Phonetic Cues to Syllabification

Ian Maddieson

1. INTRODUCTION

Ladefoged (1982:219) states simply that "there is no agreed phonetic definition of a syllable." That such a definition is lacking can be readily seen in any reading of current phonetic literature. Earlier optimism over defining the syllable (see, e.g., Pike 1943, Stetson 1951) has largely given way to pessimism. Yet despite the difficulty of defining it, the syllable has been given a major role in recent developments in phonological theory (e.g., Cairns & Feinstein 1982; Clements & Keyser 1983; Kahn 1976; Kiparsky 1979; Selkirk 1980; Steriade 1982). Views differ as to how complex the internal structure of the syllable is, for example, whether a syllable node dominates higher-order elements with their own constituent structure such as onset and rhyme, dominates C and V elements, or directly dominates segments (i.e., feature matrices). However, all accounts essentially agree that in some way segment-like elements are grouped into syllables.

Moreover, there may be rules that change the membership of a segment from one syllable to another (resyllabification rules). For example, Harris (1983) states a common observation about Spanish as follows: "In casual speech a word-final consonant syllabifies with the initial vowel of the following word" (p. 43). He formulates a rule that reassigns a consonant before a word boundary and a vowel to an onset rather than a rhyme and exemplifies the effect of the rule with the sentence:

(1) Los otros estaban en el avión.

After this rule applies, this sentence is syllabified as follows (a syllable boundary is represented by a period):

(2) Lo.so.tro.ses.ta.ba.ne.ne.la.vión

Elsewhere, Marlett and Stemberger (1983) argue that resyllabification of
a somewhat different sort applies in Seri after vowel deletion in certain forms with prefixes. The prefixes have the form "consonant + /l/," as in the irrealis /si-l/. When a consonant follows this prefix, the vowel /l/ is dropped so that

\[(3) \quad \sigma \quad \sigma \quad \sigma \quad \|
\quad i \quad s \quad i \quad k \quad a\]

becomes

\[(4) \quad \sigma \quad \sigma \quad \sigma \quad \|
\quad i \quad s \quad k \quad a\]

Since a syllable containing only /si/ is not well formed, a rule of resyllabification applies that attaches /si/ to the onset of the following syllable, giving /i.skai/.

With the ability to define a syllable phonetically in doubt, questions obviously arise concerning the basis on which selection between plausible alternative syllabifications is made. These questions apply as much to any initial (lexical) assignment to syllables as to cases where resyllabification is posited across word boundaries, as in the Spanish example above. Likewise, in the Seri example, the syllabification of /si/ with /ka/ is obviously only one of two potential ways that the faulty syllabic structure could have been remedied. The output of resyllabification could have been /i.ska/, with the syllable boundary between the consonants as in the Spanish /es.ta.ban/.

2. DETERMINING SYLLABIFICATION

When syllabification is at issue, what is the basis on which linguists have determined that their view in any given case is the correct one? There are sometimes formal arguments that can be made to justify particular syllabifications, for example, those related to input to reduplication rules advanced in Steriade (1982). These seem more likely to relate to initial syllabification, leaving surface syllabification to be determined from other kinds of evidence. If it is accepted that languages differ in their surface syllabification, it is reasonable to assume that there must be some indications of the differences in syllable structure in the phonetic string. Note that the lack of a phonetic definition of the syllable does not prevent the recognition of phonetic markers of syllable constituency. Their presence would enable a resolution to be made in situations where alternative syllabifications might be posited.

Of course, in many languages there are extrinsic allophonic rules that select allophones based on their position in the syllable. A well-known example is the difference between syllable-initial and syllable-final /l/ in both British and American English. Acoustic data on this phenomenon in American English are provided in Lehiste (1964). Since it is syllable based, this allophonic difference is capable of providing evidence of constituency of syllables in potentially ambiguous cases. An example is *holy* versus *holey* (i.e., *hole* + adjectival suffix -y). *Holy* is syllabified [hou.lij] with the syllable-initial (clear) allophone of /l/. In the monosyllabic *hole*, a syllable-final allophone of /l/ occurs, and, in my speech as well as that of many other speakers of British English, a special allophone of the preceding vocalic element that appears only before a tautosyllabic lateral also occurs. That both of these features occur in the derived form *holey* provides evidence that the syllabification of this word retains the lateral as a constituent of the first syllable (cf. Faure 1972). Tokens of *holy* and *holey* showing these syllable-bound properties from my speech are given in Figure 14.1.

