

Syllable Rhythm in VCCV-Type Disyllabic Words

Akitoshi Fukushima

I Introduction

The aim of this paper is to examine whether the durational behaviour of VCCV-type disyllabic words is the same as that of VCV-type disyllabic words, which was dealt with in Fukushima (2008).

Fukushima (ibid.) examined the temporal relationship between the first and the second syllables of VCV-type disyllabic words from two different points of view. One view, adopting Wells's (1990) theory, was to treat the intervocalic consonant as affiliated to the first syllable (VC-V); the other view, adopting Abercrombie's (1964) theory, was to treat it as affiliated to the second syllable (V-CV). Which of these two different syllabifications could offer an insight into the temporal relationship between the two syllables? The finding was that, although we observed the effect of pre-fortis clipping in all the words with a voiceless intervocalic consonant, V-CV syllabification seemed better, in that all the words retained 'short-long' syllable quantities, and all the pairs seemed to undergo the compensation effect between the two syllables. (The words with a voiced intervocalic consonant held longer first-syllable duration than those with a voiceless counterpart, while the duration of the second syllables of each minimal pair had the reverse pattern.)

II Material and recording procedure

The test words to be examined are three minimal pairs as follows. They are composed of real and non-real words in order to examine whether pre-fortis clipping takes place or not. Also, they share the features that the first of the intervocalic consonants is a sonorant and the second one is either a plosive or a fricative.

- | | |
|--|--|
| 1a. <i>limpid</i> / ^l lɪmpɪd/ | 1b. <i>limbid</i> / ^l lɪmbɪd/ |
| 2a. <i>centre</i> / ^s sentə/ | 2b. <i>sender</i> / ^s sendə/ |
| 3a. <i>dolphin</i> / ^d dɒlfn/ | 3b. <i>dolvin</i> / ^d dɒlvɪn/ |

The speaker and the recording procedure are the same as in Fukushima (ibid.). A male RP speaker read 25 words including the test words listed above in a random order. He read each word in time with clicks which were distributed at the speed of 75 beats per minute by an electronic metronome. In other words, he read the sequence of words in time with alternate beats, one beat for each word and one as a rest. The purpose of using a metronome was to block unnecessary final lengthening.

The rendition was recorded directly on to an iMac (OS-X version 10.4.11) by using Scicon's Macquirer speech analysis package (version 8.4.5) at the sampling rate of 44,000 hertz. The measurement was carried out by using the same software.

III Pre-fortis clipping and VCC-V syllabification

It is well known that a vowel (and/or a sonorant) becomes shorter when the following consonant is voiceless; for example, the vowel in *bat* is shorter than that in *bad* (Jones 1960⁹, Gimson 2001⁶). Wells (ibid.) himself adopts the name *pre-fortis clipping* for this phenomenon. Accordingly, /ɪm/ in *limpid* in the list above should be shorter than /ɪm/ in *limbid*. In addition, Wells (ibid.) suggests that syllabification is governed by a set of rules, one of which is as follows:

Rule 1: Subject to certain conditions, consonants are syllabified with the more strongly stressed of two flanking syllables.

In accordance with this rule the test words for the present paper should be syllabified as follows:

- 1a. limpid /lɪmp-ɪd/ 1b. limbid /lɪmb-ɪd/
 2a. centre /sent-ə/ 2b. sender /send-ə/
 3a. dolphin /dɒlf-ɪn/ 3b. dolvin /dɒlv-ɪn/

The two intervocalic consonants are syllabified with the first syllable. If a pre-fortis clipping takes place, the duration of the vowel+the following sonorant in the first syllable of the word under 'a' should be shorter than that of under 'b'. The measurements of duration of the relevant part of each word are given in Table 1 below.

Word	Duration
1a. l impid	241.2
b. l imbid	322.9
2a. c entre	276.2
b. s ender	315.6
3a. d olphin	215.3
b. d olvin	289.6

Table 1: Duration of the first vowel+the following consonant in milliseconds

It is evident that the values under 'a' (the word with a voiceless intervocalic consonant) are shorter than those under 'b' in each pair, which means that the clipping took place. However, this does not necessarily mean that the first syllable as a whole is shorter in the word with a syllable-final voiceless consonant than that with a voiced counterpart. The measurement of syllable durations of VCC-V type under examination is shown in Table 2.

