

Prosodic constituents in the representation of consonantal sequences in Polish

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1 Introduction

The aim of this paper is to show what role prosodic constituents, especially the foot and the prosodic word play in Polish phonology. The focus is placed on their function in the representation of extrasyllabic consonants in word-initial, word-medial, and word-final positions.

The paper is organized as follows. In the first section, I show that the foot and the prosodic word are well-motivated prosodic constituents in Polish prosody. In the second part, I discuss consonant clusters in Polish focussing on segments that are not parsed into a syllable due to violations of the Sonority Sequencing Generalisation, i.e. extrasyllabic segments. Finally, I analyze possible representations of the extrasyllabic consonants and conclude that both the foot and the prosodic word play a crucial role in terms of licensing. My proposal differs from the ones by Rubach and Booij (1990b) and Rubach (1997) in that I argue that the word-initial sonorants traditionally called extrasyllabic are licenced by the foot and not by the prosodic word (cf. Rubach and Booij (1990b)) or the syllable (cf. Rubach (1997)). For my analysis I adopt the framework of Optimality Theory, cf. McCarthy and Prince (1993), Prince and Smolensky (1993), in which derivational levels are abandoned and only surface representations are evaluated by means of universal constraints.

1.1 Stress assignment

In comparison with other Slavic languages Polish has predictable stress¹ and the foot plays a crucial role in its assignment. Feet are maximally bisyllabic and left-headed. Primary stress falls on a penultimate syllable, while a secondary stress is assigned to an initial syllable.² Kraska-Szlenk (1995) also mentions tertiary stress which falls on every odd syllable – except for the initial one – starting from the left edge of the word, i.e. every foot head.

In (1) some examples illustrating stress assignment are shown. Feet are indicated by parentheses, ‘1’ marks primary stress, ‘2’ shows the placement of the secondary stress and ‘0’ indicates no stress, a dot corresponds to a syllable boundary and ‘+’ to a morpheme boundary.

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¹ Most Slavic languages, e.g., Belorussian, Bulgarian, Russian, and Ukrainian have a lexicalized stress system. For comparison of the prosodic systems of Slavic languages see Rochoń (in prep.).

² There are a few exceptions to this rule in foreign words and in stem+clitic structure, cf. discussion below, in which stress falls on the antepenultimate syllable.

(1) Stress assignment in Polish

a. grymas ‘grimace’ nom.sg.

1 0
(gry.mas)

b. grymaś+ny ‘fussy’ adj.masc.nom.sg.

0 1 0
gry.(ma.□ny)

c. grymaś+nic+a ‘fussy girl’ nom.sg.

2 0 1 0
(gry.ma) (śni.ca)

d. grymaś+nic+ami ‘fussy girl’ instr.pl.

2 0 0 1 0
(gry.ma.) □ni.(ca.mi)

The stress pattern presented in (1) leads to the conclusion that suffixes create with stems prosodic words. This is shown in (2). In the following the prosodic word will be abbreviated ‘ ω ’.

(2) [(gry.ma.) □ni.(ca.mi)] ω

As far as prepositions are concerned, they are generally not stressed. Consider examples in (3) showing that prepositions like *do* ‘to’, *przez* ‘through’ *przed* ‘in front of’ are not accented when they occur before nouns, cf. Dogil (1999:834).

(3) do domu ‘to home’

0 (1 0)

przez miasto ‘through the city’

0 (1 0)

przed teatrem ‘in front of a theatre’

0 0 (1 0)

The patterns in (3) suggest that prepositions are not incorporated into a prosodic word with the following stem, because they do not bear a secondary stress. This is shown in (4).

(4)

przed teatrem ‘in front of a theatre’

0 [0 (1 0)] ω

Interestingly, there are prepositions which behave in a different way, i.e., in some phrases

1.2 Syllabification

In many languages syllabification is generally considered to be one of the most important diagnostics used for the determination of prosodic words, cf. Booij (1985), Nespor & Vogel (1986), Hall & Kleinhenz (1999). In the following, I test this diagnostic in Polish with respect to (i) prefixes, (ii) suffixes, and (iii) prepositions in order to analyze their prosodic representation and to show how it corresponds with other diagnostics, i.e., stress assignment and phonological rules.

One of the reasons for assuming that prefixes in Polish are independent prosodic words is that the final consonants of prefixes are not resyllabified into the onset of the initial stem syllable. Consider the examples in (12). It is important to note that in Polish *dr-* and *dń-* are legitimate syllable onsets as in *droga* ‘road’ nom.sg. and *dnia* ‘day’ gen.sg.

- (12) nad+rywać nad.rywać ‘to strain’ imper.inf.
 pod+niesć pod.niesć ‘to raise’ perf.inf.

In other words, the syllabification in (12) suggests that prefixes are ‘noncohering’ in the sense that they do not belong to the prosodic words of the stem but create separate prosodic words. One could alternatively argue that prefixes like the ones in (12) are not dominated by their own prosodic words. Both representations are shown in (13a) and (13b), respectively.

- (13) a. podnieść → (pod)_ω(niesć)_ω ‘to raise’ perf.inf.
 b. podnieść → pod (niesć)_ω ‘to raise’ perf.inf.

Considering the data in (12) one can also conclude that the decisive role in the syllabification is played not by a *prosodic word* boundary but rather by a *morphological* boundary between a prefix and a stem (nad+rywać). This possibility is confirmed by the syllabifications of prefixes with vowel-initial stems, cf. examples in (14).

- (14) pod+odcinek pod.odcinek *po.docinek ‘subection’ nom.sg.
 pod+orać pod.orać *po.dorać ‘to give a first ploughing’ inf.

The examples presented in (14) show that even if a stem begins with a vowel, no resyllabification across word-boundaries takes place.⁴ In terms of constraints one can also argue that the impossibility of resyllabification in (14) is caused by the left stem bracket blocking resyllabification, cf. Rubach and Booij (1990). In OT a constraint guaranteeing that the left edge of a stem and the left edge of a syllable align would be higher ranked than a constraint prohibiting syllables without onsets, cf. McCarthy and Prince (1993).

⁴ It is interesting to notice that Szpyra (1989) maintains that final consonants of prefixes like those in (12) can be resyllabified. For example, words like *pod+oficer* ‘non-commissioned officer’ and *nad+użyć* ‘to abuse’ may be syllabified not only as *pod.oficer* and *nad.użyć* but also as *po.doficer* and *na.dużyć*, respectively, cf. Szpyra (1989:203). However as she admits herself, her statement is not confirmed experimentally.

However, there is at least one important argument against the representations in (13). The most serious piece of evidence is provided by stems beginning with an extrasyllabic segment (sonorant). The examples presented in (15) show that (i) the resyllabification of a stem-initial extrasyllabic segment into the coda of a preceding vowel-final prefix takes place and (ii) the left edge of a stem and the left edge of a syllable do not have to coincide. Their alignment is optional as shown by the alternative syllabifications in (15).

