The acquisition of lexical rhythm and duration by Japanese second language learners

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Introduction
Abercrombie (1967) hypothesized that language can be separated into syllable and stress timed languages. Subsequently, Han (1962) and Ladefoged (1975) suggested that mora timing be added as a further category. Although, several researchers believe that isochrony may not be a basis for categorizing language (Roach, 1982; Dauer, 1983), recent research has demonstrated that the variance in consonant and vowel length correlates with the predicted rhythmic classes (e.g., Ramus et al., 1999; Low, Grabe & Nolan, 2000; Grabe & Low, 2002).

Given the lack of status of the study of rhythm categories in language, and until recently, the lack of a valid measure of rhythm, there have been few studies which have examined the acquisition of rhythm by non-native speakers of the language or the influence of the rhythm of their first language. There have been even fewer in the case of the acquisition of Japanese as a second language. However, one such study is Toda’s (2003) who determined that in addition to positive and negative transfer for English native speakers learning Japanese there was also an obvious development through the interlanguage towards the native speaker norm.

The present study first sets out to investigate the measurement of rhythm, and compares two new rhythmic measures, the pairwise variability index (PVI) developed by Grabe and colleagues (e.g. Grabe & Low, 2002) and the $\Delta V$, $\Delta C$ and $\%V$ measures developed by Ramus et al. (1999) with the long/short ratios used in researching Japanese mora timing (e.g. Kashima, 1992).

Then the second, and main, research question aims to investigate the nature of productive rhythm development of Korean native speakers learning Japanese.

Methodology
For this study 10 Korean participants were selected from a group of volunteers based on the number of years they had spent studying the language. Five advanced learners (KH) who had learned Japanese at a Korean university for a minimum of three years were selected, and five beginning (KL) learners who had spent less than a year studying were also chosen. Five Japanese native speakers (NS) of the Tokyo dialect were also included in the sample.

Seven 2- and 3-syllable nonsense words were made up and used to elicit spoken samples from the participants (Mamaa, Maama, Mamaama, Maamama, Mamaamaa, Maamaama, and Maamaamaa). The words varied in the number of mora they contained. They were presented in hiragana, one of the Japanese scripts. Because the stimuli consisted of only two characters participants had sufficient control of the script.

After the participants had visually confirmed the stimulus, they were required to read each of the words twice aloud as they were presented on a computer screen. Their production was recorded with a Sony DAT and a condensing microphone, then uploaded into the computer and stored as 48 kHz 16 bit .wav files.

The intervocalic and the vocalic intervals for each of the sound files were then measured and recorded. These were used to produce three measures of alternating duration, as described above. The scores from the seven words were averaged for each participant. In order to respond to each of the research questions, first, correlations were calculated between the various measures. To determine the rhythmic development of the learners, the duration measures of the learner groups were compared, both with each other and with those of the native Japanese using an ANOVA. Tukey’s (HSD) post hoc tests were used for post hoc comparison in the event of significant difference being found. Probability was set at the five percent level for significance.
Results
The highest correlation was demonstrated between the vocalic nPVI and the ratio measure (r = .87, p < 0.05). The intervocalic PVI measure showed a negative moderate correlation (r = -.61, p < 0.05). Only one of Ramus’s measures, ΔC, demonstrated a significant moderate correlation (r = -58, p < 0.05). The other measures of ΔV and %V failed to demonstrate any significant correlation with the ratio measure.

Based on the results of the correlation studies the vocalic nPVI and intervocalic rPVI measures were selected for subsequent analysis as these measures were judged to produce results comparable to those of previous research. The ANOVA demonstrated significant differences between the groups for the vocalic nPVI measure (F = 3.25, p < .05) only. Tukey’s HSD determined that there was a significant difference between the KL and the other two groups (NS and KH).

Discussion
The correlations demonstrated that the PVI measures related best to the ratio measures used by researchers in Japanese in the past. This result is not surprising given the fact that both measures are comparing the relative length of adjacent vowels. Thus, the field now has a valid measure which can be extended beyond single vowel comparisons.

The second research question demonstrates that inexperienced Korean learners of Japanese develop towards the Japanese rhythmical norm as their interlanguage develops. This is supported by the fact that while the vocalic nPVI of the beginning learners was significantly different from NS, that of the advanced learners was not.

Conclusion
Overall it appears that the correlations demonstrated the PVI measure to be the better measure to use to compare with the ratio measures used by researchers in the past. Whether these measures are relevant to the measurement of both the syllabic nasal and the geminate consonant is yet to be seen.

The second main result demonstrated that the Japanese rhythm of Korean Learners develops towards the Japanese norm over time. This replicates the results of Toda (2003).

References