

LENGTH IN METRICAL PHONOLOGY

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ABSTRACT

2001

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1. Rationale

Metrical phonology, the study of stress systems, began to emerge as a separate branch of phonology about 25 years ago, and has, over the years, contributed to our knowledge of linguistic systems with the discovery of many universal and language-specific regularities. But, as in many other areas, there is no unanimous agreement between linguists even on some of the most basic theoretical assumptions and the ways in which the workings of metrical phonology are to be described and modelled.

English and **Hungarian** present particular challenges to the metrical phonologist.

- The **stress system of English** abounds in obvious regularities, yet once a generalisation is made, puzzling exceptions begin to emerge. The problem with these is not their pure existence but that they tend to form groups that follow different regularities and tempt the linguist to make newer and newer sub-generalisations. This can lead to unrealistically complex systems, and we often see more problems created than solved.
- Highly controversial views have been published concerning the (word-internal) **stress system of Hungarian**. Some deny the existence of word-internal stresses completely, others have argued for a quantity-insensitive analysis (stress mechanically on every second syllable after the first one), and a third group of linguists have proposed a partially quantity-sensitive stress system for Hungarian.

This work wishes to achieve two major goals:

- to present and compare methods and theories of metrical analysis through the existing analyses of English
- to propose a novel, fully quantity-sensitive, optimality-based theory of Hungarian word-internal stress

2. Research Questions

The dissertation aims at providing answers to the following:

Questions concerning metrical stress theory & theories of English word stress:

- Can segment lengthening and shortening phenomena be related to metrical structure?
- Which theoretical framework is best able to account for facts of metrical phonology?
- Which is the least problematic account of English word stress?
- What are the shortcomings of the three most recent (and most advanced) theories of English word stress (Burzio 1994, Halle 1998, Hammond 1999)?

Questions concerning Hungarian:

- Are there word-internal stresses in Hungarian?
- Is Hungarian quantity-sensitive?
- What types of segmental phenomena may be related to, and thereby be used for identifying, the metrical structure of words?
- What types of regularities determine the metrical structure of words? What is the system?

3. A Brief Overview of the Dissertation

The dissertation examines in detail metrically conditioned segmental phenomena, especially those affecting the length of segments (vowel and consonant lengthening and shortening) in English and in Hungarian. Because of the rather dissimilar nature of the metrical system of the two languages, the dissertation is, inevitably, a “two in one” study of two fundamentally different stress systems: of English stress (Chapter 3) and of Hungarian stress (Chapter 4). The paper focuses on word-internal (secondary) stresses, and claims, contrary to some views, that such stresses exist in Hungarian, that they affect the realisation of segments, and that they can be analysed in a systematic (OT-based) framework.

It is a far more straightforward matter to deal with word-internal stresses in English than in Hungarian: these stresses in English manifest themselves in clear-cut phonological ways and can easily be located by native speakers. Word-internal stresses in Hungarian, on the other hand, produce only very slight, though arguably identifiable, phonetic differences in the realisation of segments, though their location, and sometimes their very existence, is debated in the literature.

The difference between the two major parts of the dissertation lies not only in the languages examined, but also in their **focus**.

- Chapter 3, describing and comparing various descriptions and analyses of the English stress system, focuses on the **theoretical aspects** of dealing with metrical systems in general, and tries to highlight the merits and shortcomings of different approaches in a critical overview of the literature of English stress in the last three decades, with special emphasis on the latest attempts¹.
- Chapter 4, the analysis of Hungarian word-internal stress, on the other hand, focuses on the **evidence** available for the existence and location of these stresses, and on developing a **constraint system** that can identify them. The evidence

¹ especially Burzio 1994, Halle 1998 and Hammond 1999

offered in Chapter 4 comes from three sources: universal considerations², the assumptions and findings that appear in works of Hungarian linguists³, and the author's own (admittedly subjective) intuitive observations and hypotheses.

The results of the research are, like all other aspects of the dissertation, different in the two major parts (Chapter 3 and Chapter 4).

- The examination of English metrical theories leads to the conclusion that constraint-based accounts (like that of Burzio 1994) are better able to grasp the exception-ridden world of English word stress than rule-based ones. Rule-based accounts, as is clearly shown in the paper, produce a greater amount of lexical exceptions, and are less able to make well-motivated generalisations – this is shown to be true of even the latest such attempt, i.e. that of Halle 1998.
- The main claim underlying the analysis of Hungarian, on the other hand, is that Hungarian is quantity-sensitive, i.e. that its metrical system is based on syllable weight. This is shown by diverse phenomena, and is supported by the views of many Hungarian linguists. This claim and other evidence is then used for the construction of a constraint system that identifies word-internal stresses on a quantity-sensitive basis.

