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Word-stress and the distribution of consonant clusters in English

Abstract

Empty categories have been around in linguistics for a long time already. In particular, Strict CV-Phonology promotes a strictly alternating CV skeleton where members of a traditional consonant cluster enclose an empty vocalic position, while the two consecutive vocalic positions of a long vowel or a diphthong flank an empty consonantal position. Although the concept of empty skeletal positions might seem strange at first blush, its importance can be likened to the importance of the concept of zero in mathematics. This also means that traditional consonant clusters are just surface manifestations of underlying CVCV sequences.

The aim of this paper is to seek a principled account for the distribution of different types of vocalic positions and consonant clusters by promoting the algorithm put forward in Csides (2008). It seems that this algorithm treats the distribution of different types of consonant clusters and the distribution of stressed versus unstressed vocalic positions in a unified manner.

In order to be able to grasp the parallel between stress-related issues and the distribution of different types of consonant clusters, we must part with some of the basic tenets of standard Government Phonology and Strict CV. Contrary to mainstream assumptions, I wish to maintain bidirectional government in Phonology, cf. Csides (2008). It is important to emphasize that unidirectional theories have been promoted mainly in the phonological literature. Scheer (2004), Szigetvári (1999) and many others assume that government in phonology is strictly right-to-left, an idea that probably originates in the concepts of Proper Government (PG) of standard GP. Rowicka (1999), however, assumes that government proceeds in the opposite direction, i.e., it is left-to-right. Csides (2008) resolves this conflict by proposing that government goes in both directions but in a principled manner. Another novel, non-mainstream proposal of Csides (2008) is also maintained in the present framework, namely that government can target empty and contentful skeletal positions alike.

Keywords: government, CV-Phonology, stress, consonant clusters, the minimal-word constraint

1 Basic concepts and theoretical background

CV-Phonology, originates in Government Phonology (GP), promoted originally by Kaye, Lowenstamm & Vergnaud (1985, 1990), Kaye (1990), Charette (1990, 1991), Harris (1990). GP was applied to a massive number of languages in various books, articles, presentations by – among others – Harris (1992, 1994, 1997), Gussmann & Harris (1998), Törkenczy (1992), Cyran (1997), Gussmann (2002). For different versions of Strict CV-Phonology cf., Lowenstamm (1996), Rowicka (1999), Dienes & Szigetvári (1999), Szigetvári (1999), Dienes (2000, Csides (2000, 2001, 2002, 2004a, 2004b, 2008), Ségéral & Scheer (1999), Scheer (1998a, 1998b, 2004).

In Strict CV-Phonology onset-nucleus sequences are referred to as CV sequences. Consider the representation of heavy and light syllables in Strict CV-Phonology.

| (1) н | EAVY AND LIGHT SYLI | ABLES IN CV | | | | | | | | | | | |
|--------|---------------------|-------------|-------------------|---|---|--|------|------|-------------------|---|--|--|--|
| a. lig | ht syllable | b. hea | b. heavy syllable | | | | | | c. heavy syllable | | | | |
| | | type I | 1 | | | | type | e II | | | | | |
| С | V | С | V | С | V | | С | V | С | V | | | |
| | | | | | | | | | | | | | |
| α | β | α | β | | γ | | α | β | γ | | | | |

It appears from the representations above that a traditional light syllable consists of one whereas a traditional heavy syllable consists of two CV sequences. A strictly alternating CV skeleton also allows for some interesting generalisations in connection with English stress assignment. Consider the representations in (2) below.

| (2) | STR | ESS A | SSIG | NME | NT IN | ENG | LISH | | | | | | | | | |
|-----|-----|-------|------|-----|-------|-----|------|--|----|---|---|---|---|---|---|---|
| a. | | | | | | | | | b. | | | | | | | |
| С | V | С | V | С | V | С | V | | С | V | С | V | С | V | С | V |
| | | | | | | | | | | | | | | | | |
| | A | m | e | r | i | c | a | | | a | g | e | n | | d | a |
| c. | | | | | | | | | | | | | | | | |
| С | V | С | V | С | V | С | V | | | | | | | | | |
| | | | L | | _ | | | | | | | | | | | |
| | a | r | e | | | n | а | | | | | | | | | |
| | | | | | | | | | | | | | | | | |

In non-strict CV frameworks, the location of stress could be expressed only by a disjunctive statement, here the same facts can be captured by a non-disjunctive generalisation since stress appears to fall on the antepenultimate vocalic position in each case.

