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THE ROLE OF ALIGNMENT IN MORPHOLOGY AND PROSODY: THE CASE OF POLISH

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A dissertation submitted in partial fulfilment of the requirements for the
degree of Doctor of Philosophy in Linguistics

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Moim Rodzicom,

THE ROLE OF ALIGNMENT IN MORPHOLOGY AND PROSODY: THE CASE OF POLISH

Abstract

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This dissertation investigates the role of alignment in morphology and phonology and its implications for the theory of *Generalised Alignment* (McCarthy & Prince 1993) via a close examination of Polish data.

An issue of great theoretical interest is the asymmetry between LEFT and RIGHT ALIGNMENT. LEFT ALIGNMENT enjoys a privileged treatment in prosody and morphology. In prosody, LEFT ALIGNMENT is obeyed even in languages with right oriented primary stress: LEFT ALIGNMENT is crucial in the assignment of secondary stress. A similar asymmetry applies to ANCHORING. A detailed study of truncation reveals that LEFT ANCHORING is preferred over RIGHT ANCHORING. The source of this asymmetry is sought in left-to-right processing (Hay 2002). I argue, against Nelson (2003), that in spite of this preference, RIGHT ANCHORING cannot be replaced by other ANCHOR constraints, such as ANCHORING to head foot.

Another issue addressed in this dissertation is the type of material that can be aligned. I concentrate on segmental feature spreading (palatalisation and voicing) across morpheme boundaries. Palatalisation does not spread across prefix/stem boundaries and obeys ALIGN(FEATURE, STEM). Voicing is immune to ALIGNMENT and spreads across the whole obstruent cluster. This asymmetry is grounded in articulation. Spreading of palatalisation involves an additional tongue movement towards the hard palate. De/voicing involves a complete readjustment of the glottis, which is more difficult to control than the palatalising tongue movement.

Lastly, I show that primary and secondary stresses can be sensitive to different prosodic domains in a single grammar. In Polish, primary stress aligns with the Morphosyntactic Word, while secondary stress aligns with the Prosodic Word.

Further, I investigate the mode of violation of the alignment constraints and I argue, contra (McCarthy 2003) that violation of constraints cannot be categorical.

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INTRODUCTION

The aim of this dissertation is to investigate the role of alignment in morphology and prosody and its implications for an understanding of alignment in general via a close examination of Polish data. The work is grounded in the theory of *Generalised Alignment* (McCarthy & Prince 1993). The central theme of the thesis is the asymmetry between LEFT and RIGHT ALIGNMENT. It has been observed in the linguistic literature that the left edge of grammatical or prosodic categories enjoys certain privileges over the right edge. McCarthy & Prince (1993) notice that the occurrences of RIGHT ALIGNMENT are less frequent than the occurrences of LEFT ALIGNMENT and that RIGHT ALIGNMENT refers to a smaller number of prosodic/grammatical categories than LEFT ALIGNMENT. Nelson's (2003) study of reduplication and truncation claims that these processes do not require any references to the right edge at all. Similarly, Hayes (1995) points out that iambic footing always proceeds from left to the right rather than right to left. These observations have led a number of linguists to the conclusion that RIGHT ALIGNMENT/ANCHORING should be excluded from the grammar (e.g. Bye & de Lacy 2000, Nelson 2003). In this dissertation, I show that there is indeed an asymmetry between the left and the right edge, but I argue that it is still necessary to refer to the right edge of a given category (e.g. Krämer 2003a).

Both in prosody and in morphology, the left edge of the domain requires an absolute alignment of foot (in prosody) or place feature (in morphology). In prosody, LEFT ALIGNMENT may play an important role even in languages where the primary stress is right oriented: the workings of LEFT ALIGNMENT can be observed in the assignment of secondary stress. I show that a similar asymmetry can be observed with regards to prefixation/suffixation and to LEFT/RIGHT ANCHORING. The experimental data analysed in this dissertation show that feature spreading is more readily blocked in prefixed words rather than in suffixed words. Similarly, a detailed study of truncation reveals that LEFT ANCHORING is preferred over RIGHT ANCHORING. The source of this left/right asymmetry is sought in psychology, i.e. in left-to-right processing (Hay 2001, 2002, 2003). I argue, however, against Nelson (2003), that in spite of this preference, RIGHT ANCHORING cannot be done away with. Polish truncation shows that RIGHT ANCHORING, although less frequent, cannot be replaced by other ANCHOR constraints, such as ANCHORING to head foot.

Further, I show that primary and secondary stresses can be sensitive to different prosodic and grammatical domains in a single grammar. In Polish, primary stress is sensitive to the grammatical category of morphosyntactic word (MWord) and as such it belongs to the level of morphosyntax and disregards any prosodic boundaries. It is only the secondary stress that is sensitive to the prosodic category of Prosodic Word (PWord). Further, I investigate the mode of violation of the alignment constraints and I argue, contra (McCarthy 2003), that violation of constraints cannot be categorical.

