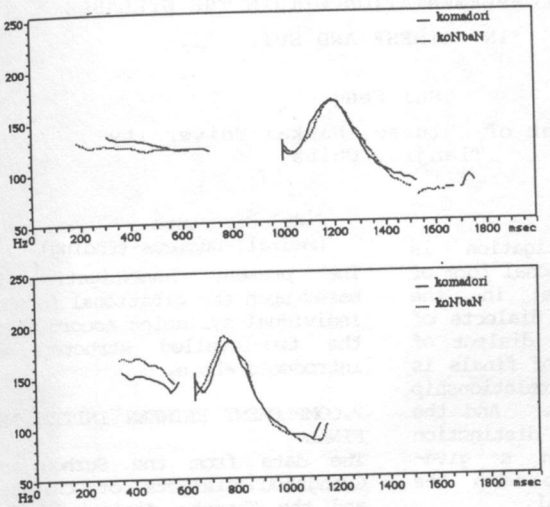

Fig. 1. F0 contours of /koŃbaN/ and /komádori/ in slow (above) and fast (below) speech.

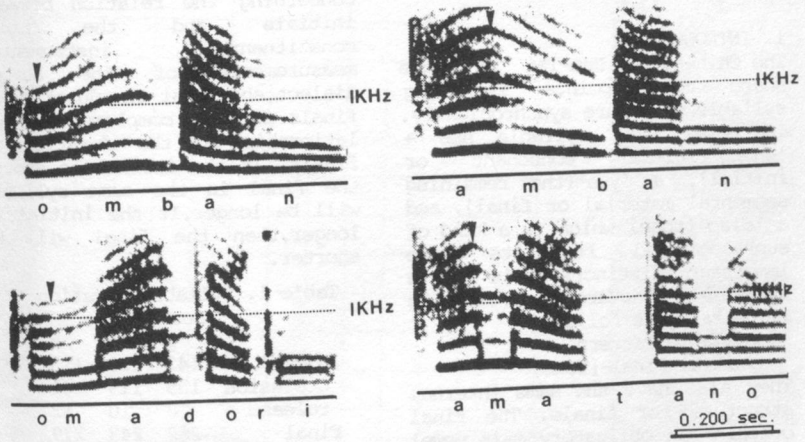

Fig. 2. Narrow band spectrograms of [(k)oḿban], [(k)omádori], [(k)ámban], and [(k)ámatano] in slow speech by the female speaker. The arrow indicates the onset of F0 change.