A PHONETIC-PHONOTACTIC APPROACH TO RHYTHM: RHYTHMIC JITTER

Viktória Gyöngyi Papp

The occurrence of a phonemic short-long variation in a language would, in theory, enhance rhythmic variability, potentially pushing the language towards stress-timing. The extent to which this actually occurs, however, will be likely mediated by the frequency of occurrence of long vs. short segments in the language. If long segments are fairly infrequent, or the durational difference between short and long segments is very small, it is expected that the quantity effect would be attenuated. This study is looking at three languages with differing degrees of quantity contrast, and attempts to explain the rhythmic differences with the help of phonotactic and durational information about each language. The concept of rhythmic jitter is introduced.

Finnish distinguishes short and long segments both among vowels and consonants, and has diphthongs as well. Finnish has 16 vowels (8 short-long pairs) and 21 consonants, out of which about 7-8 occur only in loanwords. The diphthongs in the language can be either underlying or created by the phonological consonant gradation of /k/. In some dialects /p, t, k, s/ lengthen after /l, n, m, r/, and /ng/ is always long. Iivonen states that classification of Finnish rhythm is controversial. He states that Finnish is often included among syllable-timed languages, although a tendency towards a stress-timed system exists (Iivonen 1998). O'Connor points out that both stress-based rhythm and syllable-based rhythm would have a conflict with the length distinctions in Finnish, and suggested that neither of them fits well with Finnish rhythm (O'Connor 1973: 240). Finnish rhythm as a moraic system have been reconsidered by Aoyama and Doty et al. as well (Aoyama 2001; Doty et al. 2007).

In Hungarian, all vowels can occur as either as short or long typically with /ɔ/ and /aː/ and /ɛ/ and /eː/ forming short-long pairs, respectively, that also differ in quality. Hungarian has no diphthongs and the variety considered in this paper is the 14-vowel Standard Educated Hungarian inventory with short /ɔ/, short /ɛ/ and long /aː/ and /eː/ (/ɔ, aː, ɛ, eː, i, iː, o, oː, ø, øː, u, uː, y, yː/). Hungarian has 24 consonants (/b, ʦ, ʧ, d, ʤ, ʤ, f, g, ɟɟ, h, k, l, m, n, ɲ, p, r, ʃ, s, t, cç, v, z, ʒ/) and a glide (/j/) all of which can appear as geminates. Hungarian is reported as a syllable-timed language (Siptár & Törkenczy 2000).

Turkish has 20 consonants /b, ʤ, ʧ, d, f, g, h, ʒ, k, l, m, n, p, r, s, ʃ, t, v, j, z/ and 8 vowels /a, e, ɨ, i, o, ø, u, y/. Geminates occur in the language infrequently. While it has few primary long vowels in Arabic and Farsi loanwords, secondary long vowels emerge from compensatory lengthening processes, such as the consonant gradation of /k/ (through what is termed as "soft g" in the traditional Turkish linguistic literature) or fortition of /h/ and /v/ (Sezer 1985). Long vowels are not marked in the orthography, but the consonantal morpho-phonological alternations are represented. Turkish is claimed a syllable-timed language (Lewis 2001).

In order to investigate the duration proportion of short and long segments in the target languages of Finnish, Hungarian and Turkish, a literature search was conducted. The duration proportion information was used to construct the predicted normalized pairwise variability index (nPVI) for each sentence in the translation of Aesop's fable "The North Wind and the Sun." The predicted nPVI values were then compared to observed nPVI values based on the same passage.

The difference between the predicted and observed nPVI values was modelled with jitter (noise) added to every duration value in the predicted PVI formula in 5% increments. For each round of simulation, the predicted PVI was recalculated with the jitter-added values. The result of the jitter simulation is the jitter expressed in percentage where the predicted values are the closest to the observed values. Finally, an analysis of written corpora in the three languages (approximately 0.5M words / language) was carried out to quantify the proportion (compared frequencies) of short vs. long

segments in the three languages.

If we define phonotactic prominence as the combined effects of durational and frequency ratio of short and long segments in a language, then the results of this study show that the more prominent long segments are the less rhythmic jitter a language exhibits. This puts pairwise metrics in a different light: from a rhythmicity metric they become a device to quantify rhythmic jitter added to the predictable differences arising from the durational and frequency profile of a language.

References

Aoyama, K. 2001. *A Psycholinguistic Perspective on Finnish and Japanese Prosody: Perception, Production and Child Acquisition of Consonantal Quantity Distinctions.* London: Springer.

Doty, C.S., K. Idemaru & S. G. Guion. 2007. Singleton and Geminate Stops in Finnish – Acoustic Correlates. In *Proceedings of the 8th Annual Conference of the International Speech Communication Association*. Antwerp, Belgium, pp. 2737-40.

Iivonen, A. 1998. Intonation in Finnish. In D. Hirst & A. D. Cristo (eds) *Intonation Systems*. pp. 311-28.

Lewis, G. 2001. *Turkish Grammar* 2nd ed., Oxford University Press, USA.

O'Connor, J.D. 1973. *Phonetics.* Hammondsworth: Penguin.

Sezer, E. 1985. An autosegmental analysis of compensatory lengthening in Turkish. In L. Wetzels & E. Sezer (eds) *Studies in compensatory lengthening. Publications in Language Sciences*. Dordrecht: Foris Publications.

Siptár, P. & M. Törkenczy. 2000. *The Phonology of Hungarian*, Oxford: Oxford University Press.