Another issue addressed in the dissertation is the type of material that can be aligned. Most literature on alignment deals with stress assignment, but previous work on prosodic morphology (e.g. McCarthy & Prince 2001) has shown that spreading of segmental or tonal features can also be subject to alignment constraints. Here, I concentrate on segmental feature spreading across morpheme boundaries, in particular on palatalisation and voicing. The study reveals that place features (palatalisation) do not spread across prefix/stem boundaries and thus obey ALIGN(FEATURE, STEM), while voice features are immune to any alignment constraints and spread across the whole obstruent cluster. It is argued that this asymmetry is grounded in articulation. Spreading of palatalisation involves an additional tongue movement towards the hard palate. In case of certain consonants, such as labials, this tongue movement is completely independent of the primary place of articulation and thus can be easily controlled. De/voicing, on the other hand, involves a complete readjustment of the glottis, which is more difficult to control than the palatalising tongue movement.

The work is organised as follows: Chapter 1 overviews the theoretical accounts of the asymmetric behaviour of prosodic and (morpho)phonological processes across left and right morpheme boundaries. A substantial part of this chapter is devoted to the discussion of psycholinguistic factors affecting the processing of morphologically complex words. These factors are largely responsible for the asymmetric behaviour of prefixation vs. suffixation and LEFT vs. RIGHT ANCHORING. It should be pointed out that these psycholinguistic factors constitute preferences rather than absolute rules. As such, they can be overridden by higher level preferences, e.g. ANCHORING in truncation will not be obeyed if it produces forms with unattested consonant clusters in a particular language. The psycholinguistic preferences can also compete with each other resulting in grammars where a given rule applies in a gradient rather than absolute manner.

Chapter 2 provides a new OT analysis of the Polish stress system. It is shown that the right edge of the MWord plays a crucial role in the assignment of primary stress. Contrary to previous accounts, it is claimed that the left edge of the MWord is irrelevant in the stress system, even in the assignment of secondary stress. The secondary stress, on the other hand, aligns with the left edge of the PWord. A substantial portion of this chapter is devoted to an in-depth analysis of irregular stresses (antepenultimate and final), an issue that has not been dealt with within OT. It is argued that lexical accents override RIGHT ALIGNMENT.

Chapter 3 studies place assimilation across morpheme boundaries in prefixation and suffixation. Experimental data indicates that the boundary between the left edge of the stem and the prefix is much stronger than the boundary between the right edge of the stem and the suffix. In a great majority of cases, in suffixation the place of articulation usually spreads leftward from the suffix onto the rightmost stem consonant and continues through any preceding consonant. On the other hand, in clusters resultant from prefixation, the place of articulation hardly ever spreads from the stem-initial consonant to the prefix.

A similar asymmetry can be observed in the truncation data studied in Chapter 4. I analyse a large corpus of hypocoristics, and truncated forms found in school slang. The formation of hypocoristics again indicates that the left edge of the stem is more salient than the right one. 65% of truncated pet names consist of a portion of material taken from the left edge of the full name stem. Right-edge stem oriented hypocoristic formation is much less frequent but still accounts for 35% of cases, showing that RIGHT ANCHORING is really needed. In the school slang truncation, almost all the new forms are left-edge oriented. It is argued that the source of these asymmetries is rooted in left-to-right processing (e.g. Hay 2001, 2002, 2003).

The dissertation shows that there exists an asymmetry between LEFT and RIGHT ALIGNMENT/ANCHORING. Left-edge oriented processes are more frequent than right-edge processes. However, contrary to previous literature (e.g. McCarthy & Prince 1993), in Polish RIGHT ALIGNMENT is more diverse than LEFT ALIGNMENT. The study of stress assignment, affixation and truncation demonstrates that RIGHT ALIGNMENT must refer to MWord, PWord and stem, while it is enough for LEFT ALIGNMENT to make reference only to PWord and stem.

CHAPTER 1

THEORETICAL BACKGROUND: PREFIX/ SUFFIX ASYMMETRY

This chapter sets out the basic assumptions of this dissertation. First, I will briefly discuss some aspects of the asymmetric behaviour of prefixes and suffixes. In section 2, I will outline previous attempts to account for the differences between prefixes and suffixes. Section 3 discusses the relationship between word order and the place of affixes. Lastly, I will present the psycholinguistic factors that affect the asymmetric behaviour and distribution of suffixes and prefixes. This section constitutes a substantial part of this chapter and all the analyses in the following chapters are built on the assumptions set out in this particular section.

1. Asymmetries between prefixation and suffixation

1.1. Frequency

Languages that are exclusively suffixing are considerably more frequent than those that are exclusively prefixing. Further, suffixal morphology is more frequent than both prefixing and infixing, i.e. more functions are expressed by suffixes than by prefixes or infixes. These observations are based on Greenberg's (1966) study of 30 languages, where 17 languages allowed both prefixing and suffixing, 12 were exclusively suffixing and only 1 was exclusively prefixing. Hawkins & Gilligan (1988), who surveyed a sample of 200 languages, and Julien (2002), who surveyed a sample of 530 languages, reported similar results. These are, however, only statistical generalisations and no explanation is provided as to why suffixation should be preferred to prefixation.

