# VIOLATION OF NOCODA CONSTRAINT IN WORD-FINAL SYLLABLE (ANALYSIS IN ENGLISH AND LITHUANIAN)

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## INTRODUCTION

The present investigation was done following the Optimality Theory (OT) approach to the syllable (Prince & Smolensky, 1991; McCarthy & Prince, 1993, 1996; Archangeli, 1998; Hammond, 1998). As it is known, the OT, a theory of generative linguistics of the 1990s, rejects the rule component and introduces violable constraints. The constraints have a universal nature, but their hierarchy is language-specific. The violability of a constraint depends upon its position in a hierarchy: lower- ranked constraints are likely to be violated to satisfy higher-ranked constraints.

The analysis of the NOCODA constraint is a contribution to the establishment of the constraint hierarchy in Lithuanian syllabification. This helps in explaining the specificity of the syllabification process in word form production (Levelt, Roelofs, Meyer, 1999) in Lithuanian and, consequently, the differences in this process in English and Lithuanian.

## THE CONSTRAINT HIERARCHY IN SYLLABIFICATION

Within the OT theoretical framework the universal properties of syllables were summed up by Archangeli (1998, p.7). The general tendencies are as follows:

- syllables begin with a consonant;
- syllables have one vowel;
- syllables end with a vowel;
- syllables have at most one consonant at an edge;
- syllables are composed of consonants and vowels.

These general tendencies led to the formulation of the universal constraints in syllabification: ONSET, PEAK, NOCODA, *COMPLEX, FAITHFULNESS (FAITHC and FAITHV) respectively.[1] The constraint hierarchy in a particular language determines the sound distribution in syllables and words.

Thus, ONSET constraint requires that syllables begin with a consonant; the PEAK con-

[1] *COMPLEX is shorthand for *complex onsets and complex codas are unacceptable.

straint – that syllables have one vowel; the NOCODA constraint – that syllables end with a vowel; the *COMPLEX constraint – that syllables have at most one consonant at an edge, i. e. in the onset and coda; the FAITHFULNESS constraint – that input and output in generation coincide, i.e. there is no consonant or vowel insertion or deletion.

In the OT the relationship between input and output is arbitrated by two mechanisms: GEN (for Generator) and EVAL (for Evaluator). EVAL selects the optimal candidate(s) produced by GEN, making use of the language-specific constraint hierarchy, i. e. a particular ranking of CON (the universal set of constraints).

To satisfy universal constraint requirements, languages allow different constraint violations, and thus create different constraint hierarchies. A case in point is, e. g., a three-consonant sequence that appears in languages in word derivation or inflection. D. Archangeli (1998, 19–20) gives an example in Yawelmani, a native American language. *Logw*, the verb root for "pulverize" with *-hin*, marking the past tense, would create a three-consonant sequence, which would be a violation of *COMPLEX constraint, because either the coda of the first syllable or the onset of the second syllable would be bound to have a complex unit (either *logw.hin* or *log.whin*). The analysis of this particular language shows that this constraint is highly ranked, and such syllables do not appear. The second possible violation could be FAITHC, effected by deleting one of the consonants (e. g. *log.hin*). This does not happen in the language either. The third possible solution might be the violation of PEAK constraint, creating the third syllable containing not a vowel, but a consonant (like *log.w.hin*). The Yawelmani language does not behave in this way either. This language violates FAITHV constraint by including an extra vowel (i. e., *lo.giw.hin*).

Further investigation of the language allowed to establish the analysed constraint hierarchy in Yawelmani (Archangeli, 1998, 20): *COMPLEX, FAITHC, PEAK, FAITHV. Thus, FAITHV is the most prone to violations to secure more high-ranking constraints.