Such an allophonic difference in laterals (and in vowels preceding laterals) is a particular fact about my dialect of English and is not general across languages. Many languages lack such salient cues for syllable constituency in their allophonic rules. And in the languages that do show them, they are not present in all segment types. It follows that if there...
are cues to syllabic constituency in these other situations, they must be more subtle ones. Linguists (not to mention native speakers) may well be responding to these cues when they make judgments about syllabic constituency in their data.

An explicit appeal to these more subtle cues can be made in the attempt to determine syllabic constituency in ambiguous circumstances. For example, Maddieson (1983) claims that most word-initial consonant sequences in the Chadic language Bura are resyllabified when a vowel precedes. Thus, the first element of the sequence becomes a coda to the syllable containing that vowel, and the syllabic boundary falls between the elements of the sequence. For example, the verb /bda/ when preceded by the person-aspect marker /tsa:/ is syllabified as /tsa:da/. Part of the evidence for this view is that the vowel preceding one of these sequences tends to be shorter than that before a single word-initial consonant. Figure 14.2 shows waveforms of utterances containing /tsa:/ before [ptsi] and [p]. A substantially shorter vowel can be seen before the sequence consisting of [p] preceding the affricate /ts/ than before the single consonant /p/ in the form /pits/. As is shown below, vowel shortening in closed syllables is a relatively common phenomenon across languages. Its occurrence in this Bura example thus provides some objective support for the intuitive feeling that the syllable boundary falls where it is shown in /tsa:bi/.

However, the appeal to vowel shortening in Bura carries no weight unless the phenomenon of vowel shortening in closed syllables is in fact a general cross-linguistic one. Since there are no Bura words that contain unambiguous syllable-closing obstruents (e.g., word-final stops), the argument cannot be extended to the between-word cases on the basis of language-internal evidence from within-word cases. Unless closed-syllable vowel shortening can be shown to be quite widely found in other languages, the Bura data are unconvincing evidence for any particular syllabification, since the mere fact of a difference could reflect a language-particular rule of vowel shortening under some other circumstances.

The topic of universal bases for recognition of syllable constituency seems to have been rather neglected since an early and unconvincing experiment on formant transitions with the Haskins pattern-playback synthesizer by Malmberg (1955/1967). Although the vowel shortening referred to above has previously been mentioned as common (e.g., Abercrombie 1967; Jones 1950), there does not seem to be any study that has explicitly shown that it tends towards universality and hence has value as evidence. The remainder of this chapter is dedicated to showing that vowel shortening associated with syllable structure is widely found. For convenience, the phenomena being investigated are referred to under the name Closed Syllable Vowel Shortening (CSVs).²

### 3. VOWEL DURATION

Of course, many factors in addition to syllable constituency affect the duration of a vowel, including lexical vowel quantity and other inherent properties of the vowel itself, various suprasegmental factors (stress, tone, intonation, etc.), and contextual effects such as the nature of surrounding segments and position in units such as the word and sentence. However, when these factors are controlled for, many languages prove to have a vowel duration difference that relates to the syllabification of the following consonant. It is shown below that there are quite a few
languages in which this effect seems to have been phonologized, for example in the form of rules that require only short vowels in closed syllables or forbid them in open syllables.

4. PHONETIC VOWEL DURATION BEFORE SINGLE AND GEMINATE CONSONANTS

The best test for a relationship between vowel length and syllabification is to be found in languages that allow word-internal geminated intervocalic consonants. It is assumed that these geminates are a sequence of two identical consonants with a syllable boundary falling between them. The vowel in a syllable closed by the first of a pair of geminated consonants can be compared with the vowel preceding a single consonant of the same type that is the onset to a second syllable, that is, C1V1C2C2V2 compared with C1V1C2V2. In this way the contrast is limited to only the syllabic structure, and all other variables are controlled for.

