DURATIONAL COMPLEMENTATION WITHIN THE SYLLABLE
IN CHINESE AND SUI

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ABSTRACT
The present investigation is based upon the citational form of
dividual syllables in the Suzhou and Guangzhou dialects of
Chinese, and Zhonghe dialect of Sui. The duration of finals is
in a complementary relationship
to that of initials. And the
long-short vowel distinction manifests itself in a give-
and-take relationship with the ending within the final.
The duration of stop endings is
confirmed to be a part of the
whole final although the closure
is silent.

1. INTRODUCTION
The Chinese and Kam-Tai languages share many points regarding
syllable structure synchronically. In both, each syllable has a
'sheng' (initial consonant or initial), a 'yun' (the remaining
segmental material or final), and a 'diao' (tone) which is a kind of
suprasegmental but its more important distinction is as a
syllable feature. This is illustrated as follows:

<table>
<thead>
<tr>
<th>Syllable Pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial-Final-[Tone]</td>
</tr>
</tbody>
</table>

They also have the same internal structure for finals. The final
contains an obligatory main vowel as its nucleus. Sometimes a high
vowel appears in front of the main one, serving as a medial. It is
also called the 'final head'. Sometimes there is a consonant or
a high vowel following the nucleus, serving as the final
ending. Thus the typical structure of the final is as follows:

<table>
<thead>
<tr>
<th>Final Structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Medial)-Nucleus-(Ending)</td>
</tr>
</tbody>
</table>

The present investigation is based upon the citational form of
individual syllables according to the two-levelled structure we
introduced above.

2. COMPLEMENT BETWEEN INITIAL AND FINAL
The data from the Suzhou and
Guangzhou dialects of Chinese,
and the Zhonghe dialect of Sui
were selected to investigate the
relationship between the
different components in a
syllable.
Concerning the relation between
initials and the final constituent, instrumental
table of the Suzhou
dialect show that the duration of
finals is in a complementary re-
relationship to the duration of
finals. If the initial is short, the final in the same syllable
will be longer. If the initial is longer, then the final will be
shorter.

<table>
<thead>
<tr>
<th>Table 1. Syllable Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Suzhou)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Initial</th>
</tr>
</thead>
<tbody>
<tr>
<td>occlusion</td>
</tr>
<tr>
<td>release</td>
</tr>
<tr>
<td>Final</td>
</tr>
<tr>
<td>Syllable</td>
</tr>
</tbody>
</table>

It is evident in Table 1 that
aspirated stops are much longer.
than unaspirated as regards ini-
tial duration whereas the finals 
following aspirated stops are much 
shorter than those following un-
aspirated.(Shi 1983) The same 
conclusion was also drawn from 
Pekingese.(Feng 1985)

It should be pointed out that 
initial and final are not equal in 
the complementation. The initial 
is the passive factor and the 
final the active. The duration of 
an initial is relatively stable 
and the duration of a final is 
easily variable. The cross-
match test shows a final may alter 
its duration after different in-
itials while an initial duration 
would only change a little before 
different finals. The difference 
between various initial durations 
is mainly due to their mode of 
articulation.

3.REPLACEABLE DURATION OF MEDIAL 
AND ENDING
Although there is a phoneme of 
zero initial in phonological 
analysis, it is in fact a glottal 
stop or a slightly voiced frica-
tive at the beginning of the 
syllable. In the structure of 
finals, only the nucleus is 
indispensable. Both the medial and 
the ending are optional for some 
of the finals. And the nucleus 
will fill up the vacancy by 
extending its duration when the 
medial and/or the ending are ab-
sent in a final. Thus we call 
medial and ending replaceable and 
nucleus obligatory. As can be seen 
in Table 2, the duration of finals 
containing nucleus alone is approxi-
mately the same as those of 
finals involving a nucleus and a 
nasal ending.