1.2. Assimilation and the affix-stem juncture phonotactics

Prefixes and suffixes do not behave uniformly in terms of across morpheme boundary assimilation or in terms of resolving affix/stem junctures. In general, suffixes are more immune to any changes in their structure than prefixes, and are more likely to trigger feature changes in stems than prefixes, e.g. in English the suffixes *–ism* or *–y* trigger alternation at the end of the stem:

1.	catholi[k]	catholi[s]+ism
	democra[t]	democra[s]+y

In the case of prefixes, it is the prefix that alternates (it assimilates to the place of articulation of the stem-initial consonant), while the beginning of the stem remains constant:

2. a. Prefix *en-*
e[n]+[t]itle
e[m]+[p]ower

b. Prefix *in-*
i[n]+[s]ane
i[m/ɱ]+[p]ossible
i[ŋ]+[k]onsitent

The same tendency can be observed historically. For example, before liquids, the prefix *in-* assimilated to the stem-initial consonant both in place and manner of articulation and then the underlying /n/ found in the prefix was lost altogether. Today the traces of these changes can be still observed in the spelling but not in pronunciation:

3.	legitimate	il+legitimate
	regular	ir+regular

There are double letters on the morpheme boundary in the derived form reflecting the past assimilation process. However, this spelling does not affect pronunciation, i.e. the adjectives on the right are not realised with a geminate consonant.

In Slavic languages, suffixes regularly induce feature changes in stem-final consonant(s). Prefixes do not trigger any changes in stem-initial consonants, but stem-initial consonants can trigger assimilation of prefix-final consonants. This phenomenon will be discussed in more detail in chapter 3.

Similarly, in Kashaya (Buckley 1994), suffixes trigger palatalisation of stem-final consonants, while no feature changes in the stem are induced by prefixes.

Also, prefix + root and stem + suffix junctures can be resolved in different ways. In Axininca Campa (McCarthy & Prince 2001), in prefixal allomorphy, illegal V+V and C+C sequences are solved by the loss of material from the prefix:

4.	ir+saiki	isaiki	*will sit*
	no+anani	nanani	*my black dye*

At the suffix level, there is no loss of morphemic material. Problematic V+V and C+C sequences are resolved by positing epenthetic structure:

5.	i+N+koma+i	iŋkoma+Ti	*he will paddle*
	no+N+tasoŋk+wai+i	nontasoŋk+Awai+Ti	*I will continue to fan*

1.3. Affixation and syllable structure

Prefixes tend to behave as prosodically more independent than suffixes with respect to syllabification. Prefixes usually do not integrate with the stem, while suffixes do. In Dutch (van Oostendorp 2004), tautomorphemic sequences of a consonant and a vowel are syllabified together (6a). The same happens if the consonant is at the end of the stem and the suffix is V-initial, i.e. the syllable will cross the stem-suffix boundary (6b). However, if the consonant belongs to a prefix and the stem is V-initial, then the syllable boundary will fall between the consonant and the vowel, i.e. the morpheme boundary and the stem boundary will overlap (6c).

6.	a.	o.de	*ode*
	b.	e.r+en	*to honour*
	c.	ont.+eer	*dishonour*

Further, in Dutch monomorphemic words, schwa never precedes another vowel. In affixed forms, we find an asymmetry between prefixes and suffixes. The schwa cannot be deleted if it ends a prefix, because the resulting surface syllable would cross a prefix-stem boundary, but the schwa at the end of the stem can be deleted because syllabification over a stem-suffix boundary is not blocked.

Similar facts regarding syllabification of prefixes and suffixes can be found in Italian (Nespor & Vogel 1986, Peperkamp 1997, Krämer 2003b), Kihehe (Odden & Odden 1985) and Indonesian (Cohn 1989, Cohn & McCarthy 1998).

1.4. Affixation and stress assignment

Prefixes often fall outside the domain of accentual rules, while suffixes constitute the same stress domain as roots. For example, in Indonesian (Cohn & McCarthy 1998), monomorphemic words have stress on the penultimate syllable, secondary stresses on the initial syllable and on the alternating syllables in between, e.g. *èrod̀inamíka* (aerodynamics). Prefixes, however, never attract stress, either primary or secondary:

7. di+cát *dí+cat *printed*
di+koréksi *d̀i+koréksi *corrected*

Suffixes, on the other hand, are a part of the domain of the main stress assignment, i.e. in root+suffix(es) forms the main stress is always penultimate:

8. kòntinuasí+ña *the continuation*
məm+bicàra+kán+ña *speak about it*

Similarly, Meldov (1990) assumes that prefixes in Russian verbs fall outside the stress domain, although suffixes fully participate in the assignment of stress. Also, Carlson (1989) notes that prefixes are never stressed in Spokane, a Salish language. In Northern Tepehuan, an Uto-Aztecan language spoken in Mexico (Woo 1970), prefixes play no role in tone assignment and as such they are outside the domain of tonal resolution.