A shorter vowel before geminate than before single consonants is known to occur at least in Kannada, Tamil, Telugu, Hausa, Italian, Icelandic, Norwegian, Finnish, Hungarian, Arabic, Shilha, Amharic, Galla, Dogri, Bengali, Sinhalese, and Rembarrnga. I review below some of the phonetic data from these languages, reporting principally on studies in which measurements from several speakers are provided.

Mona Lindau (personal communication February 1984) has measured the duration of lexically short vowels before single and geminate consonants in three pairs of words in the Chadic language Hausa. The results, given in Table 14.1, show that vowels are distinctly shorter before geminates. Long vowel duration is provided for comparison.

<table>
<thead>
<tr>
<th>Word</th>
<th>V duration (msec)</th>
<th>Word</th>
<th>V duration (msec)</th>
<th>Word</th>
<th>V duration (msec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ci:tu</td>
<td>67</td>
<td>cii:tu</td>
<td>46</td>
<td>li:tu</td>
<td>106</td>
</tr>
<tr>
<td>wa:da</td>
<td>71</td>
<td>haa:ta</td>
<td>64</td>
<td>fa:ta</td>
<td>118</td>
</tr>
<tr>
<td>ga:da</td>
<td>67</td>
<td>hadda:</td>
<td>50</td>
<td>tadda:</td>
<td>125</td>
</tr>
<tr>
<td>means</td>
<td>68</td>
<td></td>
<td>53</td>
<td></td>
<td>116</td>
</tr>
</tbody>
</table>

* Each value is the mean of two or three tokens from 9 or 10 speakers, except for the third set for which data from only six speakers is available.

Italian also has shorter vowels before geminate consonants (Antonetti & Rossi 1970; Bertinnetto & Vivalda 1978). The difference in duration is greater in Italian than it is in Hausa. Some measurements of /a/ before single and geminate affricate /ʃʃ/ were made at two different speech rates by Maddieson (1980). The results are reproduced in Table 14.2.

Ghai (1980) recorded data from five speakers of Dogri, an Indo-Iranian language related to Panjabi. He reports that the short vowels /a/, /i/, and /u/ before the geminates were 27 msec on average shorter than the vowels before single consonants in the three word pairs in Table 14.3, and the long vowels /o:/ and /u:/ were 36 msec shorter before geminates in the two word pairs in Table 14.3. (The mean values themselves are not reported, only the differences.) It should be noted that there is a tendency for single medial stops to become fricatives in this language. The examples cited here, with the possible exception of /ja:da:/, are exempt from this trend.

In the variety of Icelandic labeled Norðlenzka (Northern Icelandic) by Orešnik and Pétursson (1977), vowel quantity can be predicted. For our purposes, what is important is that the vowels are about half as long before long voiceless stops (orthographic bb, dd, gg) than before single voiceless stops (orthographic p, t, k). The mean duration of all vowels

<table>
<thead>
<tr>
<th>Word</th>
<th>Vowel duration (msec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>kaca:</td>
<td>'kaca:</td>
</tr>
<tr>
<td>ko:li:</td>
<td>'ko:li:</td>
</tr>
<tr>
<td>kta:</td>
<td>'kta:</td>
</tr>
</tbody>
</table>

* From Ghai (1980).
ciassed as short is 81 msec, the mean duration of long vowels is 163 msec. Data are from two speakers, but results are not given separately for vowels before geminates as opposed to other clusters or environments in which short vowels are found. (The facts in the more standard Southern Icelandic are different and call for vowel length to be taken as an underlying contrast; see Orešnik and Pétursson 1977:163–167.) In another North Germanic language, Norwegian, Fintoft (1961) found that vowels before geminate consonants have a mean duration 94 msec shorter than vowels before single consonants in a set of nonsense words (eight speakers).

That CSVS also operates in Finnish can be deduced from a remark by Wik (1965): “The same amount of lengthening [as is found when comparing final openyllables with final closed syllables] is found in words like muuta, puita as compared with muutta, puitta” (p. 118). Wik has data from five speakers but does not publish these measurements separately.