- (15) o+mdleć o.mdleć or om.dleć ‘to faint’
 po+mścić po.mścić or pom.ścić ‘to revenge’
 za+rdzewieć za.rdzewieć or zar.dzewieć ‘to get rusty’

In light of the facts sketched above the data in (15) question the initial assumption that prefixes are separate prosodic words.⁵ It cannot be the case that the same prefix followed by the same stem is sometimes a prosodic word and sometimes not. The conclusion that follows from the data in (15) is that prefixes are not prosodic words since they do not create domains for syllabification.⁶ Other diagnostics which are helpful in determining prosodic words are analyzed below.

As far as suffixes are concerned, they are usually assumed to create together with a stem one prosodic word, cf. Kraska-Szlenk (1995). A convincing piece of evidence comes from the syllabification: the final consonant of a stem is always parsed into the onset of the following suffix. Consider the examples in (16).

- (16) przedszkol+ak przedszko.lak ‘nursery school child’ nom.sg.
 odwiedzając+y odwiedzają.cy ‘visitor’nom.pl.

The structures in (16) must be dominated by a prosodic word given the organization of a prosodic hierarchy and constraints on prosodic domination, cf. Selkirk (1995). In (17) a representation of a vowel initial suffix is shown.

- (17)

⁵ One may also conclude that prefixes ending in a consonant like those presented in (14) are prosodic words and those ending in a vowel as in (15) are not. It is indeed very difficult to prove this hypothesis because of the lack of relevant data. Words with a consonant-final prefix and a stem beginning with an extrasyllabic consonant (e.g. *pod+rdzewieć* ‘to start to rusty’) are rare. As expected, they are syllabified as *pod.rdzewieć*. However, if vowel-final prefixes were not prosodic words, the question would arise as to why the syllabification *o.mdleć* is possible.

⁶ A possible explanation for these data would require a constraint militating against extrasyllabicity that outranks the alignment constraint mentioned above. This proposal has to be checked against various kinds of data which is beyond the scope of this article.

The representation in (17) shows that the structures in (16) are prosodic words, as shown in (18).

- (18) [przed.szko.l+ak]_ω
 [od.wie.dza.ją.cy]_ω

A different situation occurs in prepositional phrases. Final consonants of prepositions are never resyllabified into the onset of following vowel-initial word for the simple reason that the resyllabification across word-boundaries is not allowed in Polish, cf. Rubach and Booij (1990b). In (19), some examples confirming this generalization are given.

- | | | | |
|------|------------------|------------------|--------------------|
| (19) | przed śniadaniem | przed.śniadaniem | ‘before breakfast’ |
| | po szkole | po.szkole | ‘after school’ |
| | nad miastem | nad.miastem | ‘over the city’ |

To sum up, taking the syllabification as a diagnostic for determining prosodic words we come to the conclusion that suffixes create together with stems prosodic words, while prepositions and all other word classes, being never resyllabified, are not incorporated into following prosodic words. The prosodic status of prefixes is not unambiguous, especially if one considers the syllabification as the only diagnostic. Therefore, in order to find out adequate representations of prefixes, other factors have to be taken into consideration, cf. analyses given below.

1.3 Phonological processes

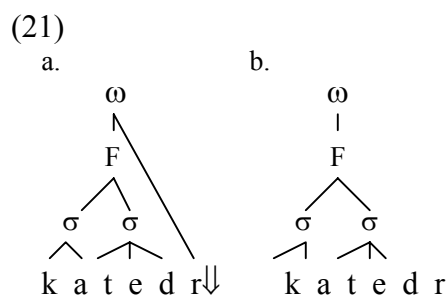
In the following I discuss some phonological processes whose domain is the prosodic word. These rules are: final devoicing (1.3.1), and Lower: vocalisation of yers (1.3.2).

1.3.1 Final devoicing

Another piece of evidence for the role of a prosodic word in Polish can be gained from final devoicing. As has been argued by Rubach and Booij (1990), a prosodic word creates the domain for final devoicing in Polish. In this section I summarize this evidence. Relevant examples are shown in (20). Note that the process is motivated by morphophonemic alternations, e.g., pró[k] – pro[g]i ‘threshold’ nom.sg./nom.pl. go≥a[p] – go≥e[b]ia ‘pigeon’ nom.sg./gen.sg.

- | | | | |
|------|----------|-----------|---------------------|
| (20) | pró/g/ | pró[k] | ‘threshold’ nom.sg. |
| | gra/d/ | gra[t] | ‘hail’ nom.sg. |
| | go≥a/b/ | go≥a[p] | ‘pigeon’ nom.sg. |
| | g≥a/z/ | g≥a[s] | ‘stone’ nom.sg. |
| | gra/m/ | gra[m↓] | ‘gram’ nom.sg. |
| | kate/dr/ | kate[tr↓] | ‘cathedral’ gen.pl. |

The last example in (20), in which the extrasyllabic sonorant *r* is devoiced shows that the prosodic word and not the syllable is the domain of final devoicing, cf. discussion on extrasyllabicity in section 2. In (21a) a representation is shown in which the devoicing of an extrasyllabic *r* is motivated by its prosodic word final position while the extrasyllabic *r* in (21b), is not devoiced because it is not linked to a higher constituent.



As far as prepositions are concerned, their final consonants undergo devoicing only if they occur without the following noun, as shown in (22). Note that the voiced consonants in the underlying representations are motivated by alternations such as *po[d]e* ‘under’ and *na[d]e* ‘above’ in which a final vowel appears in some contexts, for details see 1.3.2.

- (22) *po[d/ i na[d/* → *po[t] i na[t]* ‘under and above’
po[d/ lub na[d/ → *po[t] lub na[t]* ‘under or above’

If the prepositions are followed by nouns, the final consonants do not devoice, cf. examples in (23).

- (23) *nad miastem* *na[d]. miastem* ‘over the city’
pod. ochroną *po[d]. ochroną* ‘to be preserved’

This evidence suggests a prosodic structure as presented in (24) where both prepositions are prosodic words.

- (24) [*pod*]_ω i [*nad*]_ω

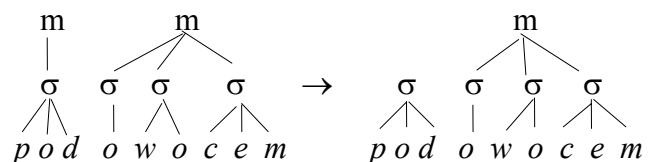
If *pod* and *nad* occur as prepositions (*po[d] owoce* ‘under a fruit’) and prefixes (*po[d]oficer* ‘non-commissioned officer’) they do not undergo final devoicing, but the evidence in (22) leads Rubach and Booij (1990) to the conclusion that *pod* and *nad* are prosodic words. In light of this conclusion Rubach and Booij propose either erasing the right bracket] of the prepositions when they occur in a proclitic position or erasing the node *mot*⁷. In (25)a and (25)b both proposals are illustrated by a phrase *pod owoce* ‘under a fruit’, cf. Rubach and Booij (1990:440).

⁷ *Mot* is another term for a prosodic word.

(25)a. Erase the bracket] in a proclitic position

[pod] [owocem] → [pod [owocem]]

b. Erase the node mot in a proclitic position



Both options presented in (25) account for the fact that prepositions which are prosodic words do not undergo final devoicing when they occur in a proclitic position. The structure in (25)b also shows that final devoicing cannot be syllable final because [d] remain voiced.

In contrast to *pod* and *nad*, two other prepositions *z* ‘with’ and *w* ‘in’ are not devoiced even if they occur in non proclitic position, cf. (26).

(26) *z i w* → [z] i [v] ‘with and in’
z lub w → [z] lub [v] ‘with or in’

The lack of final devoicing in an isolated position suggests that *z* and *w* are not prosodic words, as shown in (27). Since they consist of a single consonants, they also violate a word minimality condition.

(27) *[z]_ω *[v]_ω

Additional evidence for (27) follows from the fact that *z* and *w* consist of a single consonant which is resyllabified to the following stem, e.g., *z+robić zro.bić* ‘to do’ inf. perf., cf. also additional evidence in Cetnarowska (this volume).

To sum up, the prosodic word creates the domain of final devoicing in Polish. Prefixes/prepositions such as *pod* and *nad* undergoing final devoicing are prosodic words while others such as *z* and *w* remain voiced and therefore cannot be considered as prosodic words.

1.3.2 Lower: vocalisation of yers

Another piece of evidence supporting the importance of a prosodic word in Polish phonology is provided by a rule called Lower (vocalisation of yers), cf. Rubach (1984). In the following I review main points of Rubach’s (1984) and Szpyra’s (1986) approaches to Lower.

According to Rubach (1984), underlying abstract vowels called yers either show up on the

surface as *e* [ɛ] (or *y* [→]) or they are deleted. This is shown in (28), cf. Rubach (1984:185). A yer is defined featurally as [+syll], [+high], and [-tense].

(28) a. Yer Surfacing (Lower)

$$\begin{bmatrix} \text{+syll} \\ \text{+high} \\ \text{-tense} \end{bmatrix} \rightarrow \text{[-high]} / \text{--- Co } \begin{bmatrix} \text{+syll} \\ \text{+high} \\ \text{-tense} \end{bmatrix}$$

b. Yer Deletion

$$\begin{bmatrix} \text{+syll} \\ \text{+high} \\ \text{-tense} \end{bmatrix} \rightarrow \emptyset$$

The rules in (28) show that a yer is lowered to *e* before a yer occurring in the next syllable. Otherwise, the yer is deleted. An investigation of morphologically derived words with respect to Lower reveals that prefixes are separate prosodic words. This conclusion follows from a vowel alternation in prefixes because prefixes – in contrast to suffixes – create their own domains for Lower. In his derivational approach Rubach (1984) proposes that prefixes are separate prosodic words, in which Lower applies. An example of derivational steps yielding a prefix+stem+suffix structure is shown in (29), cf. Rubach (1984:227f). Note that after suffixation Lower reapplies, but its domain is enlarged: it is now a prosodic compound that consists of two prosodic words.

(29)

cycle 2	(roz î) _ω (j îm) _ω	(roz î) _ω (j îm) _ω
Lower	- -	- -
cycle 3	(roz î) _ω (jîm+ov) _ω	(roz î) _ω (jîm+îc) _ω
Lower	- -	- (jem+îc) _ω
cycle 4	(roz î) _ω (jîm+ov+1) _ω	(roz î) _ω (jem+îc+a) _ω
Lower	- -	- -
Phonological	((roz î) _ω (j î m+ov+1) _ω) _ω '	(roz î) _ω (jem+îc+a) _ω
Compound		
Lower	((roze) _ω (j î m +ov+1) _ω) _ω '	((roz î) _ω (jem+îc+a) _ω) _ω '
Postcyclic		
Yer Deletion	((roze) _ω (jm +ov+1) _ω) _ω '	((roz) _ω (jem+c+a) _ω) _ω '
	rozejmovy	rozjemca

Unfortunately, Szpyra (1989) observes that Rubach's proposal leads to false outputs in

some cases, e.g., structures such as (bezi)_ω(p≥î(+ov+1))_ω ‘sexless’ or (odî)_ω(vî□+1+î)_ω ‘delouse’ are incorrectly predicted to be *[bezepw(ow1)] or *[odef□1(î)] instead of [bespw(ow1)] and [otf□1(î)], respectively. In order to account for these and other forms, Szpyra (1989) claims that the same prefix may have a different prosodic representation which depends on the grammatical features of a stem. If a prefix is adjoined to a verbal stem which contains an alternating vowel, it forms together with a stem a prosodic word. In other cases the same prefix is a separate prosodic word. Both representations are shown in), cf. Szpyra (1989:215). (Pref=Prefix, C=consonant, î= alternating vowel, VS= verbal suffix, V=verb).

$$(30) \quad \left[\begin{array}{l} \text{(Pref+ [C î C(+VS)]V)}_{\omega} \\ \text{([Pref+])}_{\omega} \end{array} \right] \rightarrow \left[\begin{array}{l} \text{([Pref+])}_{\omega} \\ \text{([])}_{\omega} \end{array} \right]$$

In other words, the representations in (30) can be alternatively expressed as in (31a) and (31b), respectively.

(31) a. Prefixes with verbs containing a jer:

$$([\text{Prefix+verb}])_{\omega}$$

b. Prefixes with other stems containing a jer:

$$((\text{Prefix})_{\omega} + \text{noun})_{\omega}$$

To sum up, the prosodic word is an indispensable constituent for the application of the rule called Lower which shows that the prosodic structure of prefixes depends on the grammatical features of stems they are aligned to.

2 Consonant clusters in Polish

In the previous section I showed that the foot and the prosodic word play an important role in Polish phonology. In the following I argue that both constituents are also important for the representation of consonant clusters.

I begin the investigation by presenting consonant clusters attested in word-initial and word-final position. The clusters are systematized from a qualitative point of view, i.e., in terms of sonority, and from a quantitative point of view, i.e. in terms of the number of segments occurring in a cluster. As far as sonority distinctions are concerned, they are limited to the distinction between obstruents and sonorants. Many clusters are presented with a subscript to the right, e.g. <₁, ₂> which indicates the number of lexical items attested containing the given cluster. If the cluster occurs in some words that belong to the same semantic family but do not differ in grammatical category (noun, verb), it is counted as a

single cluster. (< * > marks clusters attested in foreign words.)

Clusters in word-initial position

In the following word-initial clusters are presented. As far as obstruent+sonorant, obstruent+obstruent, obstruent+obstruent+sonorant are concerned, only examples are provided. For a complete list see Rochoń (2000).

(32) Two-member consonant clusters

a. Obstruent+sonorant^{8,9} (examples)

pl	pw	pr	pn ₂	p> ₁	tl ₁	tl' ₁	tw ₁	t _r	t>	kl	kl'	kw
kr	kn	k>	km' ₃	bl	bw	br	b> ₁	dl ₃	dw	dr	dn ₁	dm ₁
gl	gw	gr	gn	g>	gm	gm' ₁	t ^s w ₁	t ^s n ₁	t ^s m ₂	t ^ã w	t ^ã m ₁	t ^ç m ₁
t ^ç m'	v+l	vw	v+w	vr	v+r	v+m	vn	v+n	v>	v+>	sr	sw
sn	sm	ãl	ãr	ãw	ãn ₃	ãm	ãm'	çl	çl'	çr	ç>	çm'

b. Obstruent+obstruent (examples)

pt ₁	ps	pã	pç ₃	px ₁	tk ₂	tt ^ã ₁	t□	tf	tf'	tx	t ^ã t ₁	t ^ã t ^ã ₁
t ^ã k ₁	t ^ã f ₁	t□p ₁	t□f'	kp' ₁	kt	kt ^ç ₁	kf	kf'	*ks	kç	kã	bz ₂
b□ ₁	bþ	db ₁	dv ₂	dv' ₁	dþ	d ^z v ₁	d ^ø g ₁	d ^ø v' ₁	d□d□ ₂	gb ₁	gd	gd ^ø ₁
gv	gv'	gz	g□	g□	f+p	f+p'	fk	f+k	ft	f+t	f+t ^s ₃	ft ^s
ft□	f+t□	f t□	f+t□	fs	f+s	f+□	f□	f+□	f+x ₁	sp	s+p	sp'

c. Sonorant+obstruent

lg ₁	lv ₁	lv' ₁	lp ₂	wk ₁	wb ₁	wg ₁	wz ₁	rt ₁	rd ₁	rd ^z ₂	rv ₃	rþ ₂
mg' ₁	mþ ₃	mã	mx ₁									

d. Sonorant+sonorant

mn ₃	m>	ml	mr	mw	ln ₁	l> ₁
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optional: *lj

(33) Three-member clusters

a. Obstruent+sonorant+obstruent

plf ₁	pwþ ₁	trf ₂	krf' ₁	krf ₁	krt ₁	brd ₁	brv' ₁	drg ₂	drv ₁	drv' ₁	drþ ₁	grd ₁
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⁸ I employ the symbols traditional in Slavic linguistics. The following is a list of these symbols and their IPA equivalents.

IPA transcription	Slavic transcription	IPA transcription	Slavic transcription
u	u	e~/en	/en
a~/om	≠/om	ʁ	ʁ
ʑ	>	tʃs	c/t ^s
tʃ	≠/t ^ç	tʃ♣ (tʃΣ)	~/t ^ã
dʃz	Z/d ^z	dʃ	Z↔/d ^ø
dʃ (dʃZ)	Z®/d ^b	ʃ	□
♣ (Σ)	□		□
(Z)	□	v	v

⁹ All affricates are treated as single segments as opposed to a sequence of stop+fricative, cf. Rubach (1994).

b. Obstruent+sonorant+sonorant

kl_n₂ kl>₁ km₁ *krj₁ brn₁ br>₁ *brj₁ *prj₁ *trj *drj zmr₁ z+mr₂
z+m>₁ smr₂

c. Sonorant+obstruent+sonorant

l□>₁ mdl₁ mdl'₁ mdw₁ mgl'₁ mgw₁ mg>₁ m□t□₁ rpn₁ rp>₁

d. Obstruent+obstruent+obstruent

pāt^ā₁ tkf'₁ d□v'₁ tāp'₂ tāt□₁ kāt₁ bzd₂ bpd₂ gpb'₁ gpd₁ f+pā₂
fsp fs+p
f+sp'₂ f+st f+sk f+sx₁ fāt^ā₂ fꞤtꞤ₃ v+zb v+zb'₂ v+zv₂ vzg₂ vzd₂ vpd₁ s+ps₁
spā s+pā s+p□₁ s+tf s+tf' stā s+tx skf s+kf skf' skā sk+ā s+st
s+xf āt^āf z+b∅₁ z+bᵑ₂ z+dv₁ z+dᵑ₁ z+gv zgp z+gp
colloquial: s+xā₁

e. Obstruent+obstruent+sonorant (examples)

pxw₁ pxl'₁ pxnpx> tkn₁ tk>₁ tkl'₁ txn₁ tx>₁ tān tām'₁ bpm' gbm₁
gbm'₁ t^skl'₁ t^ākn₁ t^āk>₁ d[∅]gn₁ d[∅]g>₁ f+pᵑ₁ f+pw₃ f+pr f+tw f+tr fkl
f+kl fkw f+kw f+kr f+tr f+Ꞥl₁ fꞤr₁ f+Ꞥr f+sw f+sn₁ f+xw₁ vbr
v+dr₃ v+dm v+gw vgl₁ v+gr₁ v+g>₁ v+zl₁ vzr₃ v+zn₃ vz>₃
vzm'₁ v+zm s+pw s+pl *spl' s+pl' spr s+pr s+tw s+tl str s+tr
*st^sj skw s+kw skr s+kr

f. Obstruent+obstruent+obstruent

pāt^ā₁ tkf'₁ d□v'₁ tāp'₂ tāt□₁ kāt₁ bzd₂ bpd₂ gpb'₁ gpd₁ f+pā₂ fsp
fs+p
f+sp'₂ f+st f+sk f+sx₁ fāt^ā₂ fꞤtꞤ₃ v+zb v+zb'₂ v+zv₂ vzg₂ vzd₂ vpd₁ s+ps₁
spā s+pā s+p□₁ s+tf s+tf' stā s+tx skf s+kf skf' skā sk+ā
s+st s+xf
āt^āf z+b∅₁ z+bᵑ₂ z+dv₁ z+dᵑ₁ z+gv zgp z+gp
colloquial: s+xā₁

(34) Four-member consonant clusters

drg>₁ drgn₁ pstr₃ pstā₁ s+trf s+krf₁ ∅d[∅]bw₁ fstr₁ f+s+tā₁ f+s+kā₁
f+s+kr₁
v+z+dw₁ v+z+dr₃ v+z+gl₂