1.5. Historical development: grammaticalisation

Historically, many prefix forms maintain their free counterparts for a longer period than suffixes, which indicates that they are less bound to the stem than suffixes. For example, in Classical Latin the prefixes *ab(s)-* (from), *ex-* (out), *per-* (through) occur also as prepositions, while *intro-* (within) functions as an adverb and a prefix. Similarly, in English, it is mostly prefixes that have yielded free-standing analogues, e.g. *ex-*, *pro-*, *anti-*, *pseudo-*; of suffixes there are only the marginal *–ism* or *–ish.* A similar situation can be found in Polish and other Slavic languages, where prefixes function as prepositions but the suffixes do not.

Bound, non-free-standing prefixes are also more likely to be lost and replaced by suffixes. In Old Norse unstressed prefixes and proclitics were lost and their functions replaced by post-verbal adverbs, enclitics and suffixes. (Samuels 1972). A similar thing happened in Ethiopian Semitic and Iranian, where original prefixes were lost in favour of suffixation (Greenberg 1980).

Various theories of phonology attempted to capture these differences and analyse them in a formal way. Below, I will briefly outline some of the theoretical approaches to the phonology/morphology interface and show why, in general, these approaches have failed.

2. Theoretical approaches

2.1. Pre-generative phonology

The observation that one and the same phoneme can behave differently when it occurs within a morpheme and when it occurs across morpheme boundaries was made by phonologists in the early part of the 20th c. In American Structuralism (e.g. Bloomfield 1933, Moulton 1947; Stockwell, Bowen & Silva-Fuenzalida 1956, Aronoff 1980, Anderson 1985, 1992,), morphophonological alternations were assumed to be triggered (or blocked) by 'juncture' phonemes that occurred between distinct morphological entities. Thus, in German, stem-final velars are palatalised morpheme-medially when followed by [ə], but they remain unchanged after the attachment of the suffix *-ən*. The difference between the German minimal pairs below lies in the fact that in the left-hand words [ə] is in the middle of the affix, while in the right-hand ones it is at the beginning of the affix:

9.	[ku:+çən]	*little cow*	[ku:x+ən]	*cake*
	[taw+çən]	*little rope*	[tawx+ən]	*dive*

Junctures were not just elements indicating boundaries between morphological units. Bloomfield put a strong emphasis on the fact that juncture is a phonological unit independent of morphology and it has the same properties as any segmental phoneme[1].

The phonemic analysis proposed an inventory of junctures for a language (e.g. /+/, /-/, /#/, etc.) corresponding to various domains (e.g. morphemes, stems, words) and having different phonetic effects. The inventory of junctures was included in the inventory of a language's other segmental phonemes. Juncture phonemes were

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[1] Later on, Pike (1947, 1952) argued that a juncture is not an object (phoneme) but a frontier between two domains

attributed feature properties that did not necessarily contribute to plausible domains, e.g. certain suffixes in Polish trigger palatalisation of the stem-final consonant, ranging from surface palatal coarticulation to a complete change of place of the consonant, e.g. /g/ → /ʒ/. The differences between these different sorts of behaviour do not correspond to different domains since palatalisation always takes place between the stem and the suffix, but we could posit various juncture phonemes triggering distinct contextual effects, e.g. a juncture phoneme triggering surface palatalisation and a juncture phoneme triggering velar fronting.

Further, the theory has no principled way to distinguish between prefix + stem and stem + suffix junctures. The only way to account for the differences between these two junctures is to posit different types of symbols or juncture phonemes between prefix and stem and between stem and suffix. This fact by itself, however, does not explain why these two affixal junctures do not behave in a uniform manner.

2.2. Standard Generative Phonology

The Standard Generative Phonology (Chomsky, Halle & Lukoff 1956; Chomsky & Halle 1968) did not consider junctures as independent phonemes. The distribution of junctures was dependent on higher levels of morphology and/or syntax and so junctural elements always reflected grammatical structure. A number of junctures were proposed: "+" – morpheme boundary, "#" – phrase boundary, "=" – boundary between certain English prefixes and the stem. A set of cyclic rules applied within increasingly inclusive domains going from the minimal level (morphemes) up to the entire phrase. Phonological rules could be formulated so as to require the presence of a boundary at some specific location within the string. Similarly, the differences between the behaviour of various affixes could be dealt with in terms of the strength of boundaries. Thus, in English, there was said to intervene a strong boundary '#' between the base and a stress neutral suffix like *–ness* or *–ly*. A weak boundary '+' was assumed to separate the base from a non-neutral suffix like *–ic* or *–ee*, which affect the stress pattern of the word. At the end of the derivation, all the boundaries were erased, which means that boundaries (junctures) had no overt phonetic content. Their presence in the derivation could be known by their effects.

The Standard Generative Phonology faces the same problems as pre-generative approaches, i.e. the non-uniform behaviour of prefixes and suffixes can be accounted for by positing different junctures between the prefix and the stem and between the stem and the suffix. However, no real explanation is provided as to why prefixes and suffixes should have different phonological effects on the stem.

2.3. Cyclic and Lexical Phonology

Cyclic Phonology (Mascaró 1976) took a different approach to morphophonological alternations. Allomorphy is triggered by rules that can apply in a cyclic fashion. The cycle is determined by the morphological structure. After applying a set of rules to a phonological string, a new cycle is created by adding, e.g. an affix. A rule that applies cyclically can apply on its own cycle and cannot return to an earlier cycle to reapply (*Strict Cycle Condition*).