Less extensive data are available on several additional languages. Length differences consistent with CSVS can be seen in spectrographic data from the Dravidian language Telugu, although this evidence is only from a single speaker (Peri Bhasharao, personal communication, December 1983). Balasubramaniam (1972) indicates that shorter vowels occur before the geminate sonorants that remain in Tamil. Applegate (1958:13) reports shortening of vowels before geminates in Shilha (Berber) on the basis of spectrographic data from one speaker. McKay (1980:346) found in spectrograms of one speaker of the Australian language Rembarranga that “in general shorter vowels occurred before the geminate stops than before the single stops.” Informal examination of material in the language data archives of the UCLA Phonetics Laboratory confirms that the same phenomenon is found in Amharic, Gallu, Kannada (cf. Gowda 1970), Bengali, Sinhalese, and Arabic. Surprisingly, no published measurements on this question in Arabic could be located, although a few spectrograms are included in Al-Ani (1970) showing shorter vowels before /%/ and %/ than before /#/ and /#/.

Thus the reality of CSVS can be demonstrated in data from languages of several diverse language families that provide the most controlled environment for its observation, namely, before geminate and single consonants. It can be shown to occur in languages with and without a lexical vowel length contrast, in different speech rates, and under different prosodic conditions.

In at least one language, the phonetic length difference before single and geminate consonants is in the process of being converted into what is essentially a phonological contrast of vowel length. In the cornoualais dialect of Breton studied by Bothorel (1982), the distinction between single and geminate sonorants, preserved in the léonais dialect, has been reduced to insignificance. Measurements of both consonant and preceding vowel durations are given in Table 14.4 for three speakers, using five words of each type. The difference in consonant duration is an insignificant 5 msec, but the vowels before the former geminates are 40 msec shorter than before the historical single consonants.

In some Dravidian languages, such as Tamil and Malayalam, the formerly general contrast between single and geminate consonants has been eliminated from obstruents and replaced by a contrast between long voiceless stops and short voiced fricatives (Lisker 1958, Velayudhan 1971). In these languages, the vowel length difference before the former contrasting single and geminate stops is retained. Tamil data from four speakers (about 60 tokens per speaker) are given by Balasubramaniam (1981). Means from his results are reproduced as Table 14.5.

In the case of Swedish, a different phonological consequence has ensued from the restructuring of length contrasts originally related to syllable structure into both quantitative and qualitative distinctions between sets of “tense” and “lax” vowels. Elert (1964) provided measures across different vowel pairs before single and geminate consonants from eight speakers. His results before /l/ and /l/ in the two Swedish word-accent patterns are reproduced in Table 14.6. Each value represents a mean of 10 tokens for each of nine vowels in their “tense” and “lax” variants.

### Table 14.4 MEAN VOWEL LENGTH BEFORE FORMER SINGLE AND GEMINATE SONORANTS AND DURATION OF FOLLOWING CONSONANT IN A BRETON DIALECT

<table>
<thead>
<tr>
<th></th>
<th>V duration</th>
<th>C duration</th>
<th></th>
<th>V duration</th>
<th>C duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>VC-</td>
<td>127</td>
<td>48</td>
<td>VC-</td>
<td>87</td>
<td>53</td>
</tr>
</tbody>
</table>

* Computed from data provided in Bothorel (1982).

### Table 14.5 MEAN DURATIONS (IN MSEC) OF SEVEN LONG AND SHORT VOWELS BEFORE SINGLE AND GEMINATE VOICELESS PLOSIVES IN TAMIL

<table>
<thead>
<tr>
<th></th>
<th>Short vowels</th>
<th>Long vowels</th>
</tr>
</thead>
<tbody>
<tr>
<td>VC-</td>
<td>VC-</td>
<td>VC-</td>
</tr>
<tr>
<td>VCC-</td>
<td>VCC-</td>
<td>VCC-</td>
</tr>
<tr>
<td>Mean</td>
<td>112</td>
<td>97</td>
</tr>
<tr>
<td>Difference</td>
<td>15</td>
<td>13</td>
</tr>
</tbody>
</table>

