

## AN EXPERIMENTAL PHONETIC STUDY OF SPEECH RHYTHM IN STANDARD KOREAN

Hyun-bok Lee, Nam-taek Jin, Cheol-jae Seong, Il-jin Jung, Seung-mie Lee,

Phonetics Laboratory, Department of Linguistics, College of Humanities,  
Seoul National University  
Sinrim-dong, San-56, Gwanag-gu, Seoul 151-742, Korea

### ABSTRACT

The aim of this paper is to investigate the Korean speech rhythm by examining the pattern of the interstress time increases versus the number of interstress syllables. 16 informants, divided into four groups by age and sex, tape-recorded the carrier sentences consisting of two rhythmic units, each beginning with a stressed syllable. The first unit was gradually expanded by taking one to four weak syllables of CVC type. Two interesting results have emerged from this study: (1) the Korean speech rhythm is inbetween of the two opposite types like Greek; (2) two age groups differed in rhythmic type. The old group displayed the stress-timed rhythm like English whereas the young group the syllable-timed one like Spanish.

### 1. INTRODUCTION

Rhythm is an important element in human language as it is in music, and phoneticians have paid much attention to the phenomenon of speech rhythm. For instance, Daniel Jones aptly illustrated the rhythmical difference between English and French in his Outline, using the classic sentence "He wrote to the secretary.", and Kenneth Pike coined the useful terms "stressed-timed" and "syllable-timed" to characterize two different types of speech rhythm. English is said to display the stress-timed rhythm whereas French the syllable-timed rhythm.

The question of speech rhythm has

hardly attracted Korean linguists and phoneticians until the attention fairly recently. Those who mentioned anything about the Korean speech rhythm unanimously stated that every syllable in Korean is pronounced with about equal length as in Japanese. That is, the Korean rhythm has been vaguely described as being syllable-timed. In 1964 the present writer stated on the basis of auditory analysis that the Korean speech rhythm was intermediate between the two opposite types and, if anything, somewhat closer to the stress-timed rhythm. The objective of this paper, therefore, is to analyze the basic rhythmic structure of the standard Korean speech by means of an experimental phonetic method and to describe its nature by reference to the two extreme rhythmic types.

### 2. EXPERIMENT

The purpose of the experiment is twofold; 1) to measure the interstress time increases in carrier sentences to the number of interstress syllables, 2) to calculate the average ratio of the interstress time increases for relevant syllables for the four different groups. Interstress time or interval is here defined as the time between the stressed vowels, i.e. the time interval between the two stressed vowel onsets.

#### 2.1. Material

1 Starting with the carrier sentence  
['ma:l 'ma:ntha] "(He) is talkative."  
as the basic frame, the first rhythmic unit

['ma:l]"speech" was gradually expanded by adding up to four weak syllables of CVC type while keeping the second unit constant. This expansion method yielded five different carrier sentences, which were different in length, as given in a tabulated form in table 1. Then three sets of the 5 carrier sentences were prepared in the form of 15 cards(each card carrying one carrier sentence) and the cards in each set were randomly mixed so that the order of carrier sentences was different in each set.

## 2.2. Informants

Sixteen informants, all of them representative Seoul speakers, took part in this experiment and they were divided into four different groups by age and sex to check if they would show any significant difference : Old Males(OM) and Old Females(OF) in their fifties and Young Males(YM) and Young Females(YF) in their twenties.

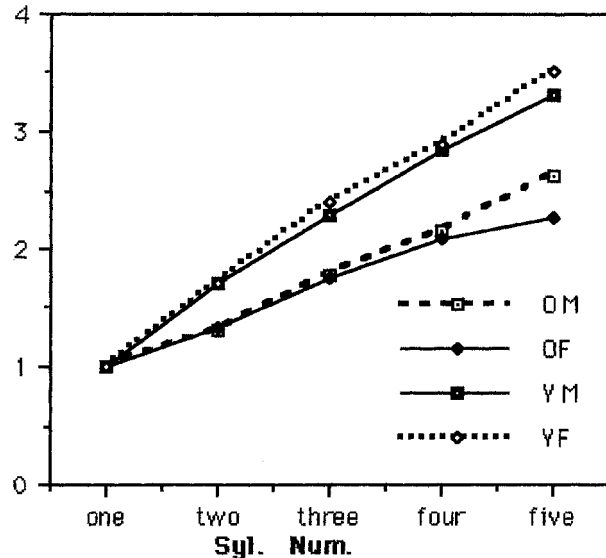
## 2.3. Recording and Measurements

The informants were asked to read as naturally as possible the carrier sentences from each of the three sets of cards. Before the recording session the informants were given a special instruction to stress the first syllable of each rhythmic unit, i.e. ['ma:l] and ['ma:n]. The interstress time intervals in each of the recorded sentences were measured by matching the audio data to the corresponding wave forms as displayed on the monitor. Segmentation of relevant sections were carried out with utmost care and statistical calculations were made of the interstress time increases and their ratios(given in bracket) using the Macintosh program "Statview".