Furthermore, the minimal-word constraint that could earlier be captured only by a disjunction² becomes easy to express in strict CV if left-to-right government is recognized and if contentful vocalic position can also be targeted by government. This observation is intimately connected to stress since all English content words must have a stressed vowel. Consider now how the minimal-word constraint can be captured by left-to-right V-to-V government, where the target of government can be an empty or a contentful vocalic position alike. I will henceforth indicate empty skeletal positions with lowercase letters.

¹ This representation is correct only if the 'syllable' is occupied by a diphthong. In the case of long vowels β should be linked to both vocalic positions as in the representation of the long /i:/ in *arena* in (2c). I have omitted the representation of a heavy 'syllable' containing a long vowel in order to save space.

² Notice that the notion of 'heavy rhyme' could also be captured only by a disjunction in frameworks recognizing branching constituents, viz., in a heavy rhyme either the nucleus or the rhyme node must branch.



It appears from the representations in (3) above that there must be at least one governing relation erected in a minimal English word. This seems to be the simplest, most straightforward formulation of the minimal-word constraint in English.

It is also worthy of note that further, very important generalizations may be captured in bidirectional strict CV-Phonology that are lost in other theoretical frameworks. For example, branching constituents are easily reinterpreted as non-branching consonantal and vocalic positions with structural relations between them and a straightforward structural similarity can be detected between long vowels and diphthongs on the one hand and binary trochaic feet on the other. Consider the representations in (4) below, originally proposed by Csides (2008).

(4) LONG VOWELS, DIPHTHONGS AND BINARY TROCHAIC FEET 3



By examining the representations in (4) above, we can draw the conclusion that long vowels, diphthongs and binary trochaic feet receive a uniform representation involving syntagmatic relations referred to by the term *government*. This term was defined somewhat loosely and

³ The arrows indicate the direction and the target of government. The broken line illustrates that government flows in both directions along that section, a convention introduced by Harris (1994). That is, in all the three representations of (4) the second vocalic position governs and is being governed simultaneously. This phenomenon will recur throughout the paper, and the vowel to consonant interactions of (4) will be referred to as licensed government.

metaphorically in standard GP.⁴ But Ségéral & Scheer (1999: 20) managed to capture the basic essence of government as given in (5) below.

(5) THE INTERPRETATION OF GOVERNMENT

Proper Government inhibits segmental expression of its target.

According to this proposal, government is a destructive force inhibiting the phonetic interpretation of melody specified in its target position. Szigetvári (1999: 56) argues that the interpretations in (6) should be attributed to vocalicness vs. consonantalness.

(6) INTERPRETATION OF CONSONANTALNESS AND VOCALICNESS

Vocalicness is loud: V slots of the skeleton aim at being pronounced. Consonantalness is mute: if nothing intervenes a C position will remain silent.

Szigetvári (1999) also introduces a new definition of government roughly as follows:

(7) DEFINITION OF GOVERNMENT

Government spoils the inherent properties of its target. A governed C position loses its inherent muteness, it loses its stricture properties and becomes louder, that is more vowellike, more sonorous, it undergoes vocalic lenition, whilst a governed V position loses its inherent loudness and becomes silent.