In English syllabification the constraint hierarchy is different. The ranking of the four constraints, analysed in Yawelmani, appears to be: FAITHV, FAITHC, PEAK, *COMPLEX (Archangeli, 1998, 23). Thus, *COMPLEX is violated by allowing, e. g., *limp.ness*, a complex coda. This word does not become either *lim.pi.ness* or *lim.ness*, or *lim.p.ness*, which would be violations of FAITHV, FAITHC, PEAK respectively. [2]

M. Hammond (1998, 41) presents a full analysis of the constraint hierarchy in English syllabification. The ranked list of the constraints is as follows: PEAK, LICENSING, SONORITY > FAITHFULNESS > ONSET, NOCODA, *COMPLEX. In this list the meanings of the constraints that appear in addition to the "general tendencies" requirements as formulated by D. Archangeli (1998) are: (1) by LICENSING M. Hammond means the composition of words of syllables (which was pointed out by Hooper, 1972; Kahn, 1976; Ito, 1989 et al). Each word is at least one syllable; (2) SONORITY is a constraint on possible sequences of consonants at the edges of syllables. E. Sievers' (1881), O. Jespersen's (1904) observations led to the Sonority Sequencing Generalisation, which requires a sonority rise or plateau between any member of a syllable and the syllable peak. Thus, in the onset the sonority profile is upward, in the coda – downward.

[2] A separate domain of investigation is constraint violation in different styles of pronunciation. E.g., in rapid familiar style there may appear FAITHC violations.

As it is seen, NOCODA and *COMPLEX are at the bottom of the constraint hierarchy in English, thus the most violable.

The constraint hierarchy in Lithuanian syllabification is not established yet. The aim of the present paper is to analyse the violations of the NOCODA and *COMPLEX CODA constraints in word-final syllables in Lithuanian and to compare them with the respective violations in English. Specifically, the following tasks were set:

1. To carry out the quantitative analysis of NOCODA and *COMPLEX CODA constraints in word-final syllables in Lithuanian and English.
2. To carry out the distributional analysis of *COMPLEX CODA constraints in Lithuanian and English with a view of establishing sonority profile satisfaction.

## METHOD

Word-final syllables were analysed in words in their citation form. The words in two passages of text – in English (Fowles, 1969) and Lithuanian (Avyžius, 1970) – were syllabified.

The English syllabification was done following J.Wells (1998), i.e. according to these rules:

- a syllable boundary is found wherever there is a word boundary, and also coincides with the morphological boundary between elements in a compound;
- affricates cannot be split;
- where the first two restrictions and the phonotactic constraint allow, consonants are syllabified with whichever of the two adjacent vowels is more strongly stressed, or, if they are equally stressed, with the leftward one.

The Lithuanian syllabification was based on the functional syllable theory presented by A. Girdenis (1981).

As the material for analysis 1397 word-final syllables in English and 1397 word-final syllables in Lithuanian were obtained.

The word-final syllables in both the languages were classified into the following types: (1) no coda syllables; (2) simple coda syllables; (3) complex coda syllables.

With a view to establish the sonority profile in complex coda syllables a distributional analysis was done, following Ladefoged's (1996, 222) sonority ranking for English and Blevin's (1996, 211) "working universal sonority scale."

## RESULTS

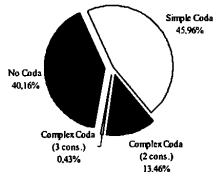
The quantitative analysis of violations of NOCODA and *COMPLEX CODA constraints in English and Lithuanian word-final syllables revealed the following data.

In English (table 1, chart 1) out of 1397 word-final syllables analysed there appeared 561 (40.16%) no coda syllables, 642 (45.96%) simple coda syllables, 194 (13.89%) complex coda syllables. Out of 194 complex coda syllables there were 188 (13.46%) two-consonant coda clusters and 6 (0.43%) three-consonant coda clusters.