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Table 2. Duration of Finals 
(Suzhou)

<table>
<thead>
<tr>
<th>Syllable</th>
<th>t t' k k'</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final</td>
<td>378 359 387 379</td>
</tr>
<tr>
<td>(=nucleus)</td>
<td>245 180 274 219</td>
</tr>
</tbody>
</table>

4. THE LONG-SHORT DISTINCTION OF 
VOWELS
In general, there is a long-
short vowel distinction in Canton-
ese as well as Kam-Tai languages. 
However this long-short vowel 
distinction does not result in a 
durational distinction of sylla-
bles as a whole. The duration of 
main vowel, as the nucleus in a 
syllable, is quite different from 
the duration of syllable. We can 
balance the nucleus and the ending 
in duration in the same final. In 
the finals with a long vowel serv-
ing as nucleus, the ending is short; in those with a short vowel 
as nucleus, the ending is long. 
Therefore the duration may be 
either long or short for a main 
vowel in a final. However, in 
general, the duration of the two 
types of finals tends to be the 
same.(Ma & Luo 1962) The ending 
can play the role of adjustment in 
the duration of the whole syl-
lable. The following measurements 
are from 10 pairs of syllables 
containing durational distinctions 
in the main vowel /a/ of Cantonese 
and Sui.

Table 3. Duration of Finals

<table>
<thead>
<tr>
<th></th>
<th>Cantonese</th>
<th>Sui</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vowel(L)</td>
<td>70 169</td>
<td>61 244</td>
</tr>
<tr>
<td>Ending</td>
<td>40 106</td>
<td>34 136</td>
</tr>
<tr>
<td>Final</td>
<td>110 275</td>
<td>95 380</td>
</tr>
<tr>
<td>Vowel(S)</td>
<td>46 116</td>
<td>33 130</td>
</tr>
<tr>
<td>Ending</td>
<td>46 116</td>
<td>72 284</td>
</tr>
<tr>
<td>Final</td>
<td>92 232</td>
<td>105 414</td>
</tr>
</tbody>
</table>

Comparing the average duration of 
the long vowels and the short 
ones, the long is in the ratio of 
3:2 to the short in Cantonese, and 
the ratio in Sui is 2:1. The 
complement of the ending to the 
nucleus is obvious in Sui, but it 
is not so evident in Cantonese.

5. SYLLABLES WITH STOP ENDING
There is another kind of syllable 
in Cantonese and Sui, the entering 
tone syllable, which ends with a 
stop consonant such as /p/, /t/, 
or /k/. The long-short vowel dis-
tinction of these syllables in 
duration is as follows:
Cantonese  Sui

<table>
<thead>
<tr>
<th></th>
<th>% ms</th>
<th>% ms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long Vowel</td>
<td>71</td>
<td>171</td>
</tr>
<tr>
<td>Short Vowel</td>
<td>44</td>
<td>112</td>
</tr>
</tbody>
</table>

The durational distinction is generally the same as those with unstopped endings in Cantonese, while in Sui the long vowels are much longer and the short even shorter. But what is the difference between the stop endings?

In general, the pronunciation of a consonant is divided into three steps: start, hold and release. It is difficult to measure the duration of stops because they do not release in the ending. As a substitution for this, the silence intervals from three informants' bisyllabic utterances were measured. This involved each entering tone syllable followed by a syllable with a voiced initial consonant in Cantonese. The following is the result:

Speaker A B C Average
Closure (with L) 106 124 107 112ms
Closure (with S) 123 153 109 128ms

Here are some individual variations in different informants. The closure duration following a short vowel is longer than that following a long vowel for A and B, but not C. However if we add the closure duration to the nucleus duration respectively, then the result will be roughly similar to that with an unstopped ending.

e.g. Final(L) 112+171=283 275ms
     Final(S) 128+112=240 232ms

Thus the closure duration of the stop ending should be considered as a part of the final duration although it is silent. The entering tone syllables are, thus, those that are interrupted with a period of silence. It is unreplaceable in the final duration.

Concerning durational relationships within the final, the long-short vowel distinction manifests itself in a give-and-take relationship with the ending. The final ending will be long if the main vowel is short and vice versa. In this way they reduce the difference between the two kinds of finals in duration. Therefore we can say that, in citational forms, syllables of all types tend to have roughly the same duration, while their internal constituents vary in duration in a complementary way.

References: