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The prosodic hierarchy of Swedish

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We give an overview of the phonological properties and processes that define the categories of the prosodic hierarchy in Swedish: the PROSODIC WORD (ω), the PROSODIC PHRASE (φ) and the INTONATION PHRASE (ι). The separation of two types of tonal prominence, BIG ACCENTS versus SMALL ACCENTS (previously called FOCAL and WORD ACCENT, e.g. Bruce 1977, 2007), is crucial for our analysis. The ω in Swedish needs to be structured on two levels, which we refer to as the minimal ω and the maximal ω , respectively. The minimal ω contains one stress, whereas the maximal ω contains one accent. We argue for a separate category φ that governs the distribution of big accents within clauses. The ι governs the distribution of clause-related edge phenomena like the INITIALITY ACCENT and right-edge boundary tones as well as the distribution of NUCLEAR BIG ACCENTS.

Keywords big and small accent, intonation phrase, prosodic hierarchy, prosodic phrase, prosodic word, Swedish

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1. INTRODUCTION

The goal of this article is to provide a coherent picture of Swedish prosody from the prosodic word level to the intonation phrase level. We thoroughly review the prosodic phenomena that define the constituents of the prosodic hierarchy in Swedish. Much of the data below has been presented in previous work (Myrberg 2010, 2013a, 2015a, b; Riad 2012, 2014; Myrberg & Riad 2013, forthcoming), but not as a single coherent and empirically oriented picture, which we provide here.

We base our discussion on assumptions that are generally accepted among researchers working on the prosodic hierarchy, such that our model can relatively easily be translated to theoretical approaches other than the one we apply here. Nevertheless, we will take a number of theoretical assumptions as a point of departure for our discussion.

First, our model for the prosodic hierarchy of Swedish (starting from the prosodic word and moving upward) contains three categories: the PROSODIC WORD (ω), the PROSODIC PHRASE (φ),¹ and the INTONATION PHRASE (ι).² Each of these prosodic categories holds a basic correspondence to some morphosyntactic category, where the ω is assumed to correspond to morphosyntactic words, the φ to syntactic phrases,

and the ι to clauses (Selkirk 2009, 2011; Itô & Mester 2012). The notions ‘word’, ‘phrase’ and ‘clause’ will need to be given proper definitions within syntactic theory, an undertaking that has proven non-trivial, and cannot be reviewed here (but see e.g. Selkirk 2009, 2011; Myrberg 2013a; Hamlaoui & Szendrői 2015).

Secondly, prosodic categories sometimes fail to align perfectly with morphosyntactic categories, and alignment between morphosyntax and prosody is subject to substantial optionality and variation. The non-perfect alignment between syntax and prosody is well attested for a vast number of languages (see e.g. Selkirk 1984, 1986; Nespor & Vogel 1986; Ladd 1986 for early discussion), as are several sources of such variation. For instance, prosodic structure tends to be flatter than syntactic structure (e.g. Chomsky & Halle 1968; Selkirk 1984, 1996; Nespor & Vogel 1986), and prosody may add signals of information structure influenced by discourse (e.g. Jackendoff 1972; Selkirk 1984, 1995; Truckenbrodt 1995). There is also variation in alignment between prosody and syntax that has to do with speech rate, speech style, and constituent length (e.g. Fougeron & Jun 1998; Jun 1998, 2003; Frota & Vigário 2007). We shall tacitly assume that the basic alignment between syntax and prosody, as well as the deviations from the prosodic alignment with morphosyntax, is the result of constraint interactions of the type assumed within Optimality Theory (OT; McCarthy & Prince 1993, Prince & Smolensky 1993) to account for the syntax–prosody interface (among many others Selkirk 1996, 2000, 2011; Truckenbrodt 1999; Féry & Samek-Lodovici 2006; Itô & Mester 2012). For details of the application of these constraint interactions to Swedish data, we refer the interested reader to our previous work, primarily Riad (1998), Myrberg (2010, 2013a), and Myrberg & Riad (forthcoming).

For Swedish, we find misalignment between morphosyntax and prosody at all levels of structure, providing evidence that prosodic constituents exist independently of syntactic constituents (e.g. Nespor & Vogel 1986). Misalignment and optionality are important sources of information in the investigation of individual prosodic categories.

2. TONAL PROMINENCE IN SWEDISH

Before discussing the individual prosodic categories, we review the four most basic tonal contours in Swedish phonology, as exemplified for Stockholm Swedish in the first two columns of (1), set off in the table by the heavy surrounding line.

(1) *Basic tonal contours in Stockholm Swedish*

	Tone accent 1	Tone accent 2	Tone accent 2 (two stresses)
Big accent	L*H	H*LH	H*L*H
Small accent	HL*	H*L	H*L

The separation of tonal events into these four basic contours is widely accepted in the research tradition of Swedish prosody, and is originally due to Bruce (1977, 1998). The table in (1) illustrates the shape of the four basic contours in Stockholm Swedish, which is the most well-studied dialect of Swedish. However, the distinction extends more generally to Swedish as well as Norwegian dialects (e.g. Bruce 2007; Riad, forthcoming). It serves as a base for our observations at all prosodic levels, ω , ϕ , and ι , and is therefore best described independently of the discussion of any individual category.

Two properties occasion the four distinct contours. First, there is lexical tone in Swedish, yielding a binary surface melodic distinction between tone accent 2 (lexical tone + intonation) and tone accent 1 (intonation only), represented in the first two columns of (1). The lexical tone that yields accent 2 in a prosodic domain, resides in many suffixes and some roots (Riad 2009, 2014; discussion in Section 3.2 below). The third column of the table in (1) describes the accent 2 contour when it appears in a word with several stressed syllables (accent 1 is not applied to such words in Stockholm Swedish). This contour is melodically the same as the accent 2 contour, but it is not triggered by a lexically specified tone, as it is postlexical (Section 3.2).

Secondly, there is a separation of two levels of intonational prominence, expressed in both accent 1 and accent 2 (Bruce 1977). This is represented in the two rows of (1). We shall use a new term pair for the accent types belonging to the respective prominence categories, namely BIG ACCENTS and SMALL ACCENTS. Big accents are bigger than small accents both in terms of scaling (they have larger fundamental frequency (f_0) excursions) and in terms of being (in general) perceptually more prominent than small accents.

In much previous research, these two intonational categories have been referred to as SENTENCE ACCENT or FOCAL ACCENT and WORD ACCENT or just ACCENT (e.g. Bruce 1977, 1998, 2005, 2007; Heldner 2001; Hansson 2003; Ambrazaitis 2009; Roll, Horne & Lindgren 2010; Myrberg 2013a; Myrberg & Riad, forthcoming). These terms are problematic, as they imply a strong correlation between the form of the accents and their function. Since the introduction of these terms, we have learned that the functions of the accents are quite varied. Many big accents appear on material that is not focused, and not all words have their own small accent. This leads to confusing formulations (e.g. ‘focal accents that appear on given material’, ‘word accents that cue phrasal structures’).

The intention behind the terms BIG and SMALL accent is to avoid this form/function problem. These terms should be sufficiently flexible and theory neutral to be useful for the broad research community. The terms big and small accent are, to the best of our knowledge, not used to refer to any similar distinction elsewhere in prosodic theory, and confusion with empirical distinctions in other languages (e.g. MINOR/MAJOR accent) should thereby be avoided. They are also

relatively theory neutral (as opposed to e.g. FOCAL/FOCUS accent, PHRASE accent, HEAD accent). Big and small are also not tied to the melodic shape of the accents (e.g. HL-accent or HLH-accent), a fact that allows us to use these terms for any individual Swedish or Norwegian dialect or for dialect typology, despite the fact that the shape of the basic contours is highly variable in the Scandinavian area.

In the following sections, subtypes of big and small accents will be discussed. These subtypes relate both to separate functions of the accents, and to their phonological and phonetic realization. Below, we discuss the category ω in Section 3, φ in Section 4, and ι in Section 5. We conclude the paper in Section 6.

3. THE PROSODIC WORD (ω)

The prosodic word clearly exhibits two levels in Swedish. The distinction is apparent when comparing forms containing one stress (simplex words and some derivations) with forms containing multiple stresses (compounds and some other derivations). We will analyze both these levels as aspects of the prosodic word, and will refer to them as the MINIMAL PROSODIC WORD (ω^{\min}) and the MAXIMAL PROSODIC WORD (ω^{\max}), respectively. Both levels have one phonological prominence as their defining property (so-called culminativity). For the minimal ω , the defining characteristic is the presence of stress. The properties of the minimal ω can further be supported by rules and processes related to syllabification, distribution of /h/ and aspiration, truncation in coordinations, and the lexical assignment of tone (Sections 3.1–3.2). For the maximal ω , the defining characteristic is the presence of one tone accent (big or small).