The idea of Cyclic Phonology was further developed into Lexical Phonology[2] (Kiparsky 1973, 1982a, b, c). Cyclicity is not the property of rules but it follows from the organisation of morphology, i.e. certain phonological alterations are dependent on morphology. The effects of cyclicity were obtained by introducing Level Ordering. Thus, combinatorial restrictions among English suffixes result from the fact that these suffixes belong to different lexical strata. Stratum 1 suffixes have the following characteristics:

- Latinate origin,
- attach to bound roots,
- phonologically and semantically less transparent,
- cause stress shift, resyllabification and morphological alternations,
- never occur outside stratum 2 affixes.

Stratum 2 suffixes are of Germanic origin and do not trigger morphophonological alternations. Suffixes can only attach to suffixes of the same stratum or of lower stratum.

An example of a level 1 suffix would be *–ic*, which is non-neutral and affects the location of stress, e.g. *phótograph* ⟶ *phòtográph+ic*. Phonologically neutral processes, e.g. compounding or attachment of stress neutral affixes, e.g. *–ism*, take place at level 2, after the attachment of more specific level 1 suffixes:

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[2] See also, e.g. Mohanan (1986), Pulleyblank (1986), Harris (1983), Rubach (1984, 1981), Halle & Mohanan (1985), Kaisse (1985).

- no explanation why prefixation should apply on a different level than suffixation.

These problems have been recently addressed by Hay (2001, 2002, 2003) and Hay & Plag (2004) and it has been proposed that affix ordering is largely influenced by psycholinguistic factors and speech perception (see section 4 below).

2.4. Stratal OT

Stratal OT (Kiparsky 2000, to appear) integrates OT and LP. Kiparsky proposes to adopt the LP distinction between lexical and postlexical phonology. LP comprises stem phonology (level 1) and word phonology (level 2). Each of these phonological subsystems is viewed as a parallel OT constraint system. These constraint systems may differ in ranking. The output of the stem level is the input to the word level. This approach allows us to distinguish between the different behaviour of stems and words, e.g. a process that applies at one level may be neutralised by a markedness constraint at another level. Similarly, various affixes can be attached at different levels, thus being subject to different rankings and resulting in different outputs. This approach, however, faces the same problems as Lexical Phonology.

As mentioned above, none of the above approaches provide a satisfactory explanation of the asymmetric behaviour of prefixes and suffixes. Before I present the theory adopted in this dissertation, I will briefly outline the relationship between word order and affixation.

3. The Head Ordering Principle

This section studies the relationship between word order and affixal morphology, and whether the generalisations described below can provide any explanation for why the prefix–stem boundary is stronger than the suffix-stem boundary in Polish.

In his typological study of morpheme ordering, Greenberg (1966) noticed a correlation between basic word order and morpheme order. Suffixing is massively preferred in NP + P and OV languages. These languages never have only prefixes and only very few of them have both prefixes and suffixes. If a language is prefixing only, the basic word-order will be Prep + NP and VO. A great majority of these types of languages allow both prefixes and suffixes and only very few of them only suffixes.

10. grámmar.
Level 1 grammár+ian
Level 2 grammár+ian+ism

Similarly, prefixation is assumed to take place at a different level than suffixation, hence prefixes have different effects on the stem than suffixes.

In SPE, there were several types of morpheme boundary symbols that could block/trigger a phonological process. In Lexical Phonology (LP) the boundary symbols were replaced by a direct representation of constituent structure (labelled bracketing). In LP, the phonological differences between the two classes of affixes in English are accounted for by level ordering. At the end of each level, the internal brackets are erased and they become invisible to the next level of morphological/phonological operations. This is how the same structure would be represented in SPE and in LP:

11. SPE [[un # [fastidi + ous]] # ness]
LP [[un [[fastidi] ous]] ness]
(Spencer 1991:113)

A slightly different model of LP was proposed by Booij & Rubach (1984, 1987). They do not dwell on the problem of level ordering (following the suggestion in Kiparsky 1985). The idea of the *Strict Cyclicity Condition* is abandoned. They distinguish two types of non-cyclic rules: postlexical rules that apply to whole phrases after the operation of syntax, and postcyclic rules that apply in the lexicon after the operation of all the morphological rules.

A detailed study of Polish within the framework of Cyclic/Lexical Phonology is Rubach (1984). He claims that phonologically prefixation and inflectional morphology come on different cycles. Prefixes must be processed on the last cycle, after the attachment of the inflectional suffixes. The evidence comes from the operation of *Lower*, which is responsible for the surfacing of underlying yers as /e/ (yers will surface as /e/ if they are followed by another syllable containing a yer). The words *w+szed+ł* //vɨ+ʃɨd+wɨ//[3] (*he went in*) and *we+sz+ł+a* //vɨ+ʃɨd+w+a// (*she went in*) can serve as an example. Their morphological structure is: prefix + root + past tense /w/ + gender marker. The yer of the prefix lowers to /e/ via *Lower* if the root yer of //ʃɨd// has not been lowered. The lowering of the root yer is triggered by the masculine gender suffix, which is a yer. If the gender suffix is *–a*, as is the case in the feminine form, *Lower* cannot apply to the root yer since it is followed by *–a* in the next syllable and not by a yer. Not having been lowered, the root yer functions as the environment for the lowering of the prefix yer. Thus, prefixes must be processed later than the cycles done on inflectional endings (here, the gender morphemes).