Table 1 Coda in English word-final syllables

| The total number of word-final syllables | No Coda | Simple Coda | Complex Coda | |
|---|---|---|---|---|
| 1397 | 561 | 642 | 194 | 188 (2 cons.) |
| 100% | 40.16% | 45.96% | 13.89% | 13.46% |
| | | | | 6 (3 cons.) |
| | | | | 0.43% |

*Chart 1.* Coda in English word-final syllables

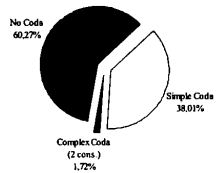



In Lithuanian (table 2, chart 2) out of 1397 word-final syllables analysed there appeared 842 (60.27%) no coda syllables, 531 (38.01%) simple coda syllables, and 24 (1.72%) two-consonant complex coda syllables.

*Table 2.* Coda in Lithuanian word-final syllables

| The total number of word-final syllables | No Coda | Simple Coda | Complex Coda |
|---|---|---|---|
| 1397<br>100% | 842<br>60.27% | 531<br>38.01% | 24 (2 cons.)<br>1.72% |

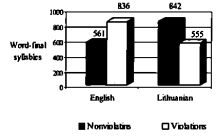
*Chart 2.* Coda in Lithuanian word-final syllables




In total, in English the NOCODA constraint was found to be violated in 836 word-final syllables (59.84%), in Lithuanian – in 555 (39.73%) word-final syllables out of 1397. This is shown in chart 3.

The second task of the present investigation was the analysis of the sonority profiles of the complex codas in English and Lithuanian. A complex coda, i.e. consonant clusters, appeared in 194 word-final syllables in English; it constitutes 23.09% of all NOCODA constraint violations in English (836 in total).

*Chart 3.* Violations of NOCODA constraint in word-final syllable in English and Lithuanian




In Lithuanian out of 555 NOCODA constraint violations complex codas appeared in 24 cases (4.32%).

Furthermore, in Lithuanian there were only two-consonant clusters, whereas in English out of 194 complex codas there were 188 two-consonant clusters and 6 three-consonant clusters.

The two-consonant clusters in Lithuanian (24 cases in total) were as follows:

- ms – 10 cases (41.67 % of all two-consonant coda clusters);
- ks, nt, rs – 3 cases each (12.50 % each of all two-consonant coda clusters);
- nk, ns, rp, rš, ts – 1 case each (4.17 % each of all two-consonant coda clusters).

The two consonant clusters in English vary greatly. Out of 188 two-consonant clusters there were:

- nd – 49 cases (26.06 % of all two-consonant coda clusters);
- st – 22 cases (11.70 % of all two-consonant coda clusters);
- nt, ld – 12 cases each (6.38 % each of all two-consonant coda clusters);
- lz – 11 cases (5.85 % of all two-consonant coda .clusters);
- nz – 9 cases (4.79 % of all two-consonant coda clusters);
- kt, lf – 7 cases each (3.72 % each of all two-consonant coda clusters);
- vd – 6 cases (3.19 % of all two-consonant coda clusters);

- ts, dz – 5 cases each (2.66 % each of all two-consonant coda clusters);
- pt, ps – 4 cases each (2.13 % each of all two-consonant coda clusters);
- zd, md, ntʃ, ns, ŋk, ls - 3 cases each (1.60 % each of all two-consonant coda clusters);
- dʒd, ft, vz, ŋd, ŋz – 2 cases each (1.06 % each of all two-consonant coda clusters);
- ks, gd, ðd, sk, ʃt, mz, lt – 1 case each (0.53 % each of all two-consonant coda clusters).

The three consonant coda clusters (6) in English appeared to be:

- nts – 3 cases (50% of all three-consonant coda clusters);
- nst, znt, ndʒd – 1 case each (16.67 % each of all three-consonant coda clusters).

In Lithuanian there appeared 4 (16.67 %) cases of the sonority profile violations in the 24 complex coda cases, i.e. three cases of -ks cluster (*koks, kažkoks, neatsitiks*), and one case of -ts cluster (*pats*).

In English there were 11 cases (5.85 %) of sonority profile violations in 188 two-consonant coda clusters. These were: -ts (*its, its, waits, that's, its*); -dz (*upwards, towards, towards, towards, periods*); -ks (*backs*).