2 Structural relations in CV-phonology

In Csides (2008) I propose that stressed vocalic positions are just as good governors as their unstressed relatives, inasmuch as they exert their governing potential on other vocalic positions in the first place. These other vocalic positions will then be identified as unstressed contentful vocalic positions to their right within the stress-domain, call it the *foot*. Notice that this move is entirely in line with the interpretation of government proposed by Ségéral & Scheer (1999) and D&S (1999). Government spoils the inherent properties of its target. Within the foot then left-to-right government by a stressed vocalic position will relatively cripple the inherent loudness of its unstressed peer(s). This type of government will be referred to as *METRICAL GOVERNMENT*.

(8) METRICAL GOVERNMENT

A governing relation established between two contentful vocalic positions is metrical government. Metrical government has phonetic effects similar to proper government.

In Csides (2008) I propose that contrary to mainstream assumptions, government in phonology is bidirectional.

⁴ Harris (1994) proposed that government is a stricter form of licensing, since it is always accompanied by phonotactic dependencies. Licensing is not discussed in this paper because it has no bearing on the argumentation. The details can be found in Harris (1994).

(9) BIDIRECTIONALITY OF GOVERNMENT IN PHONOLOGY

Government in phonology is bidirectional.

In Csides (2008) I also proposed an algorithm concerning the governing function of stressed vs. unstressed vocalic positions as (10) below.

(10) THE GOVERNING FUNCTION OF STRESSED VS. UNSTRESSED VOWELS

- a. Stressed vocalic positions govern primarily left-to-right: they govern their nonempty peers within trochaic feet silencing them relatively (reduction). They can also exert their primary left-to-right governing potential on a neighbouring empty vocalic position only if there is no available contentful vocalic position in this direction.
- b. Unstressed vocalic positions govern in both directions by virtue of being licensed to govern by their stressed governors. Their primary function is to govern their farthest contentful vocalic peer (reduction) within the foot in an alternating direction until all contentful vocalic positions are integrated into the metrical hierarchy. After all contentful vocalic positions have been governed, unstressed contentful vocalic positions (syncope). Only after all vocalic positions have been taken care of can they govern contentful (non-empty) consonantal positions (foot-internal intervocalic lenition), and empty consonantal positions inside a long vowel or a diphthong by default.
- c. Ungoverned empty consonantal positions remain silent, ungoverned empty vocalic positions remain loud unless situated in a closed domain (a coda-onset cluster in terms of GP).

There is a generalisation that can be drawn from (10) which we formulate as (11) below.

(11) PRIMARY DOMAIN OF GOVERNMENT

The domain of government directly affecting melodic complexity is the foot.

3 Metrical government and English word-stress

One of the most problematic issues of English phonology is word-stress. The reason for this is that English words may host several stresses whose distribution is usually calculated in relation to the (most strongly stressed/accented) syllable/vowel of the word. Furthermore, in order to be able to predict the location of primary word-stress we need at least three different types of information: syntactic, morphological and phonological. In other words, we need to know the *word-class/part of speech* (syntactic), also if the word is *simple* or *prefixed or suffixed* (morphological), and finally we need to know the nature of the last two syllables (phonological). I fully agree with Scheer & Szigetvári (2005: 37) that "there is no need to split the representations into two worlds: one syllabic and another in which word stress is calculated. Furthermore, they remain "agnostic" on the issue if additional structure is necessary in order to account for prosodic processes other than word-stress. I tentatively suggest that there is no need for such an additional structure and phrasal and sentential prosody may also be accounted for

in a unitary way. This issue, however, will not be investigated in the present paper and I will limit my discussion to what is traditionally called the basic stress rule for verbs in order to keep the scope of the paper within manageable limits. My primary aim is to demonstrate how the machinery of metrical government in strict CV-Phonology can treat basic stress phenomena in English. A detailed discussion of English word-stress would take us far beyond the scope of the present paper.

3.1 The basic stress rule for verbs

Once we have identified the lexical category of the word, the basic stress rule takes phonological properties of the word into consideration when assigning stress.

| deléte | persíst |
|----------|---------|
| regáin | defénd |
| denóunce | evólve |
| belíeve | preténd |
| enjóy | eléct |
| refráin | eréct |
| deláy | repént |

(12) Disyllabic verbs with heavy ults

Translated into traditional syllable-based frameworks: disyllabic English verbs having a heavy ult⁵ are stressed on the ult.