In simplex words, as in (2), there is no distinction between the minimal and maximal ω . Simplex forms thus receive one stress and one accent. When the minimal and maximal ω is not distinct, we indicate this with ' $\omega^{\min=\max}$ '.

(2) *Culminativity in words where $\omega^{\min}=\omega^{\max}$*

(^h hus) _{$\omega^{\min=\max}$}	'house'
(^h taxi) _{$\omega^{\min=\max}$}	'taxi'
(^h sy.fi.lis) _{$\omega^{\min=\max}$}	'syphilis'
(e.pi.de. ^h mi) _{$\omega^{\min=\max}$}	'epidemic'
(e.lek.tri.fi. ^h e.ra) _{$\omega^{\min=\max}$}	'electrify'
(me.lo. ^h dra.mer.na) _{$\omega^{\min=\max}$}	'the melodramas'

The pattern in (2) is distinct from several of the other Germanic languages (Kager 1989, Hammond 1999, Kaltenbacher 1999, Zonneveld et al. 1999:503ff.), in that there is very little evidence of stable secondary stress within the ω in Swedish.

Swedish forms are compared with cognates in American English in (3) and German in (4).³

(3) *American English and Swedish stress*

(¹ mone ₁ tary) _ω	(mone ¹ tär) _ω ^{min=max}
(to ₁ tali ¹ tarian) _ω	(totali ¹ tär) _ω ^{min=max}
(¹ ab ₁ strakt) _ω	(ab ¹ strakt) _ω ^{min=max}

(4) *German and Swedish stress*

(¹ mili ₁ tari ¹ sieren) _ω	(militari ¹ sera) _ω ^{min=max}
(¹ ono ₁ matopo ¹ etisch) _ω	(onomatopo ¹ etisk) _ω ^{min=max}
(¹ uni ₁ versi ¹ tät) _ω	(universi ¹ tet) _ω ^{min=max}

The contrast between minimal and maximal shows up in forms with more than one stress, and in forms with unstressed prefixes *för-* and *be-*, illustrated in (5).

(5) *Structures where $\omega^{\min} \neq \omega^{\max}$*

- ((¹sommar)_ω^{min} (¹ledig)_ω^{min} (¹heten)_ω^{min})_ω^{max} ‘the summer holidays’
- ((¹moder)_ω^{min} (¹skap)_ω^{min})_ω^{max} ‘motherhood’
- ((¹an)_ω^{min} (¹komma)_ω^{min})_ω^{max} ‘arrive’
- (för-(¹ändra)_ω^{min})_ω^{max} ‘to change’

The structure in (5a) is a compound consisting of three minimal ω s organized into one maximal ω . The examples in (5b–c) include forms with a stressed suffix and a stressed prefix, which get the same ω structure as compounds. Finally, (5d) exemplifies prefixation with *för-*, a pretonic prefix that adjoins prosodically to an adjacent minimal ω . Adjunction also results in a difference between minimal and maximal ω . We return to the accentual properties of these forms below.

The baseline in North Germanic tonal varieties is for most content words, simplex or compounds, to form a maximal ω , and thereby to constitute a tonal domain. The general impression is that accents are more frequent in e.g. normal spoken Swedish than in corresponding West Germanic varieties, like English.

The notions of minimal and maximal ω come from the general model for the prosodic hierarchy given in Itô & Mester (2007, 2012). Itô & Mester propose a small set of prosodic categories (ω , φ , ι), which admits recursion and which applies universally. Phonological rules can refer separately to either the minimal (lowest) or the maximal (highest) projection of a category, or to all projections of a category simultaneously. For Swedish, the distinction between minimal and maximal is particularly useful for our analysis of the ω .

Previous models of North Germanic intonation have included separate categories headed by an accent at the word level, like our maximal ω , e.g. the Tonal Foot

(Fretheim & Nilsen 1989), the Accentual Phrase (Kristoffersen 2000, Abrahamsen 2003), and the Prosodic Word (Bruce 1998, Hansson 2003). However, these prosodic categories lack mechanisms for aligning prosody with morphosyntactic categories. From a typological perspective, Vigário (2010) proposes a category Prosodic Word Group (PWG) between the prosodic word and the prosodic phrase, and Vogel (2010) proposes the Composite Group (CompG).

3.1 Processes within the minimal ω

The arguments that provide evidence for the separation of the minimal ω from the maximal ω pertain to syllabification, distribution of /h/ and aspiration, and coordinatory truncation (Myrberg & Riad 2013, Riad 2014).

3.1.1 Syllabification

Like most Germanic languages, Swedish has the minimal ω as domain for syllabification (e.g. Wiese 1996, Booij 1999). To show this, we may challenge the Onset principle across different types of morpheme boundaries and see whether or not a consonant is syllabified with a following vowel-initial morpheme. Most simplex forms (monomorphemic and inflected words) will constitute a single ω (where $\omega^{\min} = \omega^{\max}$), whereas true compounds will consist of more than one minimal ω , as illustrated in (6).

(6) Onset and minimal ω

FORM	SYLLABIFICATION	TRANSLATION
a. 'härm-ar	(här.mar) $_{\omega}$ *(härm) $_{\omega}$ (ar) $_{\omega}$	'imitates'
b. 'härm-ade	(här.ma.de) $_{\omega}$ *(härm) $_{\omega}$ (ade) $_{\omega}$	'imitated'
c. 'härm-ande	(här.man.de) $_{\omega}$ *(härm) $_{\omega}$ (ande) $_{\omega}$	'imitating'
d. 'härm-,apa	(härm) $_{\omega}$ (a.pa) $_{\omega}$ *(här.ma.pa) $_{\omega}$	'imitation monkey'
e. 'vatten-akro,bat	(vat.ten) $_{\omega}$ (a.kro.bat) $_{\omega}$ *(vat.te.na.kro.bat) $_{\omega}$	'water acrobat'

The Onset principle is clearly thwarted across a ω -boundary (6d), thereby showing that syllabification stops within the minimal ω . This intuition remains clear when stresses are further apart, as in (6e).

3.1.2 Distribution of /h/ and aspiration

The main segmental indicator of the minimal ω is the distribution of aspiration, both in voiceless stops and in the phoneme /h/. Aspiration is prominent in the initial

position of a ω and in the initial position of a stressed syllable, as illustrated with /t/ in (7).

(7) *Aspiration*

- | | | |
|----------------|---|---------------------|
| a. dröm-torpet | (^l dröm) _ω (^l [t ^h]orpet) _ω | 'the dream cottage' |
| b. militär | (mili ^l [t ^h]är) _ω | 'military' |
| c. tolerans | (^l [t ^h]ole ^l rans) _ω | 'tolerance' |
| d. petimäter | (pe[t ^l i ^l mäter) _ω | 'nitpicker' |
| e. skämt-orgie | (^l skäm[t ^l] _ω (^l orgie) _ω | 'joke orgy' |

In (7a) /t/ is initial in the ω and in a stressed syllable. In (7b) /t/ is in a stressed but non-initial syllable, and in (7c) it is initial in the ω , but in an unstressed syllable. In these situations, /t/ is aspirated. In (7d) /t/ is in the onset of a non-initial, unstressed syllable, and in (7e) it is final in the ω . In these situations, /t/ is unaspirated.

The same distribution holds for the realizations of the phoneme /h/, whose presence may therefore also serve as indicator of stress (feet) and left edges of ω s:

(8) *Distribution of [h]*

- | | | |
|--------------|---|--------------|
| a. hemlig | (^l [h]emlig) _ω | 'secret' |
| mähä | (^l mä) _ω (^l [h]ä) _ω | 'milksoap' |
| b. mahogny | (ma ^l [h]ogny) _ω | 'mahogany' |
| Kandahar | (Kanda ^l [h]ar) _ω | (place name) |
| c. historia | (^l [h]is ^l toria) _ω | 'history' |
| heraldik | (^l [h]eral ^l dik) _ω | 'heraldry' |
| d. maharadja | (ma.a ^l radja) _ω or (ma[^l fi]a ^l radja) _ω | 'maharaja' |
| koherens | (ko.e ^l rens) _ω or (ko[^l fi]e ^l rens) _ω | 'coherence' |

The phoneme /h/ is pronounced [h] in any stressed syllable, ω -initial or not, as is (8a–b), and in ω -initial unstressed syllables, as in (8c). However, [h] only optionally surfaces between two unstressed vowels, as seen in (8d), where it may be voiced, hence [fi] (Garlén 1984:39; Engstrand 2004: 168).

With the exception of (8d), where the pronunciation of /h/ seems optional rather than prohibited, this distribution is by and large the same as in American English (Davis & Cho 2003 and references given there).

3.1.3 Coordinatory truncation

The minimal ω is also the minimal unit that can be truncated in coordination (Booij 1985 for Dutch, Wiese 1996 for German, and Riad 2014 for Swedish). Compound

members and derivations with stressed suffixes permit truncation, see (9), whereas members of prosodically reduced compounds and unstressed derivational suffixes do not, see (10) and (11).

- (9) *Truncation of ω^{\min} in coordinated ω^{\max}*
- | | |
|---|-----------------------------|
| (^h öst) _ω (blommor) _ω och ((^v år) _ω (blommor) _ω) _ω ^{max} | ‘autumn and spring flowers’ |
| (ⁱ s) _ω (björnar) _ω och ((^b run) _ω (björnar) _ω) _ω ^{max} | ‘polar and brown bears’ |
| (^v än) _ω (skap) _ω och ((^f iend) _ω (skap) _ω) _ω ^{max} | ‘friendship and enmity’ |
| (^g od) _ω (artad) _ω eller ((^l elak) _ω (artad) _ω) _ω ^{max} | ‘benign or malignant’ |
- (10) *Disallowed truncation in lexicalizations*
- | | |
|--|-------------------------------|
| a. *(^m åndag) _ω eller (^t isdag) _ω ^{min=max} | ‘Monday or Tuesday’ |
| b. OK(^m åndag) _ω eller (^t isdag) _ω ^{min=max} | |
| c. OK(^h elg) _ω (dag) _ω och ((^f ri) _ω (dag) _ω) _ω ^{max} | ‘holiday or free day’ |
| d. *(^t ranbär) _ω och (^b låbär) _ω ^{min=max} | ‘cranberries and blueberries’ |
- (11) *Disallowed truncation with unstressed suffixes*
- | | |
|---|--------------------------------|
| *både (^t revlig) _ω och (^f arlig) _ω ^{min=max} | ‘both nice and dangerous’ |
| *varken (^t ragisk) _ω eller (^k omisk) _ω ^{min=max} | ‘neither tragical nor comical’ |

In (10) the disallowed truncations of weekdays (*-dag*) and berries (*-bär*) indicate that lexicalization has taken place, the phonological effect of which is the removal of stress. Reduction is evident also in the fact that postlexical tonal accent is assigned in (10b–c), which is accent 1 when there is one stress, and accent 2 when there are two stresses (see (14), below). Other compounds involving *-dag*, which do not belong to the closed set of weekdays, retain stress and permit truncation (10c). Similar cases can be found in Dutch and German (however, without the benefit of the accentual difference, which makes the case for reduction easier to argue in Swedish).

There are parallels here with cognate suffixes in German (*-schaft/-skap*, *-ig/-ig*), but there are also contrasts, e.g. *-lich/-lig*, where only the German suffix is a ω .

3.2 Lexical and postlexical assignment of tone accent

The assignment of tone accent provides a source of evidence for both the minimal and maximal ω , in that accent assignment is differently conditioned in them. Lexical tone accent takes the minimal ω as its domain, whereas postlexical tone accent assignment targets the maximal ω .

Accent 2 in simplex forms contains the marked, lexically represented tone, which is H in Central Swedish. Accent 1 is the melody of the unmarked pitch accent, i.e. the case when no lexical tone is present. Accent 2 resides in many suffixes, that is, the lexical specification for a tone comes with the suffix. The tone is assigned to a preceding primary stressed syllable, within the same minimal ω . In addition to large

classes of suffixes, lexical tone is also inherent in some roots.⁴ Lexical accent is marked by a lowered digit (₂ for accent 2) at the end of the morpheme. The raised digit (¹ or ²) marks the realized tone accent, at the primary stress.

(12) *Lexical accent 2 (right) vs. no accent (left) in roots and suffixes*

a. Sommer	¹ ('sommer)	(name)	sommar	² ('sommar ₂)	'summer'
b. bil	¹ ('bil)	'car'	bilar	² ('bil-ar ₂)	'cars'
c. vaktis	¹ ('vakt-is)	'warden'	lärare	² ('lär-are ₂)	'teacher'
d. fred	¹ ('fred)	'peace'	fredlig	² ('fred-lig ₂)	'peaceful'
e. tal	¹ ('tal)	'speech'	tala	² ('tal-a ₂)	'to speak'

In North Germanic, the tone bearing unit (known as TBU) is the stressed syllable. The assignment of a lexical tone from a suffix is subject to a constraint on locality, normally meaning that the suffix has to be directly adjacent to the stressed syllable, as seen in (13a–b) below. Lexical accent assignment is also sensitive to whether the word begins with a stressed or unstressed syllable. In forms that begin with one or more unstressed syllables (so-called ANACRUSIS), accent-2-inducing suffixes may fail to assign their lexical tone, even if locality is met. Indeed, suffixes fall into two classes (strong and weak) with respect to anacrusis, as seen in (13c–d).

(13) *Locality and anacrusis*

a. local	bil-ar	² ('bil-ar ₂) _{ω^{min}=max}	'cars'
b. non-local	kaktus-ar	¹ ('kaktus-ar ₂) _{ω^{min}=max}	'cactuses'
c. anacrusis,			
strong suffix	bogser-are	(bog ² ser-are ₂) _{ω^{min}=max}	'tower', see (12c)
d. anacrusis,			
weak suffix	person-lig	(per ¹ son-lig ₂) _{ω^{min}=max}	'personal', see (12d)

The reader is referred to Riad (2009, 2012, 2014, 2015) for a fuller discussion of the distributional properties.⁵

The clearest indication of lexical accent assignment being limited to the minimal ω is the fact that more complex structures are clearly assigned accent WITHOUT heed to lexical information, as will now become evident. If lexical tone cannot be expressed, accent will be POSTLEXICALLY assigned, according to the simple parameters in (14).

(14) *Postlexical accent assignment*

- One stress yields accent 1 (i.e. tonal prominence pure and simple).
- Two stresses yield accent 2 (i.e. tonal prominence preceded by a H tone).

Culminativity in the maximal ω is expressed by one accent, big or small. Thus, irrespective of the lexical tonal specifications included in the morphemes of a large maximal ω (e.g. a compound), only one accent can be realized. The accent may be determined lexically or postlexically (depending on size, construction, dialect) but it is invariably the case that only one accent is realized in a maximal ω .

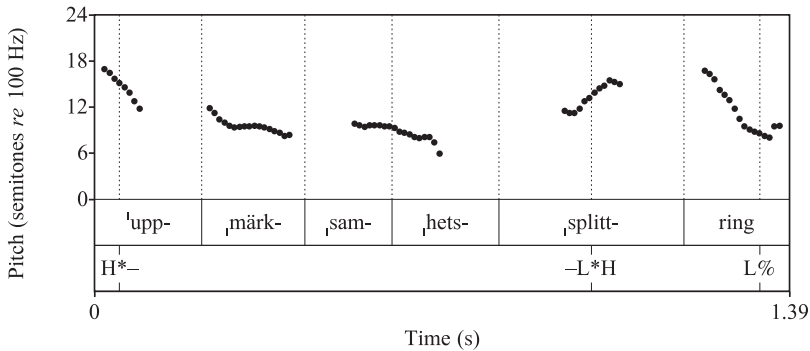


Figure 1. Tonal association pattern in a long compound, *uppmärksamhetssplättring* ‘attention split’. The accent 2 marker H* associates to the first stressed syllable (*upp-*), and the prominence marker L*H associates to the last stressed syllable (*splitt-*).

Accent 1 is always postlexical. This is the assignment of tonal prominence, pure and simple in the absence of a lexical tone. Accent 2 is either lexical, i.e. induced by a lexically marked root or suffix, or postlexical, namely in case there are two or more stresses in the structure.⁶ This is sometimes called a ‘compound rule’ (e.g. Gussenhoven 2004:214), since compounds typically contain two stresses (or more) in Germanic. However, the regularity is purely prosodic, extending to any structure that contains two stresses, including morphologically complex forms containing stressed prefixes or suffixes. This is illustrated in (15).

(15) *Postlexical accent 2 (several stresses)*

- | | | |
|-----------------|--|---------------------------|
| a. sommar-lov | $^2((\text{'somm}ar_2)_{\omega^{\min}}(\text{'lov})_{\omega^{\min}})_{\omega^{\max}}$ | ‘summer break’ compound |
| jul-lovs-morgon | $^2((\text{'jul})_{\omega^{\min}}(\text{'lov-s})_{\omega^{\min}}(\text{'morgon}_2)_{\omega^{\min}})_{\omega^{\max}}$ | ‘Christmas break morning’ |
| b. tvätt-bar | $^2((\text{'tvätt})_{\omega^{\min}}(\text{'bar})_{\omega^{\min}})_{\omega^{\max}}$ | ‘washable’ tonic suffix |
| grym-het | $^2((\text{'grym})_{\omega^{\min}}(\text{'het})_{\omega^{\min}})_{\omega^{\max}}$ | ‘cruelty’ |
| c. på-laga | $^2((\text{'på})_{\omega^{\min}}(\text{'lag-a}_2)_{\omega^{\min}})_{\omega^{\max}}$ | ‘tax; duty’ tonic prefix |
| o-nödig | $^2((\text{'o})_{\omega^{\min}}(\text{'nöd-ig}_2)_{\omega^{\min}})_{\omega^{\max}}$ | ‘unnecessary’ |

The phonological association pattern of big accent 2 in Central Swedish compounds makes the dependence on stress quite clear, as the tonal contour associates at two points, both of which are stressed syllables. The accent 2 marker H* goes to the first stressed syllable, and the prominence marker L*H goes to the last stressed syllable. This is illustrated in Figure 1. The assignment of postlexical accent is entirely insensitive to any lexical tonal specifications in Central Swedish.

Another informative case of postlexical accent is constituted by forms derived with an unstressed prefix (*be-* or *för-*), which invariably get accent 1. These forms are interesting in that they may contain a suffix that is lexically marked for accent

2. The form $(\text{f}\ddot{\text{o}}\text{r}^{-1}(\text{t}\text{a}\text{l}-\text{a}_2)_{\omega^{\text{min}}})_{\omega^{\text{max}}}$ in (16c) below is a case in point, where we take the prefix to be adjoined (rather than incorporated) to the minimal ω . The infinitive suffix induces accent 2 in canonical forms without the prefix, i.e. in the simple verb ${}^2(\text{t}\text{a}\text{l}-\text{a}_2)_{\omega^{\text{min}=\text{max}}}$, as in (12e) above. When a prefix is adjoined, a maximal ω is created which is no longer coextensive with the minimal ω . This renders the lexical tone invisible, and postlexical accent 1 is assigned, per (14a).

(16) *Postlexical accent 1 (single stress)*

a. lov	${}^1(\text{lo}\text{v})_{\omega^{\text{min}=\text{max}}}$	‘holiday’	root
b. taxi	${}^1(\text{t}\text{a}\text{x}\text{i})_{\omega^{\text{min}=\text{max}}}$	‘taxi’	
c. för-tala	$(\text{f}\ddot{\text{o}}\text{r}^{-1}(\text{t}\text{a}\text{l}-\text{a}_2)_{\omega^{\text{min}}})_{\omega^{\text{max}}}$	‘to slander’	prefix+root
d. be-låna	$(\text{b}\ddot{\text{e}}^{-1}(\text{l}\ddot{\text{a}}\text{n}-\text{a}_2)_{\omega^{\text{min}}})_{\omega^{\text{max}}}$	‘to mortgage’	

To make this point more forcefully, we can compare prefixation of *för-* with forms with a different type of unstressed prefix *des-*, which incorporates into the minimal ω .⁷

(17) *Prefixes of different kinds*

SIMPLE		PREFIXED	
a.	${}^2(\text{s}\ddot{\text{ä}}\text{l}\text{j}-\text{a}\text{r}\text{e}_2)_{\omega^{\text{min}=\text{max}}}$ ‘seller’	$(\text{f}\ddot{\text{o}}\text{r}^{-1}(\text{s}\ddot{\text{ä}}\text{l}\text{j}-\text{a}\text{r}\text{e}_2)_{\omega^{\text{min}}})_{\omega^{\text{max}}}$ ‘salesman’	adjunction
b.	$(\text{a}\text{r}^2\text{m}\text{e}\text{r}-\text{a}\text{r}\text{e}_2)_{\omega^{\text{min}=\text{max}}}$ ‘reinforcer’	$(\text{d}\text{e}\text{s}-\text{a}\text{r}^2\text{m}\text{e}\text{r}-\text{a}\text{r}\text{e}_2)_{\omega^{\text{min}=\text{max}}}$ ‘disarmer’	incorporation

The accent difference between the two prefixed forms is thus due to the difference in prosodic structure, adjoined vs. incorporated. In the incorporated structure, accent assignment is lexical, while in the adjoined structure it is postlexical, as we have seen, and this distinction serves as evidence for two levels of the ω .

3.3 Mismatches between words in morphosyntax and prosody

We have now looked at formations of minimal and maximal ω , where one word or morpheme in morphosyntax in principle corresponds to one minimal or maximal ω . There are, however, also cases where units that consist of more than one word in morphosyntax, correspond to a single word as regards prosodic structure. In a small number of cases, a single word in morphosyntax can also correspond to multiple prosodic words. In such cases, we may speak of mismatches between words in morphosyntax and words in prosody. Below, we review such mismatch cases, as they shed light on the general principles of alignment between prosody and morphosyntax.

3.3.1 Incorporation into a minimal ω

A first case in point is that a stressable pronoun can sometimes be incorporated at the right edge of a minimal ω . We can observe such incorporation with *h*-initial pronouns (e.g. *han* ‘he’, *hon* ‘she’, *hennes* ‘her’), since the distribution of [h] indicates the minimal ω , see (8). In the cases in (19) there is loss of [h], and the pronoun

is syllabified with the preceding word. Both these facts indicate the absence of a minimal ω boundary preceding the *h*-initial pronoun. Small caps mark the presence of a big accent ($\omega^{\min = \max}$ in all instances).

(18) *Loss of [h] within the minimal ω , when not in a stressed syllable*

(<i>kan han</i>) ω (<i>DET</i>) ω ?	[<i>kan:an'de:</i>]	*[<i>kan:han . . .</i>]	'can he?'
(<i>gav henne</i>) ω (<i>MJÖLK</i>) ω	[<i>gɑ:vɛnɛ'mjøl:k</i>]	*[<i>gɑ:vɛnɛ . . .</i>]	'gave her milk'
(<i>GÅR han</i>) ω (<i>sen</i>) ω ?	[<i>go:ran'sen:</i>]	*[<i>go:rhan . . .</i>]	'will he leave then?'
(<i>tog hon</i>) ω (<i>DIT den</i>) ω ?	[<i>tu:gun'di:ten</i>]	*[<i>tu:ghun . . .</i>]	'did she bring it there?'

A similar observation can be made for pronouns (e.g. *den, det* 'it', *du, dej* 'you', *de* 'they', *dem* 'them'), which undergo a rule of *d*-continuization (/d/ > [r]) when incorporated into the minimal ω (Teleman 2013, Riad 2014:99ff.).

(19) *D-continuization*

(<i>GE mej den</i>) ω	[<i>'je:merɛn</i>],	[<i>'je:mɛdɛn</i>]	'give me it; give it to me'
(<i>ge mej</i>) (<i>DEN</i>) ω	[<i>jɛmɛ'dɛn:</i>],	*[<i>jɛmɛ'rɛn:</i>]	'give me THAT (one)'

The distribution of *d*-continuization indicates that the forms undergoing it are unstressed and incorporated into a minimal ω together with some stressed item nearby.

A third, slightly more complex case is derivation with the suffix *-eri*. This is a highly productive suffix, which always attracts primary stress by the phonological stress rule of Swedish. This type of suffix belongs to the class of unspecified morphemes (Riad 2012, 2014, 2015). What makes *-eri* particularly interesting is the fact that it attaches to any type of root, i.e. not only to unspecified roots (typically non-native), but also to tonic (i.e. lexically stressed) roots (typically native Germanic), and it always forms a single syllabification domain with the preceding root morpheme. Thus, suffixation with *-eri* always leads to the formation of a minimal ω . With unspecified roots this is straightforward, as such roots combine with a large set of unspecified suffixes (*-era* and *-ik* in (20)). With tonic roots, however, culminativity is challenged, as both the root and suffix require stress, yet must form a single minimal ω domain.⁸ Combination of *-eri* with tonic (T) and unspecified (U) roots is exemplified in (20), where the quality and quantity of vowels under stress (left) is compared with the case where stress is further to the right (right).

(20) *Tonic (T) and unspecified (U) roots*

/i/	U	i: ~ ɪ	(<i>pol['i:]tiker</i>) ω	'politician'	(<i>pol[ɪ]ti's-ɛra</i>) ω	'to politicize'
	T	i: ~ iː	(<i>sl['i:]pa</i>) ω	'to grind'	(<i>sl[ɪ]p-ɛ'ri</i>) ω	'grindery'
/o/	U	o: ~ ɔ	(<i>elektr['o:]n</i>) ω	'electron'	(<i>elektr[ɔ]'n-ik</i>) ω	'electronics'
	T	o: ~ oː	(<i>sk['o:]da</i>) ω	'to behold'	(<i>sk[oː]d-ɛ'ri</i>) ω	'gazing'

In the unspecified roots, vowel length is present only under stress, whereas in tonic roots, some half-length is retained even when stress moves to the suffix *-eri*. This is, we assume, the result of the arising conflict when lexical stress cannot be expressed at the surface, due to the suffixation with *-eri*, whose stress attraction dominates. Thus, some phonetic properties of stress are retained, but stress itself is removed and placed on *-eri*, in accordance with the stress rules, and with the requirement of culminativity within the minimal ω , which constitutes one syllabification domain.

3.3.2 Syntactic phrases that form a single maximal ω

In a number of cases, a syntactically complex unit forms a single maximal ω . First, the adverb *för* ‘too’ may adjoin prosodically to a minimal ω , e.g. ²*liten* ‘small’, ²*många* ‘many’ and ²*länge* ‘long’, in a manner that is parallel to the morphological case we reviewed in (16).

(21) *Prosodic adjunction in morphology and syntax*

- | | | | |
|----------------|---|---|-------------------------|
| a. morphology: | för- ² (¹ tal-a ₂) | (för- ¹ (¹ tal-a ₂) _ω) _ω ^{max} | ‘to slander’, see (16c) |
| b. syntax: | för ² (¹ liten ₂) | (för ¹ (¹ liten ₂) _ω) _ω ^{max} | ‘too small’ |
| | för ² (¹ mång-a ₂) | (för ¹ (¹ mång-a ₂) _ω) _ω ^{max} | ‘too many’ |
| | för ² (¹ länge ₂) | (för ¹ (¹ länge ₂) _ω) _ω ^{max} | ‘too long’ |

The evidence that the structures in (21) are cases of prosodic adjunction comes from tonal accent assignment. These forms would normally have accent 2, via lexical specification in the root or suffix, but here they get accent 1, which is invariably assigned postlexically, and which indicates that the maximal word is different from the minimal word. Factors like frequency and structure affect the likelihood of this type of adjunction in syntax, and it also takes place in a few other lexicalized cases beside *för* ‘too’, e.g. *till* ¹*salu*₂ ‘for sale’, *det*¹*samma*₂ ‘the same’ (Myrberg & Riad 2013).

A second case is given in (22). In several North Germanic dialects (however not in standard Central Swedish), a so-called particle verb, or in some cases a verb plus an object, may exhibit compound prosody, where the verb and its particle/object form a maximal ω with the head to the left, on the verb. This is illustrated in the righthand column of (22) with examples from East Norwegian (ENw) and northern varieties of Swedish (NSw). The regular prosody for particle verbs in dialects that do not have this option is an unaccented verb followed by the accented particle (the left-hand column in (22)).

(22) *Prosodic compounds formed in the syntax*

- a. ENw ('komme) ¹('in) > ²((('komme)_ω(,in)_ω)_ω^{max} 'to come in'
 ENw ('gå) ¹('ut) > ²((('gå)_ω(,ut)_ω)_ω^{max} 'to go out'
- b. NSw ('kom) ¹('upp) > ²((('kom)_ω(,upp)_ω)_ω^{max} 'came up'
 NSw ('slå) ¹('in) > ²((('slå)_ω(,in)_ω)_ω^{max} 'to wrap'
- c. NSw ('säg) ¹('det) > ²((('säg)_ω(,det)_ω)_ω^{max} 'say that; who knows'

We see from the above examples that what is basically word prosody sometimes extends beyond the morphosyntactic word. In all cases, there is some kind of semantic motivation for the prosodic formation, indicating that this use of word prosody is due to some notion of lexicalization. Adjunction occurs with the adverb *för* 'too', but not with the (homonymic) preposition *för* 'for'. Compound formation occurs with particle verbs, i.e. verbs with a semantically closely connected particle, not regularly with e.g. verbs+object, which may often have the same prosody as particle verbs (i.e. with a deaccented verb). Still, (22c) is a verb+object structure, but one which is lexicalized.

A third, slightly different type of case is illustrated in (23), where we have lexicalized phrases that include more than one content word and where one or more of these content words are deaccented, though not destressed (underscored).




(23) *Deaccentuation, right-headed maximal ωs*

- a. ((röd-a₂)_ω ²('matt-an₂)_ω)_ω^{max} 'red carpet' (lexicalized phrase)
 b. ((Röd-a₂)_ω ¹('Kors-et)_ω)_ω^{max} 'Red Cross' (name, also lexicalized)
 c. (('hopp-a₂)_ω ¹('upp)_ω)_ω^{max} 'jump up' (particle verb)
 d. (('hel-a₂)_ω ('lång-a₂)_ω ¹('dag-en)_ω)_ω^{max} 'all day, lit. whole long day'

By definition, a content word that fails to receive an accent is not a maximal ω . Instead it must form part of an adjacent maximal ω . The structures in (23) above look much like compounds, but the important difference is the locus of the head, to which the pitch accent obligatorily associates. In compounds, the head is to the left, whereas in phrases it is to the right. We take this to be a reflection of the syntactic status and, to some extent, the diachronic formation of the structures in (23). It is well-known that the prosodic head (i.e. the strongest prominence) of a phrase generally appears close to the right phrase edge in Germanic languages (e.g. Selkirk 1995, Féry & Samek-Lodovici 2006). In (23), the elements in the phrases are prosodically grouped together, which is expressed by deaccentuation and incorporation into the same prosodic unit, which we take to be the (right-headed) maximal ω . If the semantic coherence of a phrase type becomes strong, the next step in prosodic lexicalization would be for the head to move to the left edge of the maximal ω , as with the particle verbs in (22). The same development is manifest historically in the formation of compounds from phrases (*kungs gård* 'king's estate' > *kungsgård*, see Strandberg 2014).⁹

This analysis entails a strong structural affinity between lexicalized phrases and compounds and predicts that they should exhibit similar grammatical behaviour, in particular, that lexicalized phrases should behave like words. This prediction is borne out, as we can see by studying incorporation of phrases into compounds. Deaccented phrasal structures like the ones in (23) can occur in initial, medial and final position in compounds; see (24), where the relevant phrases are underscored.

(24) *Incorporation of phrases into compounds*

- a.  (('första 'maj)_ω (,'tåg)_ω)_ωmax
Ist of May parade
- b.  (('Röda 'Korset)_ω ('ost och 'skink)_ω (,'macka)_ω)_ωmax
Red Cross.the cheese and ham sandwich
- c.  (('Sverige)_ω ('Röda 'Korset)_ω)_ωmax och (('Norge)_ω ('Röda 'Korset)_ω)_ωmax
Sweden Red Cross.the and Norway Red Cross.the

Another type of deaccentuation structure, which we may call local deaccentuation, is exemplified in (25). The structures in (25) differ from those in (23) in that the domain of deaccentuation is a single word, rather than a whole morphosyntactic phrase. The deaccented word attaches to any immediately adjacent word that carries a word accent, even though these two words do not form a syntactic constituent.

(25) *Local deaccentuation*

- a. (('liten₂)_ω ²('smuts-ig₂)_ω)_ωmax ²('gryt-a₂)_ωmin=max
'little dirty pot'
- b. (('lag-a₂)_ω (be-¹('gagn-ade₂)_ω)_ω)_ωmax (kopia¹torer)_ωmin=max
'repair used copying machines'

The nature, and to some extent even the scope, of this deaccentuation pattern remain to be understood, but it is clear that deaccentuation may be local.

3.4 One morphological word that forms two prosodic words

We have seen word prosody extending beyond the morphological word. In this section we look at the reverse situation, where single words are split into two ω s. The first pattern occurs regularly in a set of words, most of which end in *-iv*, and where the result is two maximal ω s. The word type exhibits three different

prosodic shapes, and for the segmentally homophonous ones, the different prosodies are often associated with different word meanings. The first is final main stress and accent 1, as in (26a), the second has prosodic compound shape and accent 2, as in (26b). The third pattern contains two separate maximal ω s, exhibiting two separate instances of accent 1, as in (26c), which is the same prosody as real phrases like those in (26d).