² Hayes 1995

³ Ács-Siptár 1994, Arany 1898, Balassa 1980, Siptár, Hall 1938, 1944, Hammond 1987, Hayes 1995, Kálmán 1989, Kálmán-Nádasdy 1994, Kerek 1971, Lotz 1939, Nádasdy-Siptár 1989, 1994, Siptár 1989, 1994, 1995, Siptár-Törkenczy 2000, Sovijärvi 1956, Szende 1976b, 1992, 1994, Szinnyei 1912, Törkenczy 1994, Vago 1992, Varga 1998, 1999

4. Theoretical Background

Chapters 2 and 3 of the dissertation present the evolution of theories of metrical phonology – especially that of English – and serve as the theoretical background to Chapter 4, which is an analysis of Hungarian. **Constraint-based theories** are argued to be the most suitable frameworks for analysing the metrical structure of both English and Hungarian, and the system proposed for Hungarian is based on **Optimality Theory**, the most well-known constraint-based theory (Prince & Smolensky (1993)). This theory, however, only appeared after decades of experiments with rule-based systems, and some (most notably Halle 1998) still believe those to be “superior” theories. The most influential **rule-based theories** of English stress are those of Chomsky & Halle (1968), Liberman & Prince (1977), Selkirk (1984), Halle & Vergnaud (1987) and Halle (1998). The two most thorough constraint-based analyses of English word stress are those by Burzio (1994) and Hammond (1999).

The main difference between rule-based and constraint-based theories is that while rule-based theories generate surface forms from their underlying representations through sequences of ordered rules of the type “*A* becomes *B* in environment *C*”, constraint-based theories generate all theoretically possible surface forms, and select the least undesirable (i.e. existing) forms from them through a filter of ranked constraints. The universality of rule-based theories lies in finding rules or types of rules that work in the same way/order in as many languages as possible, and the universality of constraint-based theories lies in finding constraints that are present/ranked in the same way in as many languages as possible.

The various theories worked with different models of stress and “objects” related to stress that the rules/constraints were argued to manipulate.

- The stress rules of Chomsky & Halle (1968) attach **numerical values** to degrees of stresses; Liberman & Prince (1977), marking the beginning of metrical phonology as a separate branch of phonology, operate with the **metrical tree** and the **metrical grid**, of which the latter, especially due to Prince (1983), survives and is developed further in later rule-based theories. Initially, the metrical grid was a sequence of

columns of grid-marks (x-es or asterisks), each grid column (i.e. the number of asterisks on top of each other) symbolising the different degrees of stress; later this model was enriched by the incorporation into the grid of pairs of parentheses, indicating stress feet (Halle & Vergnaud 1987), and it was argued that different rules apply at different “levels” (layers of grid marks). These were later modified by Halle & Idsardi (1995), who used single “unmatched” parentheses.

- Constraint-based theories work without the grid, but they still use stress marks (primary and secondary), **stress feet**, and they often refer to **abstract segments** (systematically inserted imaginary segments) in the representation.

As for the theoretical background of the representation of length & weight, **moraic theory** is invoked (as in Hayes 1989, Harris 1994, Hammond 1999).

In connection with Hungarian, Hayes’ (1995) universal metrical typology of languages is also referred to.

5. A Detailed Summary of the Chapters

After the **Introduction**, in **Chapter 2** briefly shows and compares different ways of **representing segment length**, from Chomsky & Halle’s (1968) [\pm long] feature to moraic theory (Hayes 1989, Harris 1994). Hammond’s (1999) latest moraic analysis of English syllable structure is discussed in detail in a separate section, and several, practical as well as theoretical problems are presented. This section ends with the conclusion that Hammond’s use of moras to account for co-occurrence restrictions in syllable rhymes raises serious questions about the nature and, indeed, the very definition of moras. As moraic theory is not a central issue in the dissertation, it is not discussed in any more detail.

Chapter 3 presents and compares **theories of the metrical structure of English** in great detail, with an emphasis on metrically conditioned vowel lengthening and shortening phenomena (in the hope that the same could later be legitimately used as evidence for the metrical structure of Hungarian in Chapter 4). This Chapter follows the chronology of the accounts of English word stress and has multiple aims:

- to present the evolution of metrical phonology from the pre-metrical analysis of English stress by Chomsky & Halle (1968) to the latest OT-based account (Hammond 1999);
- to highlight theoretical problem areas in each approach; and
- to provide a theoretical background to the analysis of the metrical structure of Hungarian in Chapter 4.

The greatest attention is devoted to the three most recent theories, which all declare themselves to be “superior” to previous analyses.

