A SPECTROGRAPHICAL STUDY OF KOREAN VOWELS

H.B. LEE & M.J. Zhi

Introduction

The aim of this paper is to analyze acoustically
the eight Korean vowels by means of Sound Spectrograph
on the basis of "A Phonetic Description of Korean Vow-
els" (H.B. Lee, 1971), in which the phonetic qualities
of the Korean vowels were described by reference to the
Cardinal Vowel System of the International Phonetic Asso-
ciation, and to compare the results of the two studies,
i.e. audio-articulatory versus acoustic analysis. In
other words, this experiment was carried out in an at-
tempt to confirm acoustically Lee's claim that a vowel
of Korean shows allophonic variations according to three
different environments, i.e., 1) when it is long and
stressed, 2) when short and stressed and 3) when un-
stressed.

In figure 1, the phonetic qualities of the allo-
phones of the eight Korean vowels as conditioned by the
three different phonetic environments are shown on the
Cardinal Vowel scale(Lee, 1971). It must be pointed out
at this point that the pronunciation of the old genera-
tion(those of over forty years of age) on which Lee's
description was based, shows some difference in vowel
qualities from that of the younger generation, e.g. lack
of quality difference between a long and short /ʌ/ in

the speech of youngsters.   M.J. Zhi (24 years old) who
has served as informant for this experiment can hardly
be taken as an exception in this respect.

Material

   The material used in this experiment consists of all
the words listed in Lee's paper as exemplifying the en-
vironmentally conditioned allophones as well as those
given by Prof. S.G. Gim in his "Phonetics of Korean"(19
37, 1971) as minimal pairs distinguished by vowel quan-
tity.

Analysis

   All the words mentioned above were recorded by M.J.
Zhi of Seoul and spectrograms were made of each test
word by means of 700 Sound Spectrograph, Voice Identi-
fication Inc. at the Acoustic Phonetics Laboratory of
the Department of Phonetics, Umeå University in Sweden.
On the basis of the first and the second formant frequen-
cies which were measured for each vowel occurring in dif-
ferent environments, two kinds of acoustic charts were
drawn. One of them shows the first formant on the verti-
cal axis and the second formant on the horizontal ax-
is whereas the other one shows the first formant on the
vertical axis as in the first chart but the distance
between the first and the second formant frequencies on
horizontal axis.

Results

   The results of the analysis can be summarized as

follows:

1) As shown in figure 2,3 and the formant table, three
clearly different phonetic variants are observed, as
described by Lee, for each of the vowels /i, e, o, ɯ/
in accordance with the phonetic environments set up by
Lee, i.e., 1) when they are long and stressed, 2)when
short and stressed, and 3) when unstressed.

2) On the other hand, vowels /ɛ, a, u, ʌ/ show only
two kinds of quality difference according to vowel quan-
tity, but no quality difference shown by the presence
or absence of stress.

3) The results of the experiment show there is not much
quality difference between /e/ and /ɛ/, as pointed out
already by Lee, thus blurring the phonological opposi-
tion between the two phonemes. In particular, the posi-
tion of unstressed [e] almost overlaps with that of
long and stressed ['ɛ] on the formant charts.

4) Lee reported that the phonetic quality of the long
/ʌ:/ as spoken by the old generation is considerably di-
fferent from that of the younger generation. However,
in the present experiment which is based on the material
recorded by a young man of 24 years of age, it is found
that the long /ʌ:/ is not realized as a somewhat cen-
tralized vowel as indicated by Lee in his vowel diagram.
But the long /ʌ:/ and the short /ʌ/ are found to be
different in the first formant frequency. In other words
they are different form each other in the degree of
height. The long /ʌ:/ is plotted a little higher than
the short /ʌ/ on the two formant charts.

Conclusion

The acoustic analysis of the eight Korean vowels
using Spectrograph seems to prove Lee's claim that the
phonologically distinct long and short vowels show
quality difference as well in a predictable way. It is
also found that at least in some vowels the qualitative
differences are conditioned by stress.

During the present experiment a very interesting
phenomenon was noticed relating to the correlation be-
tween vowel quantity and quality. The informant acci-
dentally pronounced short the first (long) vowel occur-
ring in the word /gɯːrim/ "picture", no doubt due to
the habit of the younger generation to which he belongs.
When the word was analyzed by Sound Spectrograph, it
was found that the vowel exhibited a phonetic quality
corresponding to that of the short and stressed ['ɯ].
However, when the same word was pronounced again with
the correct length as observed in standard pronunci-
ation, the vowel immediately showed the right phonetic
quality identical to the long and stressed ['ɯː].