Syllabified word	Duration of 1 st and 2 nd syllables
1a. limp-id	390.7-299.7
b. limb-id	467.3-210.5
2a. cent-re	495.0-131.7
b. send-er	524.8-154.1
3a. dolph-in	382.4-221.1
b. dolv-in	319.1-283.7

Table 2: Duration of 1st and 2nd syllables of VCC-V syllabification in milliseconds

While in Pairs 1 and 2 the first syllable of 'a' words have shorter duration than the 'b' words, Pair 3 shows the reverse pattern. Comparing the 'a' with the 'b' words, it might be that the target of pre-fortis clipping is the whole first syllable. But, since there is a counter

example of Pair 3, the matter of the target cannot be concluded for the moment.¹⁾

IV Possibility of VC-CV syllabification

Abercrombie (ibid.) also pays attention to the intervocalic consonant to deal with syllable rhythm. He categorized disyllabic words into three groups in reference to the durational relationship between the first and the second syllables. His rules governing the syllable quantities are as follows.

Type A (short-long) : (C)V¹CV(C)

Type B (equal-equal) : (C)VCC(C)V(C) or
(C)V²(C)V(C)

Type C (long-short) : (C)V(C)#(C)V(C)

C=any consonant, (C)=consonant optional,
 V=any vowel or diphthong, V¹=short vowels,
 V²=long vowels and diphthongs,
 # = word boundary

Since the test words have two intervocalic consonants, they should be categorized as Type B. But the problem here is that Abercrombie does not clearly state where the syllable boundary should be located. As for syllabification, a VCCV-type disyllabic word has to be either V-CCV, VC-CV or VCC-V. The V-CCV-type will not be considered in the present paper, since all the first vowels in the test words are checked vowels; ending a syllable with a checked vowel is phonotactically ill-formed. In this section, the remaining VC-CV syllabification will be examined, which would produce the syllabification as follows:

- 1a. limpid /lɪm-pɪd/ 1b. limbid /lɪm-bɪd/
 2a. centre /sen-tə/ 2b. sender /sen-də/
 3a. dolphin /dɒl-fɪn/ 3b. dolvin /dɒl-vɪn/

The durational measurement of the first and the second syllables in each pair is given in Table 3.

The first thing to be noticed is that no word in the table holds the 'equal-equal' pattern at all. Actually the pattern of the syllable rhythm is twofold: 1a, 3a and 3b have 'short-long' pattern, while 1b, 2a and 2b have 'long-short' pattern. Since the differences in duration between the

Syllabified word	Duration of 1 st and 2 nd syllables
1a. lim-pid	321.6-368.8
b. lim-bid	422.6-255.2
2a. cen-tre	393.6-233.1
b. sen-der	473.6-205.7
3a. dol-phin	232.8-370.7
b. dol-vin	254.7-348.1

Table 3: Duration of 1st and 2nd syllables of VC-CV syllabification in milliseconds

first and the second syllables well exceed the difference limens, no one would perceive that the duration of the two syllables is even (Lehiste 1970). At least, the data does not show that the words have ‘equal-equal’ syllable rhythm, if the VC-CV syllabification is adopted, nor is the VCC-V syllabification.

However, we can still observe notable syllable-quantity behaviours in VC-CV syllabification, which coincides with the observation made in Fukushima (ibid.). Now let us compare the durations of the syllables within each pair. All the pairs have in common that the ‘a’ words have shorter first syllable than the ‘b’ words do; in Pair 1: 321.6 vs. 422.6, in Pair 2: 393.6 vs. 473.6 and in Pair 3: 243.1 vs. 254.7 milliseconds respectively. In other words, the ‘a’ words, which contain ‘clip-inducing’ voiceless consonant, have *shorter* first syllables than do the ‘b’ words, which contain no voiceless consonant, do. This may imply that the ‘clippedness’ is reflected in the durations of the whole first syllable of ‘a’ words, although the voiceless consonant is affiliated to the second syl-

ble.

Taking a look at the second syllables within each pair, we further find an interesting tendency: all the ‘a’ words have longer second syllables than the ‘b’ words do. This is completely the reverse of the pattern shown by the first syllables. When a disyllabic word contains two intervocalic consonants, the second of which is voiceless, the first syllable is shorter than the voiced counterpart. At the same time, the second syllables within each pair show the completely opposite pattern. Take a look at Figure 1 to see this tendency.

V Discussion

Section III attempted to establish whether pre-fortis clipping would be triggered in VCCV-type disyllabic words. All the test words which contain a voiceless consonant as the second member of the two intervocalics attested to the fact that this is the case; /ɪm/ in *limpid*, for instance, is shorter than /ɪm/ in *limbid*. Fukushima (ibid.) reported that, in VC-V syllabification, a voiceless intervocalic consonant clipped the duration of the preceding vowel, whereas the entire first syllable wasn’t made shorter. However, the current data does not entirely support this finding. In Pairs 1 and 2, the first syllable of the ‘a’ words is shorter than that of the ‘b’ words, as if the clipping affected even the whole first syllable.