(26) *Variable prosodic word formations from one morphological word*

- | | | |
|----|---|-----------------------|
| a. | (objek ¹ tiv) _{ωmin=max} | 'lens' |
| | (posi ¹ tiv) _{ωmin=max} | 'barrel organ' |
| | (nega ¹ tiv) _{ωmin=max} | 'negative (of photo)' |
| b. | ² ((¹ adjek) _{ω} (¹ tiv) _{ω}) _{ωmax} | 'adjective' |
| | ² ((¹ substan) _{ω} (¹ tiv) _{ω}) _{ωmax} | 'noun' |
| | ² ((¹ infini) _{ω} (¹ tiv) _{ω}) _{ωmax} | 'infinitive' |
| c. | ¹ (objek) _{ωmax} ¹ (tiv) _{ωmax} | 'unbiased' |
| | ¹ (posi) _{ωmax} ¹ (tiv) _{ωmax} | 'positive' |
| | ¹ (nega) _{ωmax} ¹ (tiv) _{ωmax} | 'negative, ADJ' |
| d. | ¹ (bättre) _{ωmax} ¹ (liv) _{ωmax} | 'better life' |
| | (per ¹ sonligt) _{ωmax} (ar ¹ kiv) _{ωmax} | 'personal archive' |

The pattern in (26c) is mentioned in Bruce (1993), citing Kjellin (1978), who also makes the connection between the prosody of a two-word phrase like that in (26d) and the prosodic pattern in (26c). The similarity with a regular phrase is apparent in the regular plateau sandhi following big accents in Central Swedish (see Section 5.3 below, Bruce 1987, Myrberg 2010:102f.). When the words in (26c) carry a big accent, it appears on the initial syllable, and a plateau is created which stretches to the final stressed syllable.

It would appear that the phrasal shape of the *-iv* words in (26c) is related to the contrastive use of accents. One indication of this is that many of the words that have it come in pairs: *aktiv/passiv*, *explicit/implicit*, *positiv/negativ*. The same effect is in evidence with corrective accentuation in forms like (*kapri¹fol*) _{ω min=max} 'honeysuckle' (e.g. *Did you say (¹KIPri)(¹fol) _{ω max}? No I said (¹KAPri)(¹fol) _{ω max}!*).

A second pattern of words split into two prosodic ω s occurs in East Norwegian, at the level of the minimal ω , where the addition of an initial primary stress leads to the creation of a formal compound, always with postlexical accent 2, see (27).

(27) *East Norwegian formal compound formation* (Kristoffersen 2000:165)

- | | | | |
|--|---|---|--------------|
| (protes ¹ tere) _{ωmin=max} | > | ² ((¹ protes) _{ωmin} (¹ tere) _{ωmin}) _{ωmax} | 'to protest' |
| (selek ¹ tion) _{ωmin=max} | > | ² ((¹ selek) _{ωmin} (¹ tion) _{ωmin}) _{ωmax} | 'selection' |
| (bekka ¹ sin) _{ωmin=max} | > | ² ((¹ bekka) _{ωmin} (¹ sin) _{ωmin}) _{ωmax} | 'snipe' |

This pattern (also exemplified in (26b) above) can be interpreted as a tendency to stress initially what is perceived as a semantically coherent unit.

4. THE PROSODIC PHRASE (φ)

The primary defining property of the prosodic phrase (φ) is the presence of a big accent. Specifically, every big accent is the head of some φ , making the φ a prosodic domain defined in terms of culminativity, like the minimal/maximal ω .¹⁰

The big accent is a marker of the phrasal structure within clauses, and many clauses contain more than one big accent (e.g. (32)). An all-new sentence with a preverbal full NP subject normally contains at least two big accents, one within the preverbal XP and one within the VP. Further subdivision into more φ s is possible, and sometimes preferred. The φ thus interfaces with the syntactic structure at the level of the syntactic phrase, XP (Itô & Mester 2012, Selkirk 2011) rather than with the clause, as was implied by the term SENTENCE ACCENT used in the original work by Bruce (1977).¹¹ The correlation between syntactic phrases and big accents constitutes the main argument for separating the φ from the intonation phrase (ι), which governs the distribution of a set of other clause-related phenomena (Sections 5.1–5.3).¹²

The edges of φ s are induced primarily from three commonly assumed principles in prosody research: (i) prosodic prominences are heads of prosodic constituents (Selkirk 1984, Nespors & Vogel 1986, Truckenbrodt 1995), (ii) prosodic heads align with edges of their constituents (Féry & Samek-Lodovici 2006, Féry 2013), and (iii) syntactic constituents serve as a base for the formation of prosodic constituents (Itô & Mester 2012, Selkirk 2011). This means that the arguments for φ -edges are primarily theoretical. We assume no φ -edge tones (though it may turn out that an L boundary tone is possible/optional in the φ). Other phonetic correlates of φ -edges, such as final lengthening or pauses, have not received extensive study as regards Swedish, and therefore, we leave the correlates of φ -edges (beyond head alignment) for future research. At this point, we have no strong evidence from Swedish for recursion at the level of φ , and we will subsequently not make use of a distinction between minimal and maximal φ . Within Itô & Mester's (2007, 2012) model, applied in Section 3, this would mean that there are no known phonological rules that apply separately in the minimal and maximal φ , respectively.

Below, we take a closer look at the distribution of big accents in Swedish, inducing from this some generalizations for φ -phrasing. This discussion is primarily based on an experiment described in Myrberg (2015b), where 1200 sentences of the type in (28) below were studied with respect to the distribution of big accents. Information structural focus was on the VP in half of the sentences, as marked by the

subscript F in (28), and on the subject in the other half, see (33). The subscript G is to be interpreted as information structurally given. Small capitals in the examples here and henceforth mark words that carry big accents.

(28) *Phrasing experiment, sample sentence* (Myrberg 2015b)

[Den BRUNA $_{\omega}$ haren $_{\omega}$ med många $_{\omega}$ ungar $_{\omega}$] $_G$ [bor $_{\omega}$ i PARKEN $_{\omega}$] $_F$
the brown hare with many kids lives in park.the

Subjects varied in length between two and five ω s. The sentence in (28) shows an example with four maximal ω s. These are marked with subscript ω , but without brackets for expository purposes. In most examples in Sections 4 and 5, the minimal and maximal ω are coextensive. Therefore, any word marked with ω has both a stressed syllable and a big or small accent. Words not marked with ω have no big or small accent. We assume that function words and deaccented words are incorporated into the following maximal ω , see (23) above. We shall use the example sentence in (28) many times (albeit with different prosodic structure), and exclude the glossing below.

4.1 Obligatory φ in the preverbal constituent

A full NP in the preverbal position (often called the FUNDAMENT in Scandinavian literature, Diderichsen 1946) obligatorily contains at least one big accent and thus necessarily forms a φ . Even when a full NP in preverbal position is minimal (a single ω), it obligatorily has a big accent, as seen in (29). The requirement for φ -formation is thus not a simple reflex of phrase length, but is at least partly triggered by the syntactic boundary between the preverbal constituent and the rest of the clause.

(29) *Obligatory big accent in short preverbal NPs*

- a. (BIG) $_{\varphi}$ (BIG) $_{\varphi}$
 [ANNA $_{\omega}$] $_G$ [VÄNDE $_{\omega}$] $_F$
Anna turned
- b. *() $_{\varphi}$ (BIG) $_{\varphi}$
 [ANNA $_{\omega}$] $_G$ [VÄNDE $_{\omega}$] $_F$
Anna turned

However, when the preverbal position contains a pronoun, or another word that does not have lexical stress and therefore does not form a minimal or maximal ω of its own, the preverbal constituent usually does not form a φ . Unstressed words (words not marked ω) in the preverbal position are instead incorporated in the φ together with the VP, as in (30a) below. It should be noted that it is possible for unstressed words to be assigned ω -status, i.e. to be realized with both stress and accent when called for by information structure (e.g. in a contrastive topic reading). In these cases,

4.3 Optionality in φ -phrasing

Long and/or syntactically complex preverbal XPs, as in (31), optionally form two or more φ s. The alignment of XP-edges with φ -edges is thus subject to considerable variation (Myrberg 2013a, 2015b). The constraints that impose the alignment between the XP in syntax and the φ in prosody must therefore be assumed to interact with a number of other constraints.

The preverbal constituent in (31) consists of two XPs. These two XPs are frequently (but not obligatorily) separated prosodically, forming separate φ s. In such cases, the first φ is usually left-headed, while the following φ or φ s are right-headed, as in (32a). However, it is also possible to have two right-headed φ s, as in (32b), or indeed two left-headed ones, as in (32c). For a detailed discussion of these phrasing options and frequencies, see Myrberg (2015b).

(32) *Headedness options with multiple φ s in the preverbal constituent*

- a. (BIG) φ (BIG) φ (BIG) φ
 [Den BRUNA ω haren ω med många ω UNGAR ω]_G [bor ω i PARKEN ω]_F
- b. (BIG) φ (BIG) φ (BIG) φ
 [Den bruna ω HAREN ω med många ω UNGAR ω]_G [bor ω i PARKEN ω]_F
- c. (BIG) φ (BIG) φ (BIG) φ
 [Den BRUNA ω haren ω med MÅNGA ω ungar ω]_G [bor ω i PARKEN ω]_F

4.4 The rest of the clause

We have looked at the preverbal constituent and should also comment briefly on the prosodic phrasing of the remainder of the clause, which contains the finite and nonfinite verbs, objects, adverbials, and sometimes also the subject (which appears to the right of the finite verb when not in the preverbal position). The verb and its complement(s) frequently form a single φ when complements are short. Long verbal complements may form a φ of their own. Adjuncts frequently also form their own φ .¹³ Many details remain to be understood in this area, but in general it can be said that observations previously made for pitch accent distribution in West Germanic languages like German and English also apply to the distribution of big accents in Swedish (e.g. Selkirk 1984, Féry 1993). See further Myrberg (2010, 2013a, b), and Myrberg & Riad (forthcoming).

4.5 Focus, givenness and φ -phrasing

In addition to constituent length and ω -status, φ -phrasing is also affected by information structural focus and givenness. To the right of a focus, there are normally no φ -heads, as illustrated by the absence of a big accent on *parken* ‘the park’ in (33a–c).

of these three phenomena, interfaces with syntactic structure at the level of the clause.

5.1 *The head of ι : The nuclear accent*

The ι is always right-headed, i.e. the rightmost φ within an ι contains the head of that ι , which will be referred to here as the nuclear big accent. Technically, the nuclear accent is the head of a φ as well as an ι , and indeed also of a maximal ω .¹⁴

The term nuclear accent has been widely used in the literature on West Germanic languages to refer to the rightmost accent of a sentence, i.e. in a manner similar to our use of the term (e.g. Chomsky & Halle 1968, Pierrehumbert 1980, Selkirk 1984). However, it does not have a strong tradition in the literature on Swedish, where the primary distinction has been between big versus small accents (or variants of these terms, e.g. ‘focal’ versus ‘nonfocal’ accents), since Bruce (1977). Subtypes of the big and small accents have not received much attention.

We argue that there are empirical grounds for distinguishing nuclear from prenuclear big accents in Swedish. The nuclear accent is characterized by three distinct features, which are simultaneously fulfilled in canonical cases, such as (34), but not always (Myrberg 2015a, Myrberg & Riad, forthcoming).

First, just like in the West Germanic languages, there is a strong requirement that information structural focus be marked with a nuclear accent (Bruce 1977, Heldner 2001, Myrberg 2010, Myrberg & Riad, forthcoming), i.e. that the focus carry the rightmost accent in the ι . Big accents to the right of a focus therefore become deaccented, as in (34b) below, also (33) above. We can refer to this as postnuclear/postfocal deaccentuation, but note that only big accents are targeted. Small accents remain unaffected by postnuclear deaccentuation. In (34), nuclear accents are indicated in bold small caps and prenuclear accents in plain small caps. Curly brackets represent ι -edges. Prosodic words are marked ω , but without brackets in these representations.¹⁵

(34) *Nuclear accents (ι -heads) appear rightmost in the clause, or rightmost in a focus*

- a. $\{ (\text{BIG})_{\varphi} (\text{BIG})_{\varphi} (\text{BIG})_{\varphi} \}_{\iota}$
 [Den BRUNA ω haren ω med många ω UNGAR ω]_G [bor ω i PARKEN ω]_F
- b. $\{ (\text{BIG})_{\varphi} (\text{BIG})_{\varphi} \}_{\iota}$
 [Den BRUNA ω haren ω med många ω UNGAR ω]_F [bor ω i parken ω]_G

The nuclear accent that marks focus is obligatorily aligned with the right edge of the focused constituent. Consequently, a left-headed φ can only ever project to a nuclear accent under a narrow focus reading, as in (35a). The structure (35b) is illicit because the nuclear accent is left-aligned in the focused constituent. We conclude

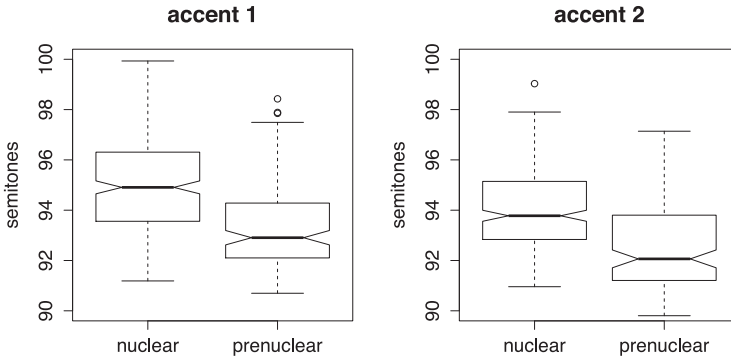


Figure 2. The highest f_0 point in nuclear versus prenuclear big accents for accent 1 and accent 2. An example of the contrast is given in (34), with nuclear accent 2 on *ungar* ‘kids’ in (34b), and prenuclear accent 2 on *ungar* in (34a).

from this that left-alignment of the head, which is frequently observed at the φ -level, is ungrammatical at the ι -level in Swedish (unless forced by the presence of a narrow focus).¹⁶

(35) *The ι is not left-headed unless forced by narrow focus*

- a. $\{(\text{BIG } \text{[Den [BRUNA}_\omega\text{]}_F \text{ haren}_\omega \text{ med många}_\omega \text{ ungar}_\omega \text{ bor}_\omega \text{ i parken}_\omega\text{]})_\varphi\}_\iota$
 b. $\{*(\text{BIG } \text{[Den BRUNA}_\omega \text{ haren}_\omega \text{ med många}_\omega \text{ ungar}_\omega \text{ bor}_\omega \text{ i parken}_\omega\text{]})_\varphi\}_\iota$

The second property of the nuclear accent is its obligatory position in the sentence. The nuclear accent cannot be moved to another word in the sentence without significantly changing the reading of the sentence. This is in contrast with the prenuclear accents, which were shown to exhibit distributional variation in Section 4.

Thirdly, nuclear accents exhibit phonetically higher scaling than prenuclear accents. Myrberg (2015b) shows that prenuclear accents on *ungar* ‘kids’ in (34a), has a lower f_0 maximum than nuclear accents in the same position of the sentence, see *ungar* in (34b). This is illustrated in Figure 2, adapted from Myrberg (2015b).

Similarly, a nuclear accent that signals all-new focus, as on *taxin* ‘the taxi’ in (36a), is lower scaled than a nuclear accent that signals narrow or contrastive focus, as *taxin* in (36b–c) (Myrberg 2013b).¹⁷

(36) *Sentence-initial nuclear accents with intransitive predicates*

- a. Vad har hänt?
what has happened
 [TAXIN_ω har kommit fram_ω]_F
taxi.the has arrived PRT

- b. Vad har kommit fram_ω?
what has arrived PRT
 [TAXIN_ω]_F har kommit fram_ω
taxi.the has arrived PRT
- c. Har bussen_ω kommit fram_ω?
has bus.the arrived PRT
 [TAXIN_ω]_F har kommit fram_ω
taxi.the has arrived PRT

To our knowledge, no study has shown that prenuclear and nuclear big accents are perceptually distinct in Swedish. It would seem likely that such a distinction could be found, but we must leave the testing of this hypothesis to future research.

5.2 φ -sequencing

In addition to controlling the distribution of edge tones and nuclear accents, ι governs the sequencing of φ s. The very existence of constraints on φ sequencing suggests that there is a prosodic structure that is larger than the φ . These constraints thus constitute further evidence for the ι in Swedish.

Within ι , φ s can be left- or right-headed, but they may not occur in any order (Myrberg 2015b). As was illustrated in (32), partly repeated in (37), an ι may consist of three φ s.

(37) *Illicit and licit φ -sequences inside the ι*

- a. $\{(\text{BIG})_{\varphi} (\text{BIG})_{\varphi} (\text{BIG})_{\varphi}\}_{\iota}$
 [Den BRUNA_ω haren_ω med många_ω UNGAR_ω]_G [bor_ω i PARKEN_ω]_F
- b. $\{(\text{BIG})_{\varphi} (\text{BIG})_{\varphi} (\text{BIG})_{\varphi}\}_{\iota}$
 [Den BRUNA_ω haren_ω med MÅNGA_ω ungar_ω]_G [bor_ω i PARKEN_ω]_F
- c. * $\{(\text{BIG})_{\varphi} (\text{BIG})_{\varphi} (\text{BIG})_{\varphi}\}_{\iota}$
 [Den bruna_ω HAREN_ω med MÅNGA_ω ungar_ω]_G [bor_ω i PARKEN_ω]_F
- d. * $\{(\text{BIG})_{\varphi} (\text{BIG})_{\varphi} (\text{BIG})_{\varphi}\}_{\iota}$
 [Den BRUNA_ω haren_ω med MÅNGA_ω ungar_ω]_G [BOR i parken_ω]_F

Of these, the initial one is often (but not obligatorily) left-headed, (37a). If the initial φ is left-headed, the medial φ may also be left-headed (37b). However, (37c), where the initial φ is right-headed and the medial φ is left-headed, is not possible. It is also not possible to have a final left-headed φ as in (37d), since the ι -final φ contains the ι -head, and recall from (35) that an ι -head may not be projected from a left-aligned φ -head, unless required by a narrow focus.