12.	*wszedł*	*weszła*	
UR	[vɨ+[[ʃɨd]+wɨ]]	[vɨ+[[ʃɨd]+w+a]][4]	
	ʃɨd+wɨ	ʃɨd+w+a	
Cycle 2	ʃed+wɨ	______	*Lower*
	vɨ+ʃed+wɨ	vɨ+ʃɨd+w+a	
Postcyclic	________	ve+ʃɨd+w+a	*Lower*
	v+ʃed+w	ve+ʃ+w+a	*Yer Deletion*

This ordering does not, however, give much insight into the assimilation processes studied in this dissertation. Rubach classifies *Strident Assimilation*, *Surface Palatalisation* and *Voicing Assimilation* as post-cyclic processes applying after the operation of all morphological operations[5]. The model would not explain why post-cyclic assimilations should be more frequent in certain contexts, i.e. before coronals, than in others, i.e. before labials.

In general, Lexical Phonology faces the following problems:

- no predictions about possible and impossible combinations of suffixes within a given stratum,
- the two strata not justified on independent grounds,
- the strata cannot be defined by the set of affixes they contain as there are affixes that belong to both strata,

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[3] /ɨ/ represents an underlying yer.

[4] I disregard the detailed derivations of these words, which, among others, include the deletion of the underlying /d/ in *we+sz+ł+a* (she came in).

[5] The palatalisation stem-final C in words suffixed with *–e* results from an earlier operation of the cyclic processes of j-insertion and *Coronal Palatalisation*. Thus, in a $C_1C_{2+}e$ cluster, C_2 is palatalised cyclically through the processes mentioned earlier, while C_1 is palatalised post-cyclically via the process of *Strident Assimilation* or *Surface Assimilation*. For a detailed analysis of j-insertion after labials and labial palatalisation see Rubach (1984, ch. 4)

These generalisations link morphology and syntax with respect to the notion of head (Cutler et al. 1985). In syntax, N, V, P and Adj are the heads of their respective phrasal categories. Similarly, within morphology, the component morphemes of whole words are divided into heads and modifiers. The morpheme that determines the categorial status of the word is the head, e.g. the suffix *–ness* attached to *sad* converts the adjective to a noun and so the affix determines the category of the resulting word *sadness*. Inflectional affixes, e.g. *–s*, on the other hand, maintain the categorial status of the item to which they attach. Thus, the categorial status of an affixed word can be compounded from the affix but not necessarily from the stem. These are the affixes that are heads of words and not the stems.

On the basis of these generalisations, Gilligan & Hawkins (in Cutler et al. 1985:731), formulate the following principle:

13. *The head order principle (HOP)*
The affixal head of a word is ordered on the same side of its subcategorizied modifier(s) as P is ordered relative to NP within PP, and as V is ordered relative to a direct object NP.

The HOP predicts prefixes in Prep + NP and VO languages and suffixes in NP + Po and OV languages. These predictions are correct as far as languages with exclusive prefixing or exclusive suffixing are concerned. There are, however, languages that allow both suffixation and prefixation. Notably, there are head-initial languages that also employ suffixes to a considerable extent. Julien (2002) studied a survey of 530 languages from all over the world. The survey also indicates that there is a correlation between word order and affixation, but there are still exceptions. She found that verb-final languages have postponed tense markers with a frequency of 92% as opposed to 53% in verb-initial languages.

Polish is a Prep + N language with the basic SVO order. It is not solely prefixing as predicted by HOP: it allows suffixes as well. However, since it is a Prep + N language, one might expect a stronger link between prefixes and stems than between suffixes and stems, i.e. assimilation should be more frequent across the prefix-stem boundary than across the suffix-stem boundary. This is definitely not the case.

Hawkins & Gilligan (1988) propose that another factor in addition to HOP principle is involved in the positioning of affixes. The second factor is a psycholinguistic one. It is argued that stems are processed before affixes and that the beginning of a word is the most salient part in lexical access. Because of this, word structures where the stem is placed before the affix are generally preferred. The psycholinguistic preference reinforces the effect of the HOP in verb-final languages, but in head-initial languages they impose an opposing force of nearly equal strength. This takes us directly to the next section where the psycholinguistic factors are discussed in more detail.

4. Psycholinguistics

This section discusses psycholinguistic evidence regarding the asymmetries between the behaviour of prefixes and suffixes. The same argumentation can be used to account for the left vs. right stem edge asymmetries in truncation. Both affixation and truncation in Polish are analysed in more detail in this dissertation. This section provides the theoretical background for the analyses. The discussion is largely based on Hay (2001, 2002, 2003) and Hay & Plag (2004). Hay provides an up-to-date and critical review of the literature on the subject. Contrary to many works on language processing, Hay addresses the question of what bearings her findings can have on non-psycholinguistically oriented phonological theories.