Clusters in word-final position

(35) Two-member clusters

a. Obstruent+sonorant

pw pr pn p> tw tr tm kw kl kr *km *kn t□m
t^ām t+w *fl *fr fn sw sm Ꞥl Ꞥ> Ꞥm □m □n x+w
xr xn *xm

b. Obstruent+obstruent

*pt pt^ā ptꞤ pā ps tf tā kt kf *ks tꞤp t^āp t^āt
āt^ā ft ft^s ftꞤ sp st sk sf āp *āt āx Ꞥp ꞤtꞤ
Ꞥf xt xtꞤ xf

c. Sonorant+obstruent

*mp mt^ç *mf *ms mǎ mç nt nk nt^s nt[□] *nt^ã *nf *nǎ
 *ns }p }t^ã }t^ç }t^s lp lt lk lt^s wt^ã wf ws wǎ
 *lf lx rf rp
 rt rk rt^s rt^ã rt^ç rf rs rǎ rç rx jp jt *jk
 jt^s jt^ã jt^ç jf *js jǎ wp wt wk

d. Sonorant+sonorant

ml mn *jl jm jn j} lm l} rm rl rn r+w r}

(36) Three-member clusters

a. Obstruent+obstruent+obstruent

p+sk *kst t+^stf¹⁰ +stf stǎ ãt^ãp

b. Obstruent+obstruent+sonorant

stm str ãtr xtr

c. Sonorant +obstruent+obstruent

*mpt mst ntǎ ntf *nks *nkt nkf nǎt }t^çp }+sk }çt^ç lǎt^ã
 rpt^s rst rsk rǎt rǎt^ã rçt^ç jst jçt^ç jsk

d. Sonorant+obstruent+sonorant

mpr *mpl ntn ntr ntr nkr *ltr lç}

(37) Four-member clusters

a. Obstruent+obstruent+obstruent+obstruent

p+stf t^ç+stf f+stf

b. Sonorant+obstruent+obstruent+obstruent

m+psk m+stf n+stf nt+^stf)+stf l+stf r+stf j+stf

(38) Five-member clusters

mp+stf

There are several reasons to believe that a significant number of word-initial and word-final consonant clusters shown above are not syllable-initial or syllable-final. One of the main reasons is that they violate Sonority Sequencing Generalisation presented in (40), cf. Selkirk (1984a:116), cf. also Hooper (1976), Murray and Vennemann (1983), Clements (1990), based on the Sonority Hierarchy for Polish in (39).

(39) Sonority Hierarchy for Polish, cf. Rubach and Booij (1990a,b)

obstruents < nasals < liquids < glides < vowels

¹⁰ The suffix is /stv/, however its first segment and the stem-final consonant constitute an affricate.

(40) Sonority Sequencing Generalization (SSG):

“In any syllable, there is a segment constituting a sonority peak that is preceded and/or followed by a sequence of segments with progressively decreasing sonority values.”

In (41), I list some examples of clusters that violate the Sonority Sequencing Generalization in word-initial, cf. (41) and word-final position, cf. (41b).

(41) a.

lg	lv	lv'	lp	wk	wb	wg	wz	rt	rd	rd ^z	rv	rp
l□	mdl	mdl'	mdw	mg'l	mgw	mg	m□t□	rpn	rp			

b.

pw	pr	pn	p	tw	tr	tm	kw	kl	kr	*km	*kn	t□m
t [̃] m	t+w	*fl	*fr	fn	sw	sm	ɕl	ɕ	ɕm	□m	□n	x+w
xr	xn	*xm	stm	str	ãtr	xtr	mpr	*mpl	ntn	ntr	ntr	

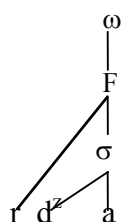
There are at least two arguments as to why word-initial segments such as *l* in *lg* or *n* in *pn* are not parsed into a syllable. First, as already mentioned they violate the SSG which in most languages is an inviolable principle organizing a syllable structure and, second, the consonant clusters listed in (41) are heterosyllabic when they occur in word-medial position. This is shown in (42).

(42)	[wk]ać ‘to sob’ inf.	pa[w.k]a	* pa[.wk]a	‘stick’ nom.sg.
	[rt]ęć ‘mercury’	na[r.t]y	* na[.rt]y	‘ski’ nom.pl.
	[rw]ać ‘to tear’ inf.	wy[r.v]a	* wy[.rw]a	‘breach’ nom.sg.

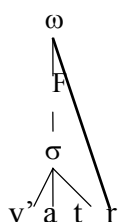
As far as word-final sequences of obstruent+sonorant are concerned, they are also never parsed into a coda as a whole sequence e.g. *bóbr bo.bra* ‘beaver’ nom.sg./gen.sg. or *bob.ra* but never **bobr.a*. However, this evidence is not as strong as in the case of the word-initial clusters because of an independent cross-linguistic principle according to which a syllable has to have an onset. Nevertheless, the examples shown above indicate that the sonorants occurring at word-edges do not belong to a syllable.

Since the initial sonorants in (41a) and final ones in (41b) violate the SSG and are not parsed into a syllable when they occur in a word-medial position (and are not deleted), I propose that they are licensed by other prosodic categories such as the foot and the prosodic word. I show that a word-initial extrasyllabic consonant is attached to the foot and the word-medial and a word-final consonant is licensed by the prosodic word. The representations are shown in (43).

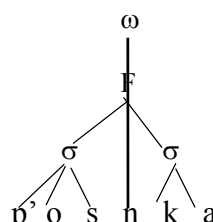
(43) word-initially



word- finally



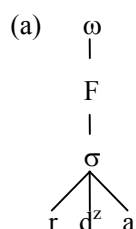
word- medially



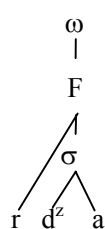
In the following I show some arguments favoring the proposal in (43).

Let us start with the representations of consonants in word-initial position. In (43) three possible representations of the word *rdza* ‘rust’ sg.nom. are shown. In (43a) the sonorant forms together with the following obstruent the onset of a syllable. In the second case it is attached to the foot and in (43)c it is linked to the prosodic word. In the following I shall argue that only the representation in (43)b is correct.

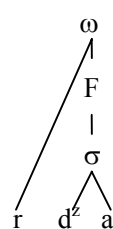
(44)



(b)



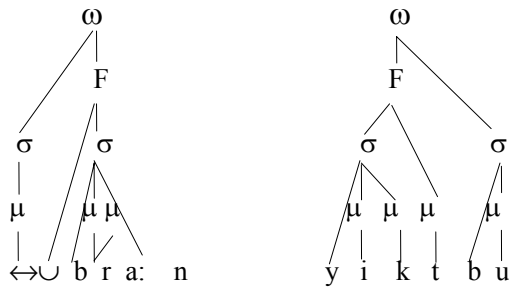
(c)



There are some important reasons why only the representation in (44)b is correct. They follow from (i) the extrasyllabic status of the sonorant, (ii) the behavior of the sonorant in phonological processes discussed below, (iii) the asymmetry between word-initial and word-medial/word-final extrasyllabic sonorants, (iv) the prosodic organization of morphosyntactic structures and (v) internal requirements of Optimality Theory, especially from the assumption that the violation of a constraint should be minimal.

Before discussing arguments in favor of the licensing role of the foot and the prosodic word in Polish phonology, it is worth mentioning that the importance of the licensing role of these constituents with respect to consonants is recognized in other languages as well, cf. Munster Irish (Green 1997, 1999), Arabic (Kiparsky 1999), French (Féry 1999), Georgian, Bella Coola (Cho and King 1999), and Polish (Rubach and Booij 1990b, Rubach 1997, Cho and King 1999). In (45) representations of words in Arabic, (Kiparsky 1999) and in Munster Irish (Green 1997) are given.