The sonority profile violations in three-consonant coda clusters appeared in 4 cases out of 6 in English, namely: three cases in –nts (*arguments, lieutenants, lieutenants*), and one case in –znt (*isn't*).

Thus, though there are fewer *COMPLEX CODA violations in Lithuanian in general, these violations show a rather high percentage of sonority profile violations (16.67 %). In English there are by far more *COMPLEX CODA violations, but they are at the same time sonority profile violations only in 5.85 % of cases in two-consonant codas. In three-consonant codas sonority profile violations in English seem to be numerous. A greater amount of data is necessary to draw conclusions.

The sonority profile violations seem to involve extraprosodic elements at the edge of the syllabification domain (Clements, 1990). [3]

The fact that the sonority profile is sometimes violated in languages shows that the sonority constraint is one of the constraints, though, as has been proposed by A. Prince and P. Smolensky (cited from Archangeli, 1998, 29), this one is an inherently ranked constraint. J. Blevins (1996, 211) asks a question whether " the Sonority Sequencing Generalization is an absolute condition on representations, or simply a preference condition expressing universal markedness values?" As there appear a fair number of the exceptions to the Sonority Sequencing Generalization, J. Blevins (1996) points out that many researchers adopt it as a preference condition, a determinant of syllable markedness, or as a constraint, which can be violated by language-particular rules and/or constraints.

## CONCLUSIONS

Answering the tasks-questions formulated, the following conclusions can be drawn about the word-final coda in English and Lithuanian:

1. The English language exhibits considerably more cases of NOCODA violations in word-final syllable than the Lithuanian language. Also, there are notably more cases of *COMPLEX CODA violations in English than in Lithuanian. Thus, the English language is more marked in this respect, and the Lithuanian language expresses a stronger universal tendency.

[3] Most probably these elements appear for functional or stylistic reasons – a separate issue of investigation, being done at present.

2. The violations of NOCODA constraint in English appear due to the low ranking of this constraint in the English language. The hierarchy of constraints in syllable formation in Lithuanian is not established; the present investigation is a contribution towards this end. Conclusion 1 leads to an assumption that NOCODA and *COMPLEX CODA constraints might be higher in Lithuanian syllable formation constraint hierarchy.

3. The sonority profile in complex codas is violated to a certain degree in both the languages. The preliminary results show that violations in two-consonant coda clusters are more frequent in Lithuanian. In three-consonant coda clusters in English (there are no three-consonant coda clusters in Lithuanian) the sonority profile seems to be violated to a greater degree. It remains to establish language-particular rules and/or constraints causing the Sonority Sequencing Generalization violations.

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## KODOS NEBUVIMO SUVARŽYMO (ANGL. NOCODA CONSTRAINT) PAŽEIDIMAI PASKUTINIAME ŽODŽIO SKIEMENYJE (ANGLŲ IR LIETUVIŲ KALBŲ ANALIZĖ)


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Santrauka

Tirta koda paskutiniame anglų ir lietuvių kalbų skiemenyje Optimalumo Teorijos plotmėje (1397 lietuvių kalbos žodžių paskutiniai skiemenys ir tiek pat anglų kalbos žodžių paskutinių skiemenų). Nustatyta, kad lietuvių kalba pažeidžia universalų kodos nebuvimo principą daug mažiau nei anglų kalba. Šia prasme lietuvių kalba yra mažiau žymėta. Tai rodo, kad kodos nebuvimo ir kompleksinės kodos universalūs suvaržymai gali pasirodyti beesą aukštesnėje suvaržymų hierarchijos pozicijoje lietuvių kalboje nei anglų kalboje, kurioje šis suvaržymas užima žemiausią poziciją. Minėta hierarchija lietuvių kalboje nėra nustatyta, todėl šis gretinamasis tyrimas yra indėlis į jos sudarymą.



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