## 2.4. Results of the Experiment.

The average interstress time intervals extracted from the four informant groups for each carrier sentence and their ratios are given in Table 2. Fig. 1 is a graphic representation of the ratios of the interstress intervals versus syllable increase with the basic interstress interval taken as the norm.

<Fig. 1.> Interstress time increase ratio for OM-OF-YM-YF



## 3. INTERPRETATION AND DISCUSSION

Table 2 and Fig. 1 clearly show that there is a significant difference between the young and old age groups. In other words, the curves for OM and OF are much less steep than those for YM and YF. This means that the speech rhythm of the old age group(OM and OF) is close to the syllable-timed rhythm while that of the young age group(YM and YF) is close to the syllable-timed one.

### 3.1 Cross-language and Inter-generation Ratio

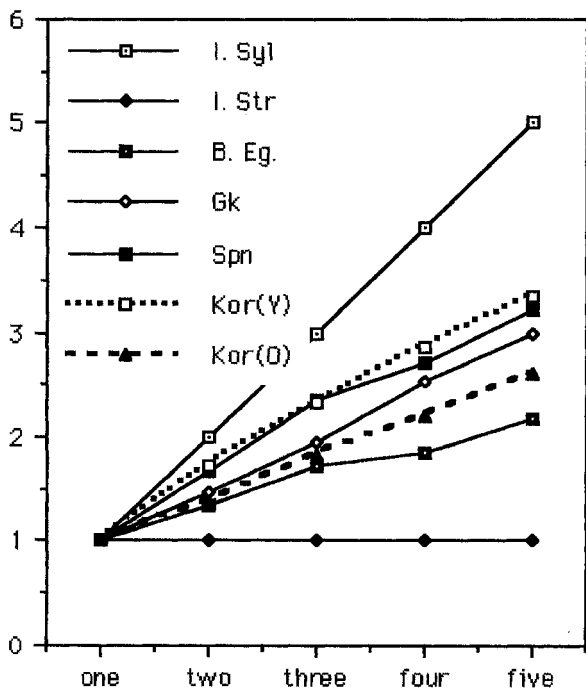
Table 3 shows the average interstress time intervals exhibited by the old and young age groups respectively as well as the total Korean average. Fig. 2 is a graph showing the basic time-versus-syllable ratios for the Korean speeches of the young and old age groups as well as those of Greek, Spanish and British English. One can conclude from this table and graph that the Korean of the old age group is similar to British English and that of the young age group to Spanish.

### 3.2 Cross-language Ratio

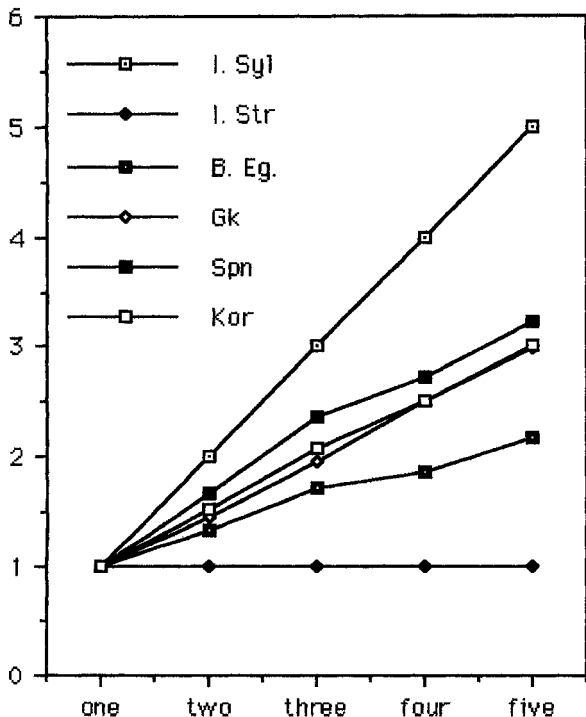
The table 4 and Fig. 3 represent a comparison of the average Korean data with

the corresponding data of Spanish, Greek and British English. As expected, Korean is intermediate between the two extreme rhythmic types just like Greek.

<Fig. 2> Cross-language interstress time ratio (Kor.Y and O)



<Fig. 3> Cross-language interstress time ratio (Kor.Average)



#### 4. CONCLUSION

The conclusions on the Korean speech rhythm arrived at in this study have mainly been based on the interstress syllables consisting of CVC type only. However CVC is not the only syllable type that can occur in the inter-stress position. Interstress syllables consisting of V, CV or CVC type or any combination of them are quite possible and are in fact very frequent. One can argue, therefore, that they might affect the interstress interval in a different manner, thus leading to a different statement about the Korean speech rhythm. In this sense, the present study should be supplemented by further research before it can give a more comprehensive picture of the Korean speech rhythm.

