

On the phonetic status of syllabic consonants: Evidence from Slovak

Our paper investigates the phonetic correlates of syllable structure on the basis of Slovak syllabic consonants. While many languages allow syllabic consonants, syllables containing consonantal nuclei are usually very restricted compared to their vocalic counterparts in terms of syllable complexity, and their occurrence is largely predictable on the basis of stress and constituency structure (morpheme boundaries). Freely distributed syllabic consonants are relatively rare in the world's languages (Bell, 1970). We consider in this paper whether this cross-linguistic restriction on syllabic consonants is grounded in articulation.

Phonetic studies of syllable structure have posited that vowels provide the basis for articulatory coordination relationships within a syllable: Consonants are coordinated with respect to the vocalic syllable nucleus, and vowels provide the basis for the articulation of consonants (Browman & Goldstein, 2000; Öhman, 1966). Vowels differ articulatorily fundamentally from most consonants in that they always involve a movement of the entire tongue body, are overall relatively unconstricted compared to consonants and are relatively slow in their movement. We may therefore hypothesize that a consonantal syllable nucleus may not provide the same possibilities for articulatory coordination compared to a vocalic nucleus. A piece of evidence in support of this reasoning is the fact that typologically, syllabic consonants usually cannot take complex onsets and codas, they are much more restricted in syllable complexity compared to vocalic syllables (Bell, 1970). If they do allow for complex syllable margins, it may therefore be the case that these consonants differ in nucleus position from their onset and coda counterparts by being kinematically more 'vowel-like' in that they are slower in their movements and longer in duration.

We tested this hypothesis on the basis of Slovak, a language that allows freely distributed vowel-less syllables with /l/ and /r/ providing the syllable nucleus, whereby /r/ is an apical trill (in all syllable positions). Slovak syllables with a consonantal nucleus can have complex onsets with up to two onset consonants (e.g., *smrt'*, 'death'), but only limitedly complex codas (cf. words like *s'inc* 'sun-Gen.Pl.' and *s'ink* 'deer-Gen.Pl.' with a homorganic coda cluster). Thereby it should be pointed out that generally complex codas are infrequent in Slovak. Phonological rules that target the syllable nucleus apply independently of whether the nucleus is occupied by a vowel or a consonant, thereby confirming that the consonants truly occupy nucleus position. For example, Slovak shows a complex set of phonemic length alternations for syllable nuclei, mainly triggered by affixation or by the rhythmic law (Kenstowicz & Rubach, 1987; Rubach, 1993). The rhythmic law states that a long nucleus becomes short if the immediately preceding syllable contains a long nucleus. Syllabic consonants participate in these length alternations just as vowels do, and serve as both triggers and targets.

Empirically, we employ two classes of measures in pursuit of our research question: In order to assess whether syllabic consonants are more 'vowel-like' in their kinematics compared to their onset and coda equivalents, we compare /l, r/ in onset, nucleus and coda position in terms of (time-to-)peak velocity, stiffness, plateau duration and maximal articulator position. Secondly, we investigate articulatory coordination in syllables with vocalic and consonantal nuclei by means of overlap measures. We compare onset-nucleus coordination in syllables with vocalic and consonantal nuclei, as well as C-C coordination in CCC, CCV and VCC syllables. EMA data for three native speakers of Slovak were recorded.

Results show that syllables with consonantal nuclei are kinematically similar to consonant clusters. First, a consonantal syllable nucleus does not show any change in its consonantal articulatory dynamics to become more vowel like. Overall, /r/ has a tendency to be faster and have a longer plateau duration in nucleus position, while /l/ has a slight tendency to be slower, with no clear pattern in plateau duration. While syllabic /l/ and /r/ differ from their counterparts in onset and coda positions, these differences in their kinematics are overall rather subtle, and can be in either direction across subjects. Particularly /r/ is, if anything, slightly ‘more consonantal’, as it were, in nucleus position in that it shows the shortest time to peak velocity, the highest position and stiffness values. We conclude from this part of the analysis that the phonological status as syllable nucleus does not fundamentally affect the consonantal phonetic properties of /l/ and /r/.

The most consistent differences between syllables with a vocalic vs. consonantal nucleus is evident in measures of articulatory timing. These analyses show that onset and coda timing to a consonantal nucleus is comparable to consonant cluster timing in CCV/VCC syllables rather than to CV timing. Further, onset-nucleus are significantly less overlapped when the nucleus is consonantal (e.g., *brm*) rather than vocalic (e.g., *bam*). Comparing onset-nucleus CC sequences (*chlp*) to the same consonant sequence as an onset cluster (e.g., *chlap*), we find that onset-nucleus sequences are even less overlapped compared onset clusters of vowel-nucleus syllables. Both onset clusters or onset-nucleus consonant sequences containing /l/ and /r/ show an open transition schwa. Complex onsets do not differ in their coordination to the syllable nucleus, independent of whether that nucleus is a consonant or a vowel. This suggests that contrary to our initial hypothesis, it is not the case that complex onsets cannot be coordinated to a consonantal nucleus if that nucleus retains its consonantal kinematics. The typological possibility for syllabic consonants seems to be rather related to the consonant timing pattern of a language.

References

- Bell, A. (1970). Syllabic consonants. *Working Papers on Language Universals*, 4, B1-B49.
- Browman, C., & Goldstein, L. (2000). Competing constraints on intergestural coordination and self-organization of phonological structures. *Bulletin de la Communication Parlée*, 5, 25-34.
- Kenstowicz, M., & Rubach, J. (1987). The phonology of syllabic nuclei in Slovak. *Language*, 63(3), 463-497.
- Öhman, S. E. (1966). Coarticulation in VCV utterances: spectrographic measurements. *Journal of the Acoustical Society of America*, 39(1), 151-168.
- Rubach, J. (1993). *The Lexical Phonology of Slovak*. Oxford: Clarendon Press.