(45) Munster Irish Arabic (C and VC-dialects)

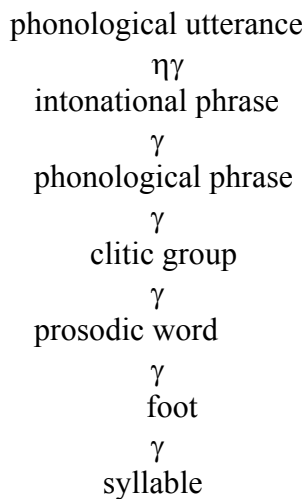


ω = prosodic word
 F = foot
 σ = syllable
 μ = mora
 ↔ = accent

The representations in (45) are not accidental but are motivated by (i) phonological behavior of segments under consideration as well as (ii) the prosodic organization of morphosyntactic structures. Since the second motivation is of universal character and therefore important for the present study, I discuss it in detail.

According to assumptions made in *Prosodic Phonology*, sentences are organized into the Prosodic Hierarchy which consists of constituents such as the syllable, the foot, the prosodic word, the clitic group, the phonological phrase, the intonational phrase, and the phonological utterance as shown in (46) cf. Nespov and Vogel (1986:11).

(46) Prosodic Hierarchy



The Prosodic Hierarchy is organized by some principles proposed by Nespov & Vogel (1986) and Selkirk (1981, 1984b, 1995). One of them is the Strict Layer Hypothesis, which demands that a prosodic constituent of a higher level (C^i) dominates only constituents on the next level down in the prosodic hierarchy, (C^{i-1}). This principle is stated in terms of the constraint in (47).

(47) Strict Layer Hypothesis

Strict Layer (Layer): A prosodic constituent of level C^i immediately dominates only constituents of the level C^{i-1} .

I assume that (i) Strict Layer is violable and (ii) violations of Strict Layer are ‘gradient’ which is shown by the examples given below.

The next constraint that selects the optimal representations is given in (48). It directly refers to the sonority hierarchy shown in (39). In contrast to SSG, the constraint in (47) also allows a sonority plateau, e.g., a sequence of two or more obstruents can be parsed into a syllable, cf. also the discussion below.

(48) *Son \searrow V: No decreasing sonority from the edges of the syllable towards its peak.

Since *Son \searrow V is inviolable, consonants which violate the constraint in (48) cannot be adjoined to the syllable, but according to *Layer* are licensed by the next prosodic level, i.e., the foot. This is illustrated by the tableau in (49) in which the conflict between *Son \searrow V and *Layer* and the selection of the optimal representation are shown.

(49)

r d ^z a	*Son \searrow V	Layer
	*!	
		*
		!

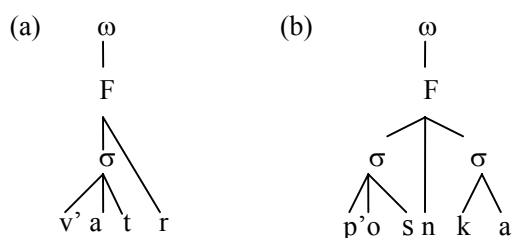
Although the first candidate in (49) perfectly satisfies *Layer* by incorporating all

consonants into a syllable, it is not selected as optimal because it violates the high-ranked sonority constraint. This candidate shows that the optimal position for consonants following from Layer is the syllable onset that cannot be filled up by *r* because of the violation of sonority. The second candidate, however, does not violate *Son \triangleright V because the word-initial sonorant is linked to a foot. Consequently, it violates Layer only once by skipping the syllable level. For this reason it fares better than the third candidate, which incurs two violations of Layer by skipping both the syllable and the foot level.

The optimal representation in (49) differs from the representation proposed by Rubach (1997) who argues in favor of the representation (49)a. Rubach (1997:566) poses a high-ranking constraint ALIGN LEFT (stem, σ) according to which the left edge of a stem coincides with the left edge of a syllable. In other words, this constraint requires the initial consonant to be parsed into the initial syllable. Since ALIGN LEFT is equally ranked with a sonority constraint, the decisive role is played by Layer which decides that a representation like the one in (49)a is selected as optimal. Since the representation is an optimal surface representation, a question arises as to why ALIGN LEFT (stem, σ) is a high-ranking in Polish, a language which shows edge-effects by virtue of its abundant extrasyllabic consonants in word-initial and word-final position and more importantly why the word-initial consonants which are parsed into a syllable are divided into a coda and an onset when they occur word-medially, cf. *kar.ty* 'card' nom.pl.

The mirror image of (49) might be obtained for extrasyllabic consonants in word-final codas. For example, the final sonorant in *wiatr* 'wind' nom.sg. could be attached to the foot, thereby avoiding violations of the *Son \triangleright V and incurring a minimal violation of Layer. The same conclusion could also be derived with respect to word-internal sonorants between obstruents or sonorants. Two hypothetical representations are shown in (50).

(50) Hypothetical representations



The possibility of incorporating all extrasyllabic sonorants into feet, which follows from structural requirements of the prosodic hierarchy as well as sonority conditions, remains to be shown. This will be a task of the next part of the article, in which I am going to show that the selected representation in (48) is correct while the structures in (50a) and (50b) are incorrect. This conclusion follows from independent phonological reasons such as the behavior of the extrasyllabic consonants in voicing assimilation and in degemination presented below. A

supporting piece of evidence in favor of this proposal comes from optional deletions attested in casual speech.¹¹

2.1 Regressive voicing assimilation

Regressive voicing assimilation in Polish is triggered by the final obstruent of a cluster. The examples in (51) show that the assimilation takes place not only word-medially but also across word-boundaries. (<#> indicates word-boundary)

(51) Obstruents clusters

≥y/□k/a	≥y[□k]a	‘spoon’ nom.sg.
gwia/zdk/a	gwia[stk]a	‘star’ dim.nom.sg.
samoch [/d #s/≥awka	samoch [[t s]≥awka	‘S≥awek’s car’ nom.sg.
po□li/zg #s/amochodowy	po□li[sk s]amochodowy	‘car skid’ nom.sg.

However, if there is a sonorant between the obstruents, the assimilation is blocked but only when the sonorant occurs in word-initial position, as shown in (52).

(52) Obstruent(s)+sonorant+obstruent clusters

ry/k#lv/a	ry[k lv]a	‘roar of a lion’ nom.sg.
sma/k#rd/estu	sma[k rd]estu	‘water-pepper taste’ nom.sg.
wielko/□t□#≥b/a	wielko[□t□ wb]a	‘size of the head’(pej.) nom.sg.
ob≥o/k#mg/wy	ob≥o[k mg]wy	‘cloud of mist’ nom.sg.

If a sonorant occurs in word-final or word-medial position, the assimilation between obstruents takes place, as illustrated by the examples in (53).