5. PHONOLOGICAL CONSTRAINTS ON VOWEL QUANTITY AND CONSONANT GEMINATION

Elsewhere, other reflections of the association between shorter vowel and geminate consonant can be found in phonotactic constraints. Quite commonly those languages with both long and short vowels and single and geminate consonants restrict the vowels before geminate consonants to being phonologically short. This rule is found in Arabic (Al-Ani 1970), Hausa (Abraham 1959), Hindi (Ohala 1972), Estonian (Lehiste 1966), and apparently in both Gowda and Standard dialects of Kannada (Gowda 1970) and Ulithian (Sohn & Bender 1973). In Koya, long vowels do not occur before geminates (Tyler 1969), and this language also has morphophonemic rules that shorten an underlying long vowel when geminates are derived. In Punjabi, the set of "lax" centralized vowels, which tend to be shorter than the peripheral vowels, are the only vowels that may precede geminate consonants (Gill & Gleason 1963:12). In a Bavarian dialect of German, Bannert (1972) reports that a long vowel can only precede a short consonant and a short vowel can only precede a long consonant (in the minimal pair [vi:sn] vs. [vi:s:n], vowel length is 190 msec vs. 110 msec).

We thus see that both on the phonetic level and in phonological constraints shorter vowels frequently precede a geminate consonant that contrasts minimally with a single consonant within a word. In other words, the shorter vowel is in the closed syllable. An apparent counterexample, Japanese, is discussed below. Otherwise all the languages on which data are to hand show the occurrence of a shorter vowel in a syllable closed by a geminate consonant.

6. VOWEL DURATION IN OPEN AND CLOSED SYLLABLES IN GENERAL

In a fairly wide range of other languages there are phonetic measurements available or brief descriptive remarks that indicate a difference between vowel length in open syllables and closed syllables in general. Jones (1950:126–128) was among the first to measure such differences in English, comparing, for example, see with seed and seat. Jones also comments on a similar difference for Russian. Wilk (1965) confirmed Jones' findings on a larger scale for English and extended them to Finnish, using five speakers from each language. Han (1964:57–61) reported that in a set of Korean data (29 words from each of 4 speakers) the mean duration of /a/ in CV syllables was 266 msec, whereas in CVC syllables it was 127 msec. In Standard Chinese the only possible syllable-final consonants are nasals. Mean values for a set of vowels and diphthongs measured by Ren Hong-Mo (personal communication, February 1984) before /n/ and /ŋ/ are 238 and 200 msec respectively, whereas these syllable nuclei without a final nasal are 363 msec (means of data from four speakers). Phonologically long vowels in closed syllables in Thai are reported as substantially shorter than the same vowels in open syllables (Abramson 1962). Listeners' judgments of vowel quantity reflect an awareness of this fact in that a shorter vowel is judged to be phonologically longer in a closed syllable than is the case in an open one.

Brief remarks on vowel duration and syllabification in other languages include the following. For Assamese, Goswami (1966:114) reports that stressed vowels are longer in open syllables than elsewhere in nonfinal syllables. Buth (1981) reports that long vowels are lengthened slightly in open syllables in the Nilotic language Jur Luo. A phonologization of the kind of distribution of vowel duration discussed here can be found in several languages, as either a synchronic or historical process. For example, vowels in Ngizim in closed syllables must be phonologically short (Schuh 1978:255). In an earlier period of English, short vowels in open syllables were lengthened, in some cases merging with existing phonologically long vowels (the short vowels /ɛ, a, ə/ were principally affected). The phonetic basis of this change, namely the correlation of length and syllable structure, inspired the thirteenth-century monk Oerm to devise an orthography in which all short vowels were indicated by writing a geminate consonant after them. (For a convenient brief summary of these facts see Strang 1970.)

Hence, several further languages that show a general relationship between shorter vowel and closed syllable can be added to those that provide evidence for the widespread effects of CSVS. If CSVS is universal, there
7. APPARENT COUNTEREXAMPLES TO CSVS

There are a small number of apparent counterexamples to CSVs. One of these, Japanese, is the only documented language that shows no difference in the length of the vowels preceding geminate and single consonants in word-medial position (Dalby & Port 1982; Han 1962; Homma 1981). However, Japanese has long been held to be organized temporally on the basis of the mora (see, e.g., Bloch 1950). That is, /kan/ is a two-mora word equivalent in this respect to /kana/, but /kana/ is not equivalent to /kanna/, which has three moras. Many analyses of Japanese treat the word-final consonants and the first element of the “geminates” as syllabic consonants (e.g., Jorden 1963). The first part of a geminate consonant in Japanese derives from a former CV syllable and is represented orthographically by a symbol that corresponds to such a syllable (Miller 1967:109). In an emphatic (facetious?) style of pronunciation this syllable may be pronounced in full (Akira Fukuyama, personal communication, March 1984). The two elements of a geminate are also separated in a pig latin-type secret language, reflecting a division such as /ka.n.na/. There is thus specific evidence in the case of Japanese to reject the general assumption made above that the first part of a geminate is the coda of the syllable containing the preceding vowel. Japanese is therefore not a genuine counterexample to CSVs. All other languages with geminates that have been studied show shorter vowels before them.