Finally, further experiments are no doubt required
with informants of diverse age groups speaking stan-
dard Korean in order to find out and systematize pho-
netic variations in vowel quality, if any, between di-
fferent generations. In particular, it would be worth-
while to investigate the phonetic difference of long
/ʌː/ and short /ʌ/ among different age groups, since
the quantity-quality correlation between the two vocalic
sounds, although a long-standing characteristic feature

of the standard (Seoul) speech, now   seems to be   in
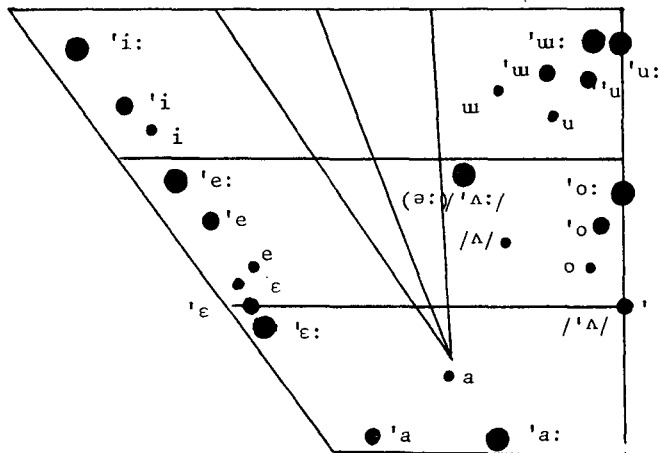a very   unstable position, specially for the younger
generation.

Fig.1 Korean Vowels plotted on
the Cardinal Vowel Scale.

Material used for auditory/acoustic analysis

    stressed/long;   str/short; unstressed
/i/:'i:l "work",   'il "one",   inal"today"
/e/:'be:da "cut",   'meuda"fill", maːnse "long
                                  live"
/ɛ/:'ɛ: "child",   'bɛk "100",   ihɛ "under-
                                  standing"
/a/:'ba:m "nut",   'bam "night", 'i:bal "hair-cut"
/o/:'go:ŋ "ball",   'bom "spring", 'ba:bo "fool"
/u/:'bu:ʤa "rich",   'mun "door",   bɛu "actor"
/ʌ/:'bʌ:l "bee",   'bʌl "punish", 'sɛːbʌn "thrice"
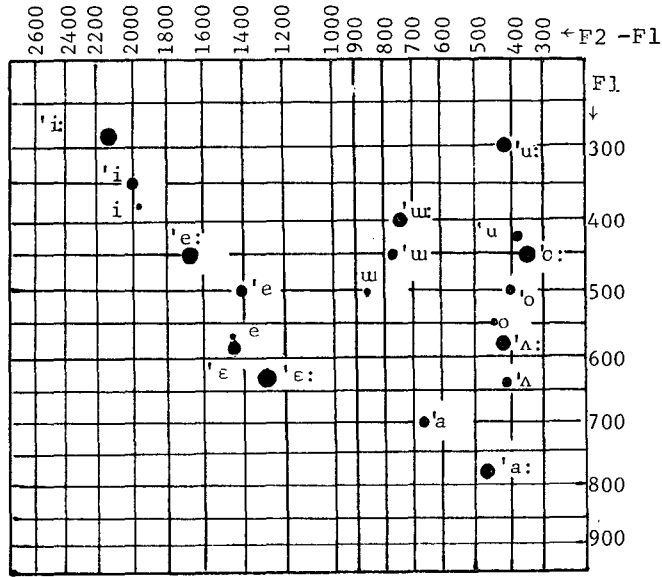/ɯ/:'hɯ:m "fault",'hɯk "soil", 'nʌlbɯn "wide"

Fig.2 A formant chart showing the F.1 frequency
on the ordinate plotted against the distance between
the frequencies of F.1 and F.2 on the abscissa for
eight Korean vowels.