In the sub-sections first Chomsky & Halle’s (1968) pre-metrical description of English stress is discussed, with a focus on obvious problems and later criticisms by others (Prince 1983, Selkirk 1984). Then Liberman & Prince’s (1977) ground-breaking w/s tree theory is presented, where segmental phenomena conditioned by an independent metrical structure, following its own rules, appear for the first time. The next sub-section presents Prince’s (1983) novel idea, the independent metrical grid, which is a standard representational device of syllable prominence to the present day. After this, Selkirk’s (1984) analysis of English using Prince’s metrical grid is described. In the next section Halle & Vergnaud’s (1987) complex grid- and constituency-based metrical rule system is presented and criticised for leaving not only a great number of lexical exceptions, but also for requiring too many different types of lexical marking.

These are followed by three longer, more detailed and more critical presentations: those of the three most recent major theories of English word stress.

The first one of these is the latest rule-based account by Halle (1998), whose representational novelty is the use of unmatched parentheses in metrical grids as proposed in Halle & Idsardi (1995). In the criticism presented, theory-internal inconsistencies and ambiguous analyses are

shown, and certain words (e.g. *horizontal* with its shortened second vowel) are argued to be underivable with the rules provided by Halle.

This is followed by the presentation of the first constraint-based theory of English word stress: Burzio's 1994 highly radical "Principles of English word stress". Burzio's system breaks away from the metrical grid and the concepts produced along with it (stress deletion, conflation, etc.), and operates with foot templates, abstract segments, and a somewhat different interpretation of the lexical nature of English word stress. The weaknesses of this theory are also shown (the dangers that lie in the possibility of too many alternative analyses).

The presentation of theories ends with the first OT-based theory of English word stress, that of Hammond (1999). This theory, although its merits are admitted, is heavily criticised for its ad hoc solutions in the treatment of word stress and for its unprincipled use of lexical exceptions.

Chapter 4 discusses the highly controversial issue of Hungarian word-internal stress. It consists of two parts: **Section 4.1.** "Arguments against quantity insensitivity" thoroughly examines and compares the views concerning Hungarian word-internal stress and presents six surface-phonological phenomena that are hypothesised to be related to metrical structure. All of these phenomena are claimed to display quantity-sensitive effects, and to be sensitive to the word's utterance-final or utterance-medial position. **Section 4.2.** develops a coherent constraint system that can locate word-internal stresses in full accordance with the evidence suggested in 4.1. The system consists of eight ranked constraints that are capable of breaking words up into di- or trisyllabic feet on a quantity-sensitive basis. This Section ends with some statistics concerning the actual length of words and with the comparison of the outcomes of the present work with those of earlier studies.

Sub-Section 4.1.1. explores the concept of quantity-sensitivity, and suggests that Hayes' (1995) categorisation of Hungarian as a quantity-insensitive language may be wrong. 4.1.2. presents the various, and often contradictory, views concerning the possible existence of secondary stresses (and stress feet) in Hungarian words. Many authors are cited who have suggested this in different ways: some (Balassa 1980, Kerek, 1971, Hall 1938, 1944 and others) have argued for a

quantity-insensitive, mechanical solution, while others (Szinnyei 1912 and Lotz 1939) have suggested a partially quantity-insensitive solution, where in certain cases a light third syllable allows for a trisyllabic word-initial foot. The conclusion of 4.1.2. is that there is no agreement on the whereabouts of Hungarian word-internal stresses.

4.1.3. attempts a partly literature-based, partly intuitive investigation of facts of Hungarian phonology in search of segmental traces of metrical structure. The evidence is found in surface phonological phenomena. The difficulty of proving facts in surface phonology is, where possible, compensated by observations of other linguists. To make it easier to deal with the elusive, speed- and sometimes dialect-dependent phenomena, theoretical abstract speeds are suggested with a focus on intuitively impossible rather than possible forms. Six, presumably stress-related, phenomena are discussed in this section:

- intervocalic degemination ($VC^{\square}V \rightarrow VCV$)
- intervocalic consonant lenition (weakening or deletion) (e.g. $e[d^y]etem \rightarrow e[j]etem$ “UNIVERSITY”),
- the deletion of segment groups (e.g. $szoc[\mathcal{H}\bullet\bullet\mathcal{H}]zmus \rightarrow szoc[\star]zmus$ “SOCIALISM”),
- the length of *í* in words ending in *ít* before vowel-initial suffixes (e.g. $seg[i^{\square}] \rightarrow seg[i]tőkész$ “HELP, HELPFUL”),
- the length of word-final *ú*, *ű* under affixation (e.g. $egyszer[y^{\square}] \rightarrow egyszer[y]ség$ “SIMPLE, SIMPLICITY”)
- pre-*r* vowel lengthening in syllables closed by *r* (e.g. $csüt[ɸ^{\square}]rtök \rightarrow csüt[ɸ]rtök$ “THURSDAY”)

These phenomena are often examined in interplay with each other, sometimes showing interdependence, e.g. in *frissítő* “REFRESHING” it is argued that the degemination of [●] is contingent on *ít* shortening: $*fri[\bullet][i^{\square}]tő$ would not occur.