According to our strict-CV analysis, the verbs in (12) above are stressed according to the requirement of a *minimal foot*. A minimal foot is a binary governing relationship incorporating either two contentful vocalic positions or at least one contentful vocalic position and a closed domain. A closed domain is either a long vowel, a diphthong or a traditional coda-onset cluster.



According to the analysis in (13), we start scanning the CV skeleton from the right edge. When a minimal binary trochaic CV foot becomes available it is immediately erected. The initial unstressed vowels are incorporated into the metrical hierarchy by what we term *default* government, indicated by the dotted lines ending in an arrow above.

⁵ Traditionally, a heavy ult consist of a long vowel or a short vowel followed by at least two consonants.

(14) Verbs longer than two syllables with a heavy ult

| délegate | ímplement | | | | |
|-------------|------------|--|--|--|--|
| sátisfy | súpplement | | | | |
| ínstitute | cómplement | | | | |
| perámbulate | cátapult | | | | |

It appears from (14) above, that verbs having at least three syllables and a heavy ult - in traditional syllable-based frameworks - are stressed on the antepenult, i.e., on the third syllable from the right edge of the word. Interestingly, 'the final syllables' of (14) are referred to as strong unstressed - in traditional syllable-based terms, cf. e.g. Nádasdy (2006).

Since we have a 'heavy ult' in all the items of (14), a governing relation can be established over what we call the 'ultimate syllable' in traditional syllable-based frameworks, like in the examples in (13) above. However, in (14) another well-formed binary trochaic foot can be erected towards the beginning of the word.



The stressing of verbs having a 'heavy ult' thus depends on the number of 'syllables' the verb consists of. The initial syllable will be accented, so super-feet are also left-headed. This approach entails that contrary to traditional assumptions, we advocate the view that the verbs in (14) above have two stresses and the location of the leftmost stress will be the location of accent.

Let us now see the stressing of verbs having a light ult, i.e., a light final rhyme.⁶

(16) Verbs with a light ult

| vómit |
|----------|
| astónish |
| elícit |
| cóvet |
| réckon |
| rável |

It appears from table (16) that verbs having a final 'light rhyme' are stressed on the penult regardless of whether they consist of two or more syllables.

⁶ Recall that a *light rhyme* contains a short vowel which is followed by maximally one consonant.

Translated into strict CV: no governing relation can be initiated by the last contentful vocalic position in the examples of (16) above since it would result in a *sub-minimal final foot*. Recall that the minimal final foot in our strict CV interpretation consists of at least two contentful vocalic positions, or a contentful vocalic position embracing a closed domain. Consider now the representations in (17) below.



As it appears from the representations above, the rightmost contentful vocalic position may not erect a governing relationship since that would result in a sub-minimal final foot. The reason for this is that this foot would contain a single contentful vocalic position followed by an empty vocalic position with no governing domain intervening, i.e., the rightmost contentful V would govern the word-final v with a single intervening C. Such a sub-minimal foot, however, is erected only as a last resort, in the case of monosyllabic words like *cat*. Note also that the leftmost contentful (ultimately unstressed) vocalic position in (17a) is integrated into the metrical hierarchy through what we call default government, shown by the dotted arrow. This operation takes place only if the word is pronounced in isolation, otherwise the initial unstressed vocalic position is integrated into a preceding well-formed foot which becomes available through concatenation.

In sum, the basic stress rule for verbs boils down to searching for minimal CV-feet towards the right edge of the word. All empty vocalic positions must be silenced by government, except those situated in a closed CvC domain, i.e., inside a traditional coda-onset clusters.

4 The distribution and markedness of consonant clusters

This section deals with the distribution and markedness of consonant clusters in the light of the algorithm presented in (10) above. I would like to demonstrate that the markedness of different types of consonant clusters follows directly governing relations contracted by vocalic and consonantal positions. Due to space limitations, I will limit the discussion to bi-consonantal clusters, a detailed discussion of tri-consonantal clusters would take us far beyond the scope of the present paper.