The other apparent counterexample to the relation between phonetic vowel length and consonant gemination arises from the conclusion of Delattre (1968) that “in distinguishing a geminate from a single consonant, the duration of the preceding vowel is a negligible factor” in English, French, Spanish, and German (p. 126). These are not languages that have geminates of the sort found in the languages surveyed above. Most of the examples used concern consonants that occur on either side of word boundaries. Delattre comments that “what is most striking as one looks at spectrograms of these utterances is the number of cases in which a vowel preserves its original length despite a practical doubling of the following consonant’s duration, as in The race ends vs. The race sends” (p. 126). In these sentences [ei] is 170 msec long in each case but [#] is 120 msec in the first while [s#s] in the second is 230 msec. But there is no reason to consider the final consonant of race in the first sentence to have been resyllabified as an onset to the word ends; in such circumstances many English speakers have a distinct word-initial onset to the vowel with glottalization. Hence there is no reason to anticipate a longer vowel in race in this sentence. Delattre’s data do not address the issue of concern in this chapter.

As for counterexamples to the more general correlation of shorter vowel with closed syllable, there is a possible one in French. Standard descriptions of French (e.g., Martinet 1960) mention that there is a rather limited length contrast of /l/ and /l:/ on the basis of such contrasts as grand–grande (grànd–grànd). The long vowel occurs in the form with the closed syllable. Malmberg (1964) challenges this account, suggesting that the longer vowel optionally occurs as an indication of the originally closed nature of the syllable when it is resyllabified, as in la grande Adèle, where the syllabification would be /la.grà.nd.de.l/. that is otherwise absent. No other authorities seem to agree with Malmberg. In fact, the long vowel in forms like grande probably originally arose when the feminine became disyllabic with addition of /s-/. (Ewart 1943) and such had two open syllables at a time when the masculine grand was a single closed syllable. Hence the /l/–/l:/ contrast derives from operation of CSVs, and Martinet’s account of it as an underlying contrast (for those speakers who maintain it) is probably preferable.

Some languages have phonological rules that appear to run counter to CSVs. The Micronesian language Kusaiean (Lee 1975; Levin 1983) is reported to have a phonological rule that lengthens vowels in closed syllables. In one pattern of reduplication, a short vowel in the reduplicated form is repeated as a long vowel in a closed syllable; for example, the simple form /ulu:/ has the derived form /ulu:ulu:/. The reduplication process appears sensitive to the closed nature of the syllable because there is another reduplication pattern in which the medial consonant is not repeated, that is, the reduplicated syllable is CV rather than CVC. In this pattern, when the simple form has a short vowel, the reduplicated syllable also has a short vowel, giving, for example, /ulu:/ulu:. However, it should be noted that the lexically short vowels in this language are severely restricted in their distribution, and it is clear that vowels are normally long. The short vowels are only permitted in the first syllable of disyllabic or longer words (apart from a few derived forms including some reduplicates). All vowels in monosyllables and noninitial syllables are long. Moreover, only nonlow vowels may be short. Lee’s grammar of Kusaiean does not include any evidence to suggest that the occurrence of the short vowels can be predicted, but their limited distribution does suggest that this might be a possibility. An account of Kusaiean in which all vowels are underlyingly long would replace the rule that lengthens vowels in closed reduplicated syllables with one that shortens vowels under certain conditions that are not tied to syllable structure. It is
unclear that such an account can be successfully made, but, if it were, it would have the advantage of explicitly representing the fact that the long vowels are the normal variants.