Table of Formant Frequencies

	'i:	'i	i	'e:	'e	e/'ɛ:
F.2	2420	2350	2250	2100	2100	2000
F.1	285	350	375	450	500	585

	ɛ	'a:	a	'ʌ:	'ʌ	'o:
F.2	1900	1250	1360	1000	1050	800
F.1	630	780	700	585	640	450

	'o	o	'u:	u	'ɯ:	'ɯ
F.2	900	1000	720	800	1130	1200
F.1	500	550	300	425	400	450

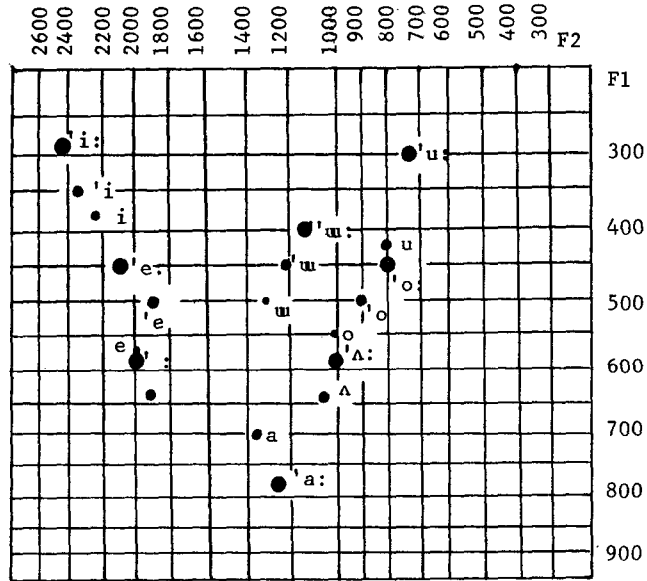|	ɯ
F.2	1300 / F.1 500

Fig. 3. A formant chart showing the F. 1 frequency on the ordinate plotted against the F.2 frequency on the abscissa for the eight Korean vowels.

참 고 문 헌

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<< 국   문   요 · 약 >>

   이 논문은 음향 분석기를 이용하여 한국어의 단순모음 8개를
음향 음성학적으로 ·분석하고 그 결과를, 이 현복의 1971년 논문 "
현대 서울말의 모음 음가"에서 기본 모음을 기준으로 · 하여 기술한
단순 모음의 소리값과 비교하는 데에 목적이 있다。 특히, ·한국어
의 모음은 1) 길고 · 세게 날때, 2) 짧고 세게 날 때, 그리고 ·
3) 여리게 날 때의 세 가지 환경에 따라 변이음의 음가가 달리
나타난다는 이 현복의 이론을 음향 음성학적으로 · 확인해 보는 것이
이 연구를 하는 주요 관심사이다。

   이 실험에 사용된 자료는 위에 말한 이 현복의 논문과 "한
국어 음성학"(김 선기, 1937, 1971; 영문)에 제시된 낱말로 · 이루어
저 있으며, 이를 스웨덴에 유학중인 지 민제가 자신의 목소리로 ·
직접 녹음하여 위메오 대학 음성학과의 음향 음성학 실험실에서 음
향분석기로 분석한 다음, 각 모음의 제 1 및 제 2 포먼트를 측정하
여 이를 토·대로 음향도를 만들었다。 이 실험 결과는 다음과 같이
요약 할 수 있다 :

 1) 그림 2, 3과 포먼트 표에서 보인 바와 같이, 모음 /이, 에, 오,

으/는 각각 이 현복의 주장대로 환경에 따라 세 개의 분명히 다른 음가를 나타내고 있다.

2) 한편 모음 /애, 아, 우, 어/는 모음의 길이에 따라 다만 두 종류의 음가 변동이 나타날 뿐이며 강세의 유무에 따른 음가 차이는 드러나지 않았다.

3) 이 현복의 주장대로 모음 /에/와 /애/는 음가의 차이가 크지 않으므로 음운 대립이 무디어질 수 있음을 이번 실험 결과로 확인하였다. 특히 강세가 없는 /에/는 강세가 있는 /애/와 소리값이 거의 같았다.

4) 이 현복은 표준말에서 /어/의 음가가 세대에 따라 다르며, 안정된 세대의 말씨에서는 /어:/가 /어/에 비해 높고 중앙화한 소리값을 지닌다는 주장을 하였다. 그러나 이 실험 연구에서는 녹음한 이가 젊은 세대이어서 인지 그러한 현상이 나타나지 않았고, 다만 /어:/는 /어/보다 높이만이 높은 것으로 나타났다.

5) 이번 실험 연구에서 모음의 소리값이 장단과 강세에 따라 달라진다는 이 현복의 주장이 대체로 증명된 셈이나, 종합적이고 확고한 결론을 내리려면 좀 더 광범한 실험 연구가 필요하다고 본다. 특히 안정된 세대의 말씨를 직접 녹음하여 음향 음성학적으로 분석함이 필요하다.

<<이 현복:서울 대학고 음성 언어학 고수>>

<<지 민제:스웨덴 워메오 대학 음성학과
           박사과정>>