(53) sonorant in word-final or word-medial position

ry/tm#b/razylijski	ry[dm b]razylijski	‘Brazilian rhythm’ nom.sg.
wia/tr#z/achodni	wia[dr z]achodni	‘westerly wind’ nom.sg.
mę/dr/ek	mę[tr↓k]a	‘crafty person’ nom.sg. / gen.sg.
Ję/dr/ek	Ję[tr↓k]a	‘Jędreki’ nom.sg./gen.sg.

To sum up, the examples above show that extrasyllabic sonorants in word-initial position prevent voicing assimilation between obstruents while sonorants in word-medial and word-final positions do not. This indicates that the asymmetry follows from different prosodic representations of extrasyllabic sonorants and therefore the representations in (50) showing

¹¹ This asymmetry was shown by Rubach and Booij (1990b) within a derivational approach. For a detailed discussion see Rochoń (2000).

the incorporation of the critical consonants into the foot as in the case of the word-initial extrasyllabic segments cannot be correct.

2.2 Degemination

Further evidence for the asymmetry in the behavior (and representation) of word-initial extrasyllabic segments on the one hand and word-medial and word-final segments on the other comes from degemination, cf. Rubach and Booij (1990b). Consider the examples in (54) which show that two identical obstruents may occur in word-initial position.

(54) no degemination in word-initial position

/ssak/	[ss]ak	‘mammal’ nom.sg.
/d [□] d [□] /ownica	[d [□] d [□]]ownica	‘worm’ nom.sg.
/d [□] d [□] /ysty	[d [□] d [□]]ysty	‘rainy’ adj.nom.sg.masc
/t [□] t [□] /y	[t [□] t [□]]y	‘empty’ nom.sg.masc.

Evidence that the adjacent segments in (54) do not surface syllable-initially is that they are heterosyllabic intervocallically, e.g. las.so ‘lasso’ nom.sg., Kos.sak ‘Kossak’, Kamobo[d[□].d[□]]a ‘Cambodia’ nom.sg. The heterosyllabification of such clusters leads to the conclusion that they constitute neither true syllable onsets nor true syllable codas. However, the interaction of the high-ranked *Son \triangleright V and Layer, proposed thus far, incorrectly selects a representation in which both consonants are parsed into the onset of the initial syllable. This is shown in (55).

(55)

s s a k	*Son Δ V	Layer
<p>a</p>		
<p>b</p>		*!
<p>c</p>		*!*

The selection of the candidate in (55) shows that *Son Δ V does not block the parsing of obstruent segments into the same syllable since they do not violate it by being equally sonorous.¹² Therefore another constraint has to be responsible for nonparsing of geminates into the onset/coda of a syllable. In (56) the general formulation of the constraint prohibiting syllabification of geminates as well as its specific formulations with respect to the onset and the coda are given.

(56) *GEMINATE_{SYLLABLE}: Geminates are not parsed into the same syllable.

*GEM_{ONSET}: Geminates are prohibited in the onset.

*GEM_{CODA}: Geminates are prohibited in the coda.

These constraints were originally incorporated in the Obstruent Sequencing Constraint proposed by Rubach and Booij (1990a:124) which says: ‘With non-identical obstruents there is no requirement of sonority distance’. In the present study they are separated from *Son Δ V in order to avoid contradictory statements: a sonority plateau is tolerated in obstruent sequences, and a sonority plateau is not tolerated in sequences of obstruents that are identical. In order to avoid this contradiction, I proposed separate constraints in (56) that are sensitive only to geminates. The role of *GEM is illustrated by the tableau in (57).

¹² *Son Δ V forces however heterosyllabification of sonorant similar segments.

(57)

	*GEM _{ONSET}	*GEM _{CODA}	*Son _{≠V}
las.so			
la.sso	*		
lass.o		*	

The heterosyllabified word *las.so* ‘lasso’ nom.sg. emerges as optimal since it neither incurs a violation of *GEM_{ONSET} nor *GEM_{CODA}. Other candidates must be excluded from consideration because they would syllabify geminates as onsets or as codas, which leads to the fatal violation of *GEM_{ONSET} and *GEM_{CODA}, respectively.

Both constraints, *GEM_{ONSET} and *GEM_{CODA}, are also sensitive to geminates occurring in all positions. The examples provided in (58) illustrate word-initial geminates. *GEM_{ONSET} prohibits them from being syllabified. As a consequence, they must be attached to a higher prosodic constituent. Since the foot is the next level up from the syllable in the prosodic hierarchy, the extrasyllabic consonant is linked to the foot in order to fulfill Layer and not to allow geminates to be parsed into a syllable. Consider the tableau shown in (58).

(58)

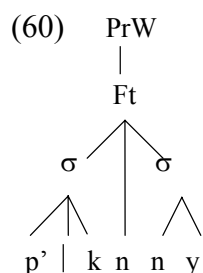
ssak	*GEM _{ONS}	*Son _{≠V}	Layer
			!
	*!		
			*

The tableau in (58) shows that the third candidate, which links the unsyllabified consonant to the foot, emerges as optimal. It fares better on the high-ranking *GEM_{ONS} than the second candidate; it also satisfies Layer better than its most serious competitor, i.e., the first candidate.

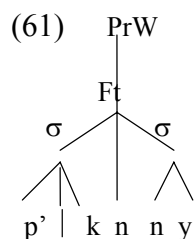
Let us now proceed to the critical examples illustrating the discrepancy between intervocalic medial geminates and medial nonintervocalic geminates. In (59) the outputs of the suffixation of the adjectival suffix /n/ are shown.

- (59) a.
- | | | | |
|---------|-----------|------------|---|
| diakon | diakon+ny | diako[nn]y | ‘deacon’ noun nom.sg. /adj.nom.sg.masc. |
| p≥yn | p≥yn+ny | p≥y[nn]y | ‘liquid’ noun nom.sg. /adj.nom.sg.masc. |
| obron+a | obron+ny | obro[nn]y | ‘defense’ noun nom.sg. /adj. nom.sg. masc |
| ko> | ko>+ny | ko[nn]y | ‘horse’ noun nom.sg. /adj.nom.sg.masc. |
- b.
- | | | | |
|----------|-------------|-------------|---|
| przyja□> | przyja□>+ny | przyja[zn]y | ‘friendship’ noun nom.sg. / adj. nom.sg.masc. |
| pił kn+o | pił kn+ny | pił [kn]y | ‘beauty’ noun nom.sg. / adj. nom.sg.masc. |

The suffixation in the words provided in (59)a does not bear any influence on the final sonorant. In the examples shown in (59)b, on the other hand, the stem-final sonorant is deleted. If it were not deleted we would have a medial sequence consisting of an obstruent followed by two identical sonorants. Since the constraint *GEM_{ONSET} disallows the parsing of the sonorants in the onset and the *Son_ΔV prohibits their parsing into the coda, the medial sonorant cannot be syllabified. The ranking stated in (58) suggests that the offending sonorant is linked to the foot, cf. the representation in (60).