According to Bloomfield (1939), Menomini has rules that both lengthen short vowels in closed syllables and shorten long vowels in open syllables under certain conditions. These rules are a part of a process that appears to be mainly concerned with establishing an alternating rhythmic pattern that is in part tied in with stress (Pesetsky 1979). The rhythmic pattern seems to evaluate CV and CVVC syllables as equivalents; the even-numbered syllables following the first long vowel in a word are changed minimally so that they conform to one or the other of these structures. On the other hand, the vowel in the second syllable of a word is lengthened regardless of whether it is in an open or closed syllable, and vowels in the odd-numbered syllables are unchanged in length. This set of rules taken as a whole does not produce any general association of length and syllable structure that is counter to CSVS.

The above are the possible counterexamples to CSVS that I am aware of. They do not seem to be such as to seriously challenge the validity of the claim that CSVS is found across the broad generality of languages.

8. DISCUSSION

CSVs seems to be present in the world’s languages with sufficient uniformity that it can be used as a cue to the syllabic constituency of a string of segments. In addition, the demonstration of the generality of CSVs may have an important implication for the understanding of speech production and linguistic structure. CSVs is consistent with the view that the rhyme of a syllable is a unit of organization in speech production. This view is connected with, but not identical to, the view that -VC- sequences are units of timing organization. Many studies have drawn attention to the tendency for vowel duration to be longer and consonant duration to be shorter in VC sequences in which the following consonant is voiced compared to when it is voiceless. Walsh and Parker (1982) have used this inverse relationship as evidence for the unity of the VC portion of a CVC syllable (at least at some point in the derivation). Port (1981) also argues for a similar “macrounit” consisting of the vowel plus the following tautosyllabic consonant. However, much of the experimental data on vowel duration and consonant voicing demonstrates that voicing-related length variations occur whether or not there is an intervening syllable boundary. Chen (1970) provides examples from French and Russian that show these phenomena before both tautosyllabic and heterosyllabic consonants and Korean data in which all the consonants are heterosyllabic but which still show a mean vowel duration 28 msec shorter before voiceless (aspirated) stops than before voiced stops. In Balasubramanian’s Tamil data, mean duration of long vowels before heterosyllabic voiced consonants is 30.3 msec longer than before voiceless ones; short vowels are 14 msec longer before voiced consonants than before voiceless ones (data recalculated from tables in Balasubramanian 1981).

None of the many studies on this question of vowel length before consonants that contrast in voicing reports data in a way that enables the possible effect of syllable boundary placement to be entirely separated from other factors that also affect duration (such as word length, consonant manner, or vowel quality). However, in Chen’s Russian data, the five word pairs in which the vowel was measured before a heterosyllabic consonant have a mean difference of 27.2 msec, and the six word pairs with tautosyllabic consonants show a mean difference of 29.8 msec. These differences are obviously of similar magnitude. Consonants and vowels are not matched across these two sets of words, and the majority of tautosyllabic cases occur in monosyllables whereas the heterosyllabic cases in disyllables. Furthermore, there is a rule of final obstructive devoicing in Russian; hence the monosyllables examined by Chen show a contrast in which the phonetic presence of voicing is probably not a factor. Nonetheless, there is some indication here that the length difference associated with the voicing contrast is the same in open syllables and in closed syllables.

Because of this, those who have argued that the vowel- (and consonant-) length adjustment associated with voicing contrast provides evidence for the unity of VC as a constituent of the syllable have yet to show that there is any basis for doing so. This influence on vowel length behaves like certain types of coarticulation such as anticipatory rounding of the lips, which has been shown to ignore word (Bell & Harris 1982) and syllable boundaries (to judge from McAllister 1978). Although data from coarticulation studies have sometimes been interpreted as throwing light on the syllabic organization of speech production (e.g., Song & Perkell 1983), these studies do not normally examine utterances that differ minimally in syllabification. Hence they also do not address the question of syllable structure in speech production and language representation.

CSVs, on the other hand, is (ex hypothesis) related to syllable structure and thus provides a basis for drawing conclusions about the role of the syllabic unit in languages and in the general human capacity for producing articulate speech. It also provides some support for those such as Kiparsky (1979) and Selkirk (1980) who wish to recognize the rhyme as an internal constituent of the syllable.
CHAPTER 14. PHONETIC CUES TO SYLLABIFICATION

REFERENCES


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