4.1. Phonological transparency and temporality

Speech is processed temporally, i.e. from left-to-right. There is abundant psycholinguistic evidence (Cutler et al. 1985 and references therein) that listeners and speakers pay most attention to the beginnings of words, rather less attention to the end of words, and least attention of all to the middles. When presented with either the unique initial or final portion of a word, listeners are much better at guessing the word on the basis of the initial fragment. Distortions at the beginning of words can inhibit the recognition process of a word, while distortions at word endings can often go unnoticed. In slips of the tongue, the intended word is often replaced by another word with the same onset, e.g. *winter* for *window*. Subjects even tend not to notice mispronunciations if they occur late in a word (Marslen-Wilson & Welsh 1978).

Similarly, Cutler (1980, 1981) observes that the acceptability of neologisms relies on the degree to which they are phonologically transparent. When forming a neologism on the basis of an existing stem, speakers should prefer the base word to remain intact in the derived form. By leaving the base word intact, the speaker allows the hearer to access the entry for the base word in their lexicon more easily. There are, however, exceptions to the general preference for transparent derivations; in some cases non-transparent derivations are preferable to the transparent ones. For example, in the word decision task, *excusion*, formed from *excuse*, was preferred to *excusement,* although the former involves a change in the final consonant from /z/ to /ʒ/. Preservation of the initial portions of the base word is more important than preservation of the final portions in defining transparency. This is consistent with the model of language processing, where words are accessed through left-to-right processing. If we consider the recognition point for *excuse*, we find that it becomes distinguishable from other words beginning with /eksk/, e.g. *exclude, exquisite, excrescence*, etc., at the occurrence of the glide /j/. Thus, the final consonant is not necessary for access to the base word's lexical entry, and so *excusion* should be as effective a cue as *excusement.* Transparency in word formation is not a matter of preserving the whole base intact, but enough of it to enable sure access of the base word's lexical entry. How much is enough will differ from word to word and depends on the characteristics of the vocabulary as a whole, e.g. differences in the size of individual speakers' vocabularies.

It is always the initial (left) part of the word that listeners rely upon to identify the word correctly. This makes two predictions that bear on this dissertation. First, in truncation, we should expect most forms to be built on the left edge of the base. Second, the left-to-right processing also predicts that suffixes should be more likely to affect the segmental or feature make-up of the stem they attach to than prefixes. Any changes that the prefix induces in the onset of the stem may slow down or distort the lexical access to the stem. On the other hand, any changes in the stem coda induced by the suffix will have little if any effect on the lexical access to the stem: by the time the listener gets to the final altered part of the stem, the stem is correctly identified. As we shall see, these two predictions are correct.

How does left-to-right processing affect the processing of affixed words? In general, morphologically complex words can be accessed in two ways:

- via a whole word route (the word is stored as a single item)
- via a decomposed route (the word is stored in a parsed form)

Hay claims that the whole word route should be favoured for prefixed words. This bias should be reduced in suffixed words. Due to left-to-right processing, language users will tend to lexicalise prefixed words and thus store them as single units. This is because the beginnings of words tend to be associated with the beginnings of stems that are the bearers of lexical meaning. Thus, the prefixes will be treated as part of the stem and will easily undergo language specific processes of morpheme internal assimilation processes.

Additionally, Hay claims that language users prefer to process stems before affixes as stems have a higher functional load than affixes (Cutler et al. 1985). Stems constitute an open class: new items are constantly added to the lexicon either through creating neologisms or through the process of borrowing. Affixes, on the other hand constitute a closed class: affixes are not frequently borrowed and forming new ones is historically a long process. Affixes also carry mainly syntactic information about agreement, gender, etc. Stems are the main carriers of semantic and lexical information in a word. Thus, in order to process a word, it is more important for listeners to access the stem rather than the affix. The stem has computational priority over the affix and that is why the stem favours the most salient initial position of a word, while the affix takes the less salient final position. This hypothesis predicts that, in general, suffixation should be preferred to prefixation as suffixation will allow easier access to the stem.

The factors outlined in this section make opposite predictions with respect to the behaviour of prefixes and suffixes. On one hand, it is predicted that there should be a clear cut boundary between the prefix and stem and, on the other hand, it is predicted that prefixes should easily assimilate to the stem. There is no clear 'yes' or 'no' answer with respect to the behaviour of prefixed words. Which one of these options is selected by language users largely depends on other factors, such as phonotactics or frequency, discussed below. Two further predictions were made:

- suffixation should be more frequent than prefixation,

- suffixation can easily affect the composition of the final position of the stem without affecting the lexical access to the stem.

The first issue was not addressed in this dissertation. The second prediction, however, was tested in this dissertation and it was born out by the experimental results.

4.2. Phonotactics

Hay claims that phonotactics plays a crucial role in the decomposition of morphologically complex words. If the phonology across the morpheme boundary is highly unlikely to occur morpheme internally, then the processor is likely to posit a boundary and so advantage the decomposed route, e.g. *inhumane* ([nh] is not found word internally). This fact will also affect the storage of morphologically complex words: words with consonant clusters that occur morpheme internally are more likely to be stored as single items and accessed via a whole word route.