4.1 Types of consonant clusters

Traditionally we distinguish 3 different types of consonant clusters: onset cluster, coda clusters and bogus clusters. Coda clusters are frequently referred to as coda-onset clusters, especially in standard Government Phonology. Although strict CV-Phonology dispenses with the concept of

the syllable and syllabic constituents for that matter, we will examine the distribution of different types of clusters by making reference to these traditional technical terms.

Very briefly, the three different types of clusters show different distribution: onset clusters occur word-initially and word-medially, coda clusters occur word medially and word-finally, while bogus clusters occur only word-medially. This means the word-medial site allows the widest distribution of consonants, i.e., this is the position where all types of clusters seem to occur. In traditional accounts the sonority slope of clusters was also often referred to. It was claimed that – proceeding from left to right – onset clusters show a rising sonority slope, while coda clusters typically exhibit a falling sonority slope, although in the latter case this pattern may be upset by, for example, coronal consonants. Bogus clusters typically also show a rising sonority slope, and hence they resemble onset clusters in this respect. Consider now table (18) below, which illustrates cluster types with representative examples and their distribution.

| type | examples | initially | medially | finally |
|---------------|--|--------------|--------------|---------|
| onset cluster | tr, pr, kr, pl, kl, fr, fj, br, dr, gl | \checkmark | \checkmark | - |
| coda cluster | lt, lp, mp, nt, ŋk, st, sp, ft, kt, ks | - | \checkmark | |
| bogus cluster | tr, kr, tl, ml, ∫n, sn | - | \checkmark | - |

(18) Types of consonant clusters and their distribution

It appears from table (18) above that certain clusters can function as onset clusters and also as bogus clusters. Consider /tr/ and /kr/, for example, which function as onset clusters in, for instance, *betray* and *sacred* but as syncope-generated bogus clusters in vet(e)ran and bak(e)ry. Similarly, /sn/ is certainly a syncope-generated bogus cluster in mas(o)nry, e.g., while it is certainly an onset cluster in *snake*, at least in traditional pre-GP accounts. Consider now the representations of onset clusters in (19) below.



It appears from the representations in (19) that the empty vocalic position flanked by members of a traditional onset cluster must be governed. This is the minimum requirement on the appearance of traditional 'onset clusters' in the framework of strict CV-Phonology. The empty vocalic position flanked by consonantal positions of an onset cluster is obligatorily governed and optionally occurs within a governing domain. Consider now the representation of coda clusters in (20) below.





It appears from the representations of (20) that a coda cluster (a closed domain) must occur inside a governing domain. It is again a minimum requirement on coda clusters that they should occur inside a governing domain. It is also visible from the representations in (20) that word-final coda clusters are followed by a governed empty vocalic position whose phonetic reflex is absolute silence. Word-medial coda clusters, however, are followed by a contentful vocalic position whose phonetic interpretation is vowel reduction. Consider now the status of bogus clusters below in (21).



Bogus clusters can come from at least two different sources. There are lexical bogus clusters, e.g., *butler* as well as bogus clusters that result from syncope, fam(i)ly. There are two conditions on the appearance of bogus clusters. The empty vocalic position flanked by the consonantal positions of a bogus cluster must be governed and the bogus cluster must occur inside a governing domain.