Section IV adopted the different approach to the syllable rhythm of VCCV-type disyllabic words; that is, what insight does VC-CV syllabification give into the matter?

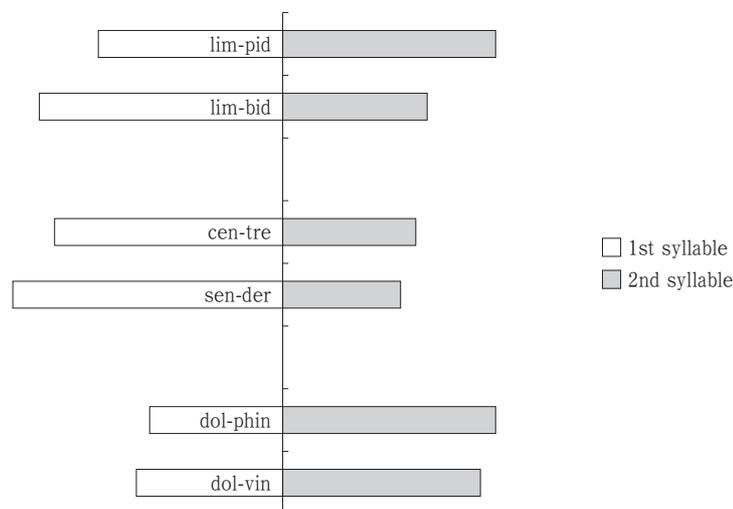


Figure 1: Durational relationship between 1st and 2nd syllables of VC-CV syllabification

According to Abercrombie (ibid.), a disyllabic word containing two intervocalic consonants should have ‘equal-equal’ syllable rhythm. However, none of our test words exhibits this pattern: three out of six test words have the ‘long-short’ pattern, and the rest of them have the ‘short-long’ pattern (See Table 3). This observation quite contradicts what was found in Fukushima (ibid.), in that most of the V-CV-syllabified words show ‘short-long’ pattern as can be expected from Abercrombie’s theory. What does this discrepancy tell us? Can we not find any syllable rhythm in VC-CV syllabification?

One thing to be noticed is the relationship between the first syllables within each pair. The word containing a voiceless consonant as the second segment of the two intervocalic consonants has shorter duration than that of a voiced counterpart. As was seen in Section II, *limpid*, *centre* and *dolphin* underwent the clipping, but this ‘clippedness’ was not reflected over the whole first syllable when the VCC-V syllabification was adopted. But, VC-CV syllabification seems to be able to show the ‘clippedness’. However, there is a theoretical problem here. That is, pre-fortis clipping is supposed to be triggered when a voiceless consonant is in the syllable final position. If we syllabify as VC-CV, the second consonant belongs to the second syllable and will not clip the preceding vowel, as you can see in *plum pie* vs. *plump eye* contrast.

The other thing to be noticed is the relationship between the first syllables within each pair on the one

hand, and between the second syllables within each pair on the other. As an instance, in Pair 2, the first syllable of *centre* has the duration of 393.6 msec while that of *sender* has 473.6 msec, making the former is shorter than the latter; the second syllable of *centre* takes 233.1 msec while that of *sender* takes 205.7 msec, meaning that this time the former is longer than the latter. This compensation is seen in every pair, as well as in V-CV pairs. This tendency is not shown clearly when we adopt VCC-V syllabification. (See Figure 2.)

The thing to be considered here is the treatment of the consonant affiliated to the second syllable. This consonant affiliation to the second syllable is activated when we adopt the ‘maximal onset’ principle (Couper-Kuhlen, ibid.). Fallows (1981) summarizes different theories of syllabification, which adopt some combination of four principles. The principles are:

- 1) “Restrictions on segment sequences”, namely, phonotactic constraints
- 2) “Maximal onset; the maximum number of consonants allowed by phonotactics of the language will occur in syllable-initial position”
- 3) “Stress”; a stressed syllable will attract the maximum number of consonants in both initial and final positions.
- 4) “Ambisyllabicity; sharing of internuclear consonants by neighbouring syllables.