4.1.4. provides an additional argument for quantity-sensitivity: the rhythmic alternation in folk songs with “adaptable rhythm”.

4.2. begins with a summary (4.2.1.) of the principles that will be followed in constructing a complex theory of Hungarian word stress, which is able to produce forms that satisfy the suggested environmental conditions of the phenomena in 4.1. In 4.2.2. and 4.2.3. the constraints themselves are formulated and supported by further arguments and data (see list of constraints in 6. below). Hungarian is argued to require a constraint demanding stress on word-initial syllables (INISTRESS), one banning adjacent stresses (NOCLASH), one on the size and weight of feet (FTMAX), one requiring stress on heavy

syllables beyond the first foot (HPROM), two constraints regulating the stress on the last two syllables of utterance-final syllables on a quantity-sensitive basis (ENDMAIN, ENDSUB), and two low-ranked constraints maximising foot length from left to right (INIFT, INTFT). It is claimed that the eight constraints are capable of producing the internal stress pattern of any Hungarian word.

The statistics in 4.2.6. compare the predictions of this analysis with those of quantity-insensitive (mechanical) stress assignment, and the output of this system is found to predict the same results in over 90% of occurring words, nevertheless, the differences are essential.

Chapter 4 is supported by an **Appendix** and some **Illustration**. The Appendix is a series of computer-generated OT tableaux showing the output of the eight constraints for all Hungarian words of up to 7 syllables, both in utterance-final and non-utterance-final positions. The Illustration is a CD-ROM with recordings illustrating some of the segmental phenomena discussed in 4.1. – also available on paper & tape.

6. Results: Answers to Research Questions

Questions concerning metrical stress theory & theories of English word stress:

- Can segment lengthening and shortening phenomena be related to metrical structure?

Segment lengthening and shortening may, in certain cases, affect syllable weight, which, in a quantity-sensitive metrical system, will affect the metrical structure. Once a quantity-sensitive system is suggested, there is a suspicion that some of the lengthening and shortening phenomena influence or are influenced by the metrical structure.

- Which theoretical framework is best able to account for facts of metrical phonology?

The dissertation argues that a constraint-based framework is a better device than rule-based theories.

- Which is the least problematic account of English word stress?

That of Burzio 1994: it can treat not only “regular” words but many words that require highly exceptional treatment in other accounts. Moreover, this account can handle words that have (dialectally or freely) variable stress naturally and insightfully.

- What are the drawbacks of the three most recent (and most advanced) theories of English word stress?

Halle 1998: theory-internal inconsistencies, some ambiguous analyses and underivable words;

Burzio 1994: multiple analyses possible for the same word;

Hammond 1999: ad hoc solutions (for more detail see 5. above)

Questions concerning Hungarian:

- Are there word-internal stresses in Hungarian?

Yes, as many authors have suggested.

- Is Hungarian quantity-sensitive?

Yes, quantity-sensitive phenomena indicate.

- What types of segmental phenomena may be related to, and thereby be used for identifying, the metrical structure of words?

Any type of surface strengthening or weakening: degemination, consonant lenition, vowel shortening or lengthening – and their absence.

- What types of regularities determine the metrical structure of words? What is the system behind it?

This dissertation claims that eight constraints are responsible for the metrical surface structure of Hungarian: **INISTRESS**, **NOCLASH** >> **FTMAX** >> **HPROM** >> **ENDMAIN** >> **ENDSUB** >> **INIFT** >> **INTFT**

In detail:

INISTRESS

The first syllable of words is stressed.

NOCLASH

Adjacent stresses are not allowed.

FTMAX

Feet consist of maximum 3 syllables and 4 moras.

HPROM

Heavy syllables after the word-initial foot are stressed.

ENDMAIN

In utterance-final position, after the first foot, the penultimate syllable is stressed if it is heavy, otherwise the last syllable is stressed.

ENDSUB

The last syllable of utterance-final words is stressed.

INIFT

Affiliate as many syllables to the leftmost foot as possible.

INTFT

In the case of two adjacent feet affiliate as many syllables to the left-hand foot as possible.

7. The Author's Relevant Publications

(in chronological order)

A) Articles

Gráf, Z. B. (1997): *Some Issues of Segment Length and Syllable Weight*, in: *The Even Yearbook 1998*, Budapest, ELTE, pp. 25-42

Gráf, Z. B. (1998): *The Outline of a Hungarian Foot Theory*, unpublished manuscript, Budapest, ELTE

B) Presentations related to the dissertation (handouts)

Odwos és Hanako (Odwos and Hanako), a presentation at the Szeged conference of Ph.D. students on 20/11/1998

Footprints in Hungarian, a presentation at the Budapest Phonology Circle on 17/11/1999

A mora mámara (Intoxicated by the mora), a presentation at the Szeged conference of Ph.D. students on 25/01/2001

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