If this were indeed the case, then we would expect no difference between word-initial and word-medial geminates. But the crucial difference between the two is that the former are not deleted and the latter are. Hence, medial geminates must differ in their representation from word-initial geminates. This asymmetry can be expressed by linking the consonant to the next prosodic constituent, i.e., the prosodic word, cf. (61).



A similar pattern is seen in word-final geminates. The words provided in (62) show that

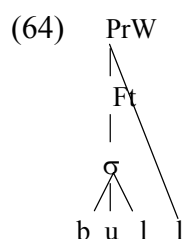
the last consonant of geminates occurring word-finally is deleted.

(62) Kano[ss]a	Kano[s]		‘Canossa’ nom.sg./gen.pl.
Kamobo[d [□] .d [□]]a	Kamobo[d [□]]		‘Cambodia’ nom.sg./gen.pl.
less+ow+y	less le[s]		‘loess’ adj. nom.sg./ noun nom.sg.

The deletion is attested if sonorant sequences are attested in a word-final position. This is illustrated by the examples in (63).

(63) bull+a	bull	bu[l]	‘bull’ nom.sg./gen.pl.
will+a	will	wi[l]	‘residence’ nom.sg./gen.pl.
idyll+a	idyll	idy[l]	‘idyll’ nom.sg./gen.pl.
sawann+a	sawann	sawa[n]	‘savanna’ nom.sg./gen.pl.
fontann+a	fontann	fonta[n]	‘fountain’ nom.sg./gen.pl.
nowenn+a	nowenn	nowe[n]	‘novenna’ nom.sg./gen.pl.

Similar to medial geminates, they cannot be linked to the syllable or to the foot, but must be linked to the prosodic word, cf. (64).



Although the representations in (58), (61) and (64) display an asymmetry in the representation, they do not show why the geminates in medial and final position are deleted. An additional constraint is responsible for the deletion of geminates. From the presented examples it follows that only geminates linked up to the foot level are prosodically licensed. If a part of a geminate is linked by a higher level than the prosodic foot, then it has to be deleted. This constraint will be not formally stated here as it requires cross-linguistic evidence. It has to be considered rather as a proposal of a constraint that is able to account for degemination in Polish.

In the word-final position the situation is different because one of the consonants is deleted. Relevant examples are shown in (65).

(65) idyll+a	idyll	idy[l]	‘idyll’ nom.sg./gen.pl.
sawann+a	sawann	sawa[n]	‘savanna’ nom.sg./gen.pl.

The data in (65) show that attaching the last consonant to the foot would be not correct

because consonants attached to the foot do not undergo deletion as shown by the optimal candidate in (55). The parsing will also attach the last consonant to the prosodic word. Similarly, the part of the identical two-consonant sequence is deleted in the nonintervocalic word-medial position.

In sum, If two identical or nearly identical segments occur in word-medial or word-final position, one of them is elided. This process shows again the asymmetry between segments occurring in different positions of a word, i.e. between word-initial on the one hand and word-medial and word-final on the other hand and indicates that the former are attached to the foot and the latter to the prosodic word.

2.3 Optional deletions of extrasyllabic consonants in casual speech

In casual speech some generalizations concerning the behavior of extrasyllabic consonants can be made. Interestingly, extrasyllabic sonorants are often deleted if they do not occur in word-medial or word-final position. Otherwise they are never dropped. In (66) I provide some examples with extrasyllabic segments in word-initial position. As already mentioned, they do not undergo deletions.

(66) no deletion in word-initial position

/mx/u	[mx]u	‘moss’ gen.sg.
/rt/ęć	[rt]ęć	‘mercury’ nom.sg.
/wb/a	[wb]a	‘head’ pej.gen.sg.

In (67) a different situation is shown. Extrasyllabic consonants occurring in word-medial and word-final position are often deleted in casual speech.

(67) deletions of segments in word-medial and word-final positions

ja/błk/o	ja[pwk]o	ja[pk]o	‘apple’ nom.sg.
ga/rnk/ów	ga[rnk]ów	ga[rk]ów	‘pot’ gen.pl.
my/śl/	my[śl]	my[ś]	‘thought’ nom.sg.
pomy/s≥/	pomy[sw]	pomy[s]	‘idea’ nom.sg.

To sum up, the optional deletions confirm the generalization stated above that there is a clear asymmetry between extrasyllabic sonorants in word-initial position on the one hand and in word-medial/word-final position on the other hand. Again, this asymmetry is mirrored in the prosodic representation of consonants.

3 Summary

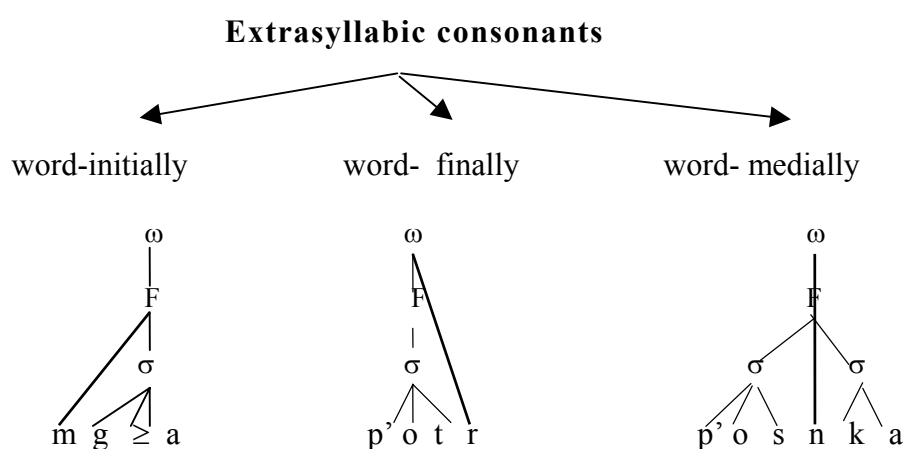
The behavior of extrasyllabic segments in the processes I discussed, i.e., regressive voicing assimilation, degemination, and optional deletion, is summarized in the table in (68), which shows a different behavior of word-initial extrasyllabic segments on the one hand and word-medial and word-final extrasyllabic segments on the other hand.

(68)

	<i>extrasyllabic consonants</i>		
	word-initially	word-medially	word-finally
Voicing assimilation	No	Yes	Yes
Degemination	No	Yes	Yes
Optional deletions	No	Yes	Yes

I propose that this asymmetry follows from the representation of segments as shown in (69), in which the word-initial extrasyllabic sonorant is attached to the foot, and the word-medial and word-final extrasyllabic sonorant are licensed by the next prosodic constituent in the Prosodic Hierarchy, i.e., the prosodic word.

(69)



In addition, these representations show that the higher prosodic levels such as the foot and the prosodic word are more tolerant of onset clusters than the syllable in a sense that they create a location for ill-formed clusters from a sonority point of view.

Finally, the present study shows that the licensing level determines the 'stability' of segments: consonants incorporated into the syllable or into the foot are more stable because they are never obligatorily or optionally deleted, in contrast to word-medial or word-final extrasyllabic segments which easily undergo deletion.

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