According to these principles, *limp-id*, *cent-re*, *send-er*, *dolph-in* and *dolv-in* (VCC-V) are attested as legal by

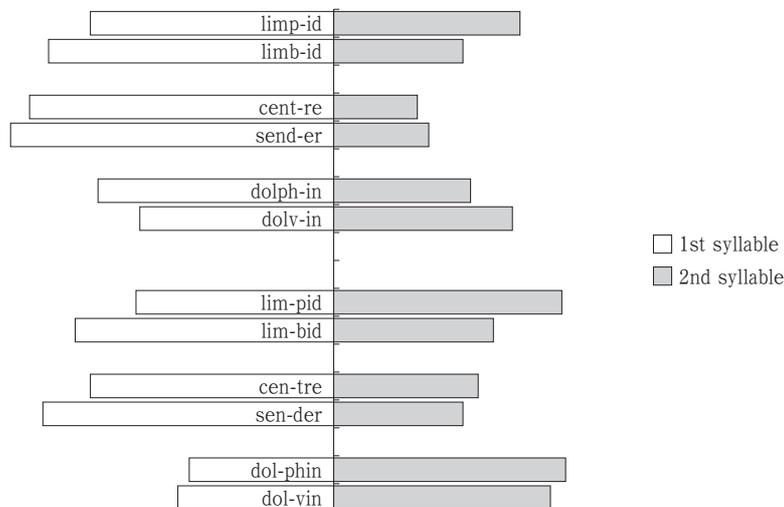


Figure 2: The relationship between the 1st and the 2nd syllable durations:
Upper half adopts VCC-V while lower half adopts VC-CV syllabifications

way of principles 1 and 3, while all the words under VC-CV syllabification are as legal by way of 1, 2 and 3.

O'Connor and Trim (1953) states that "the preference for one syllable division as opposed to another may be explained in terms of frequency of occurrence of different types of syllable finals and initials." As regards VCCV-type disyllabic words, they predict VC-CV should be preferred since CV's are more frequent than CCV's as syllable-final.

It follows from those discussions that the syllabification of VC-CV is likely to be reasonable. However, as was seen in Fukushima (ibid.), V-CV syllabification seemed to function in order to distinguish the minimal pairs (under the compensation effect), but it violated the phonotactic constraint. In other words, the maximal onset principle might not be, at least phonologically, the first order.²⁾ More phonetic research is definitely called for, to examine the status of the initial consonant in the second syllable as the *syllable-rhythm mediator*, with which I would like to deal elsewhere.

Notes

- 1) Fukushima (ibid.) obtained a different result on this matter. As regards the VC-V syllabification, the target of pre-fortis clipping is likely to be the preceding vowel alone, rather than the whole syllable, in that most of the words which include a voiceless intervocalic consonant had longer duration than those with a voiced counterpart.
- 2) This may be the place for 'ambisyllabicity' to play a role, but this is beyond the scope of the present paper.

References

- Abercrombie, David. 1964. "Syllable Quantity and Enclitics in English." In: Abercrombie, David, Fry, D. B., MacCarthy, P. A. D., Scott, N. C. & Trim, J. L. M. (eds.) *In Honour of Daniel Jones*. Papers contributed on the occasion of his eightieth birthday, 12 September, 1961. London: Longmans, Green and Co Ltd.
- Couper-Kuhlen, Elizabeth. 1986. *An Introduction to English Prosody*. London: Edward Arnold Ltd.
- Fallows, Deborah. 1981. "Experimental evidence for English syllabification and syllable structure." *Journal of Linguistics* 17, 179-392.
- Fukushima, Akitoshi. 2008. "Pre-Fortis Clipping and Syllable Quantity of VCV-Type Disyllabic Words." *The Journal of Konan University*, Faculty of Letters 155—English Studies—. Kobe: Konan University.
- Fukushima, Akitoshi. (in preparation) "On the Word-Dividing Task."
- Gimson, A. C. 2001⁶. *Gimson's Pronunciation of English*. Revised by Alan Cruttenden. New York: Oxford University Press.
- Jones, Daniel. 1960⁹. *An Outline of English Phonetics*. London: Cambridge University Press.
- Lehiste, Ilse. 1970. *Suprasegmentals*. Cambridge, Mass.: The M. I. T. Press.
- O'Connor, J. D. and Trim, J. L. M. 1953. "Vowel, consonant and syllable—a phonological definition." Reprinted in W. E. Jones and J. Laver (eds.). 1973. *Phonetics in Linguistics*. A book of readings. New York: Longman Inc.
- Wells, John. (1990) "Syllabification and allophony." In: Susan Ramsaran (ed.) *Studies in the pronunciation of English*, A commemorative volume in honour of A. C. Gimson. London and New York: Routledge.