#### <References>

- Dauer, R. M. (1983): "Stress-timing and Syllable-timing reanalyzed", *Journal of Phonetics* v.11: pp.51-62.
- Han, M. S.(1964): "Duration of Korean Vowels", *Studies in the Phonology of Asian languages 2*, Acoustic Phonetics Research Laboratory, Univ.of Southern California, Los Angeles.
- Hoequist, C. Jr.(1983a): "Durational Correlates of Linguistic Rhythm Categories", *Phonetica* 40, pp.19-31.
- (1983b): "Syllable Duration in Stress, Syllable -and Mora-timed Language", *Phonetica* 40, pp. 203-237.
- Klatt, D. H.(1973): "Interaction between two factors that influence vowel duration", *The Journal of the Acoustical Society of America*, vol.54-4, pp.1102-1104.
- Lee, H. B. (1982): "A Phonetic Study of Korean Speech Rhythm", MALSORI No.4, Journal of the Phonetic Society of Korea. pp. 31-48.
- (1987): "Korean Prosody:Speech Rhythm and Intonation", *Korea Journal* 27-2, Korean National Commission for Unesco, pp.42-68.
- (1964): "A Study of Korean Intonation", M.A. thesis presented to University of London.

Park, Ju-hyun (1985): "Prosodic Theory and English Rhythm ", Ph.D. thesis presented to Seoul National University.

Strangert, E. (1985): *Swedish Speech Rhythm in a Cross-Language Perspective*, Ph.D. Dissertation, Umeå University, Stockholm.

Seong, Cheol-jae (1991): "Experimental Phonetic Study of Word Accent in Standard Korean", M.A. thesis presented to Seoul National University.

Wenk & Wioland(1982): "Is French really syllable-timed ?", *Journal of Phonetics* 10, pp. 193-216.

< Table 1> Experiment Material (carrier sentences)

No.	syllable type	carrier sentence
1.	V	'ma:l 'ma:ntha.
1.	V	'ma:li 'ma:ntha.
2.	V	'ma:lsʌpi 'ma:ntha
3.	V	'ma:lsʌŋkuni 'ma:ntha
4.	V	'ma:lsʌŋkunduŋri 'man:tha
5.	CV	'ma:lɔ 'ma:ntha
6.	CV	'ma:lɔ 'ma:nta
7.	CV	'ma:lsʌŋkundo 'man:tha.
8.	CV	'ma:lsʌŋkunduɔ 'man:tha.
9.	CVC	'ma:lsʌŋ 'ma:ntha.
10.	CVC	'ma:lsʌŋkun 'ma:ntha.
11.	CVC	'ma:lsʌŋkunduɪ 'ma:ntha.
12.	CVC	'ma:lsʌŋkunduɪman 'ma:ntha.

<Table - 2> Total Duration & Ratio (in brackets)

Typ	Syl.num.	O M	O F	Y M	Y F
CVC	1 (1:1)	389.660 (1)	473.000 (1)	275.550 (1)	285.830 (1)
CVC	2 (2:1)	512.267 (1.31)	629.444 (1.33)	472.267 (1.71)	488.222 (1.71)
CVC	3 (3:1)	694.867 (1.78)	831.778 (1.76)	628.400 (2.28)	686.444 (2.40)
CVC	4 (4:1)	842.333 (2.16)	988.556 (2.09)	784.600 (2.85)	830.000 (2.90)
CVC	5 (5:1)	1024.600 (2.63)	1166.889 (2.26)	914.733 (3.32)	1000.000 (3.50)

< Table - 3> CVC-total & OLD vs. YOUNG

Syl.num.	Old Group	Young Group	Total Dur. (Ratio)
1 (1:1)	410.49 (1)	279.66 (1)	337.81 (1)
2 (2:1)	559.33 (1.36)	478.25 (1.71)	518.79 (1.54)
3 (3:1)	746.21 (1.82)	650.15 (2.32)	698.18 (2.07)
4 (4:1)	897.16 (2.19)	801.63 (2.87)	849.39 (2.51)
5 (5:1)	1065.45 (2.60)	934.20 (3.34)	1012.33 (3.0)

<Table 4> Cross-language interstress time ratio

Syl.Num.\Lang.	KOREAN	SPANISH	GREEK	ENGLISH
1 : 1	1	1	1	1
2 : 1	1.54	1.68	1.46	1.35
3 : 1	2.07	2.36	1.96	1.72
4 : 1	2.51	2.72	2.52	1.86
5 : 1	3.0	3.22	2.99	2.18