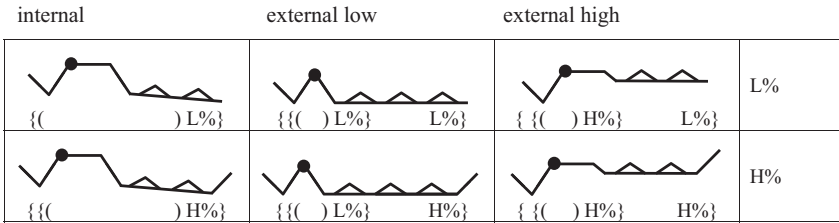


Figure 3. Right edges of ι in Stockholm Swedish (from Myrberg 2010). The dot represents the endpoint of the nuclear accent. The area to the right of the nuclear accent is the postnuclear area. Triangles inside the postnuclear area represent small accents.

5.3 Right-edge boundary tones and postnuclear areas

In addition to the differences between ι -heads and φ -heads, these two phrase categories are different in terms of their edge cues. While the φ has no strong edge correlates beyond the alignment of φ -heads with φ -edges (indirectly evidenced via syntactic structure, Section 4), the ι has a rather rich set of options at its right edge. The claim that these edge options are associated with the ι implies that these are options that the speaker has at 'larger breaks', hence ι -breaks. These options are not available at φ -breaks, i.e. between any two big accents. A sentence may be divided into two ι s (commonly one ι for the preverbal constituent and one ι for the rest of the clause), or even more than two ι in some types of speech. When there are two foci in one sentence, we also assume that the sentence is divided into two ι s in order for each focus to have its own nuclear accent. In such cases, it would be possible to have boundary tones between big accents inside the sentence.

The options for the right edge of ι are summarized in Figure 3, from Myrberg (2010).¹⁸ Each black dot represents the rightmost high tone in a nuclear big accent L*H or H*LH (in some previous literature this tone is referred to as the FOCUS TONE, e.g. Bruce 2007). The area following the dot is the POSTNUCLEAR AREA, i.e. the area to the right of a nuclear accent. The triangles represent small accents inside the postnuclear area. The number of small accents is dependent on the number of maximal ω s contained in that area. In Figure 3, the abstract examples contain three such accents, but in a given sentence, there may be more or fewer.

We distinguish two right-edge boundary tones: H% (high or rising f₀) and L% (low or falling f₀). These are represented on the two rows in Figure 3. In addition, we distinguish between postnuclear areas that contain only one ι -boundary tone, and areas that contain two ι -boundary tones. We refer to areas with one boundary tone as INTERNAL areas (the postnuclear area is internal to the ι that contains the nuclear accent). These ι s always have a high plateau between the nuclear accent (H*LH or L*H) and the following small accent (H*L or HL*).

Much remains to be understood regarding the function of the six edge types in Figure 3. Areas containing only low tones (L%L% and L%) are probably the most commonly used, being the neutral choice for statements as well as questions. Areas containing high tones are used for lists and to signal continuation. However, such areas are not consistently employed to signal e.g. questions (House 2003, 2004), otherwise a common fact in Germanic languages. The function and use of the different types of structures that end high and rising will also need to be identified by future research.

6. CONCLUSION

In this article, we have summarized the arguments for three levels of the prosodic hierarchy in Swedish: ω , φ and ι . While Swedish is a Germanic language, sharing many intonational features with West Germanic, the separation of stress from lexical accent, and the distinction between big and small accents evidence a richness of structure that is lacking in West Germanic, and that, as we have shown, greatly affects the definitions of the prosodic categories. This complex structure necessitates a distinction between maximal and minimal ω , as well as between left- and right-headed φ . As regards the ι -level, Swedish appears to have fewer options than West Germanic languages (Gussenhoven 2004). There is in principle only one option for the ι -head, whereas many more are commonly taken to exist in West Germanic languages like English (e.g. Pierrehumbert 1980). For postnuclear areas in Swedish, a relatively rich set of options are available. However, the use of rising intonation is more limited than in West Germanic languages.

The differences between West Germanic and Swedish in terms of which phonological rules apply within ω , φ and ι , do not, however, preclude deeper similarities between these language groups. Many resemblances are still in evidence in terms of the strong interdependence between intonation and the expression of information structural focus and givenness, as well as the signaling of different types of morphosyntactic structure.

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NOTES

1. In the literature, similar phrase types have been called e.g. phonological phrase (e.g. Nespor & Vogel 1986), intermediate phrase (Beckman & Pierrehumbert 1986), and major phrase (McCawley 1968).
2. We leave prosodic structure below the prosodic word aside in this article, but see e.g. Inkelas (1989) and Downing (1999, 2006) for general discussion, and Riad (2014) for a discussion of Swedish.
3. We should distinguish phonological stress from rhythmic prominence. Rhythmic prominence, to the extent one perceives it, only leaves phonetic traces like slight lengthening of every other syllable (Strangert 1985:Chapter 4; Bruce 1998:89ff.). There is no clear location of lengthening in either the vowel or the consonant, as is the case in lengthening due to phonological stress. Also, in some words, the placement of rhythmic prominence (marked with subscript x) varies, e.g. in ${}_x\text{magneti}'\text{sera}$ or $\text{mag}_x\text{neti}'\text{sera}$ 'to magnetize'.
4. As Bruce (1998:50) notes, accent tends to vary between dialects more in uninflected and undervived forms than in the suffixed forms.
5. Note, however, that an unstressed, adjoining prefix inhibits lexical accent 2 (as in (16c–d)) for a reason different than anacrusis within the minimal prosodic word (see (13c–d)), even though the initial syllable in both cases is unstressed. Adjunction always inhibits accent 2, but anacrusis only does so with weak suffixes.
6. For a model based on largely the reverse assumptions (lexical or postlexical accent 1, only postlexical accent 2), see Lahiri, Wetterlin & Jönsson-Steiner (2005), Wetterlin (2010).
7. Due to the sensitivity of accent assignment to forms with anacrusis, the relevant comparison should be made with a strong suffix, such as $-\text{are}_2$ (see (13c), Riad 2014:242ff.).
8. The formation of a complex maximal ω with two stresses and accent 2 is apparently not an option.
9. Presumably, this subordination is related to the process of lexicalization, the details of which lie beyond the scope of this paper.
10. Almost all φ s are headed by a big accent. However, there is a small number of exceptions to this, e.g. in the confirmation sentences, as discussed by Ambrazaitis (2009).
11. However, in Section 5 we will introduce a distinction between NUCLEAR big accents and PRENUCLEAR big accents, where a nuclear big accent is the head of a φ , which in turn is the head of an ι . Nuclear big accents, then, indeed relate to clausal structure.
12. In this respect, our model differs from the Lund model, where no distinction is made between φ and ι . For discussion, see Hansson (2003) and Myrberg (2010).
13. With some intransitive verbs, the VP can lack a big accent, thus incorporating into a PP together with a subject that carries a big accent, as in (i).
 - i. (TAXIN har kommit)_{PP}
taxi.the has arrived
14. There is a small number of cases where one may want to analyze a non-final big accent as the nuclear accent, specifically in cases of postnuclear Second Occurrence Focus as described in Myrberg (2015a). See also Myrberg & Riad (forthcoming).
15. In all-new sentences, the nuclear accent generally appears rightmost, making (34a) prosodically similar to an all-new reading. This is deductible from the discussion in Section 4, where the basic rules of big accent distribution are laid out. Some adjunct adverbials are exempt from this generalization, as are some intransitive predicates that

- allow the nuclear accent to appear on the subject in all-new readings, see (36), and note 13.
16. The rightmost φ -edge in (35) could also be located directly after *bruna* 'brown', leaving the postnuclear area extrametrical at the level of the φ . See also the discussion of (33), and the EXTERNAL LOW/HIGH areas in Figure 3.
 17. *Kommit fram* 'arrived' is a lexicalized verb+particle combination. Verbs that are followed by a particle are stressed but receive no accent, see (22) and (23).
 18. See Myrberg (2010) for illustration of each option with real contours.

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