(22) Types of bogus clusters

| Lexical(alised) bogus clusters | butler, motley, Scotland, ev(e)ry, et cet(e)ra |
|--------------------------------|--|
| Syncopated bogus clusters | ref(e)rence, lat(e)ral, bound(a)ry, fed(e)ral, ment(a)lly, |
| | jav(e)lin, exc(e)llent, adult(e)ry, cent(u)ry, fam(i)ly |

Bogus clusters frequently resemble traditional coda-clusters – inasmuch as they exhibit a rising sonority slope – with a few exceptions like veg(e)table, comf(or)table and med(i)cine. Moreover, some of the bogus clusters that exhibit a rising sonority profile do not qualify as onset clusters because of further phonotactic constraints on onset clusters. For example, the /tl/ of *Scotland, butler* or *motley* cannot be regarded as an onset cluster since no English word begins with /tl/. Likewise, the syncopated bogus cluster /ml/ of *fam(i)ly* is certainly not an onset cluster either. The conclusion is that some of the bogus clusters that result from syncope happen to superficially look like true onset clusters while other lexical or syncope-created bogus

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clusters like /tl/, /ml/, /ds/, /dl/ (*butler*, *fam*(*i*)*ly*, *med*(*i*)*cine*, *medley*) do not coincide with true onset clusters.

4.2 Types of consonant clusters

Markedness relations of different types of consonant clusters are frequently discussed in the phonological literature. Markedness of different types of clusters is not a binary relationship but rather it is a scalar relationship. It is usually assumed that onset and coda clusters are less marked than bogus clusters. Let us see how this traditional assumption follows from different structural relationships contracted by vocalic positions in strict CV-Phonology. Consider the table in (23) below.

| types of c cluster | the v is governed | the cluster must occur inside a governing domain |
|--------------------|-------------------|--|
| onset cluster | \checkmark | - |
| coda cluster | - | \checkmark |
| bogus cluster | \checkmark | \checkmark |

(23) Types of consonant clusters and their distribution in strict CV-Phonology

The table in (23) shows that the most marked consonant cluster is the *bogus cluster* since there are two formal conditions on such clusters: the empty vocalic position flanked by the consonantal positions of a bogus cluster must be governed and must be situated within a governing domain. In the case of *onset clusters* and *coda clusters*, however, there is just one such structural condition. The empty vocalic position flanked by the consonantal positions of a nonset cluster must be governed, while the empty vocalic position flanked by consonantal positions of a coda clusters must be situated within a governing domain.

5 Summary

In this paper we have argued for a non-mainstream view of strict CV-Phonology where government proceeds in both directions and is inherited by non-empty vocalic positions in the first place.

The algorithm or *network of governing relations* is able to come to grips with some of the phenomena of English Metrical Phonology, notably English word-stress as well as with phenomena related to phonotactics, notably the distribution of three different types of consonant clusters. As far as word-stress is concerned, I agree with Szigetvári (2020) that there is indeed posttonic stress in English, and this can be demonstrated by representations such as those in (15) above. Furthermore, I also agree with Schwartz's (2019) views concerning prosodic boundaries but this is an issue that cannot be discussed within the space limits of the present paper.

It seems that the idea that V-to-V governing relations are primarily left-to-right is supported by different pieces of phonological evidence. Besides the minimal-word constraint, which is a left-headed binary governing relationship, English CV-feet and super-feet also seem to be leftheaded. Moreover, the distribution and markedness of different types of consonant clusters can be seen to follow from the governing relationships (algorithm) presented in (10) above. It is also worth mentioning that the three different types of consonant clusters used to be identified primarily on the basis of distributional criteria in standard GP. In standard GP, however, the distributional statements were a result of mere empirical observation. Clusters that occur both word-initially and medially are called onset clusters, those that occur both word-finally and word-medially are coda clusters and those that occur only word-medially are bogus clusters. Since, however, onset clusters and bogus clusters frequently look the same on the surface, there was no way to tell what is common and what is different in between the two types. Likewise, since coda clusters occur both word-medially and word-finally while bogus clusters occur only word-medially, there must be something common and also something different between the two types. The introduction of empty vocalic positions and bidirectional government enables us to make a clear-cut difference among three different types of CvC sequences. The empty vocalic position flanked by the consonantal positions of an onset or a bogus cluster is obligatorily governed, while coda clusters and bogus clusters must be situated within a governing domain. It also follows from this that bogus clusters are the most marked of all cluster types since they must occur within a governing domain and their empty vocalic position must also be governed.

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