Phonotactics also plays an important role in Neural Networks. Elman (1990) shows that a network trained on a phoneme prediction task can indirectly predict word boundaries. A network uses the information about the phonotactic distribution in real words to divide a flow of speech into smaller chunks. Hay (2002) trained a neural network on a subset of monomorphemic words and then tested it on 515 prefixed words. The network identified a morpheme juncture in 60% of cases. It failed to recognise a complex word mostly in cases where the morpheme juncture did not contain an illegal cluster. The experiment demonstrates that a neural network heavily relies on phonotactics when deciding whether a given word is morphologically simple or complex.

Phonotactics affects segmentation of nonce forms (Suomi et al. 1997) and perceived well-formedness of nonsense forms (e.g. Pierrehumbert 1994, Coleman 1996, Vitevitch et al. 1997, Treiman et al. 2000, Frisch et al. 2000). Subjects tend to place boundaries inside phoneme transitions that are unlikely to occur word-internally. Hay conducted an experiment where subjects were presented with a list of words and asked to judge each of them as either simple or complex, e.g. *vilfim* and *vipfim*, where [lf] is a frequent cluster morpheme internally, while [pf] is an unattested one. Subjects displayed a significant tendency to choose the word with low probability phonotactics as a more complex one (around 60%).

Similar results were obtained in an experiment with real English words. Words with low probability junctural phonotactics, e.g. *i[nh]umane*, were judged as more 'complex' than words with legal phonotactics, e.g. *i[ns]incere.* The influence of phonotactics appeared to be absent from suffixed words, e.g. *ski[lf]ul* and *you[θf]ul* showed the same degree of decomposability in spite of the fact that [lf] occurs morpheme internally, while [θf] does not[6]. This asymmetry between prefixed and suffixed words reflects the left-to-right nature of lexical access. Because of the left-to-right speech processing, prefixed words favour direct access. Suffixed words are more likely to be stored in a parsed form.

Further, Hay observes that there is a correlation between semantic transparency and the probability of the phoneme transition across the base. Prefixed words with high probability transitions are likely to be accessed whole and they gradually become less tied to the representation of the base. As a result, we might expect semantic drift to occur, and the relationship between the derived form and the base to become increasingly opaque. Complex words with legal phonotactics (e.g. *i[ns]incere*) also tend to be more polysemous. They acquire additional meaning not associated with the base. Words with illegal phonotactics are easily decomposed and their meaning is closely tied to the base. Thus, they tend to have definitions which explicitly mention their bases. Hay (2003: 59) gives two examples:

14. **Dishorn** – to deprive of horns.

    Dislocate – To displace; to put out of its proper place. Especially, of a bone: to remove from its normal connections with neighboring bone; to put out of joint; to move from its socket; to disjoint.

The word *dishorn* is semantically transparent. It did not shift or proliferate in meaning: there is only one definition of this verb and the word *horn* is present in the definition. *Dislocate* is less transparent in meaning: it has more meanings than *dishorn* and the base word *locate* is not included in any of the definitions.

The investigation revealed no relationship between junctural phonotactics and semantic drift or polysemy in suffixed words. As mentioned above, beginnings of words carry a higher burden in word recognition than the ends of words. As such,

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[6] Frequency does not play a role here. Both adjectives (the base and the derived form) have

phonetics at prefixal juncture is more likely to play a vital role in the processing of morphologically complex words than phonetics at suffixal juncture.

Hay's observations concerning phonotactics and affix separability have consequences for the theory of Lexical Phonology. In Lexical Phonology, level 1 affixes usually begin with vowels. Level 2 affixes usually begin with consonants and have lower relative frequency than level 1 affixes. Suffixes beginning with consonants should be more separable than suffixes beginning with vowels, e.g. *–ness* should be more separable than *–ess*. Suffixes beginning with consonants more often form illegal phonotactics across the morpheme boundary, and so are likely to be represented by a greater number of individual words that are prone to decomposition than words with suffixes beginning with vowels. Consonant-initial suffixes are also more likely to form an 'illegal' syllable onset with the stem-final consonant than vowel-initial suffixes.

The same suffix is differently separable in individual words depending on the phonotactics. Individual words containing the same suffix will tend to be more decomposable if they contain a low probability phonotactic transition than if they do not. The suffix will also be differently separable in individual words depending on the relative frequency of the base and the affixed word (see also the discussion in the next section). Suffixed words will be more decomposable if they are less frequent than their base than if they are more frequent than their base. Thus, affixes are arranged into a loose hierarchy of juncture strength, such that any suffix below a given suffix on the hierarchy can precede that given suffix, but not follow it, and any suffix above a given suffix on the hierarchy can follow that given suffix but not precede it. In morphologically complex words, more separable affixes will occur outside less separable affixes. The ordering of affixes can be predicted on the bases of phonotactics and relative frequency. It should be pointed out that these parameters should be treated as independent of each other. Phonotactics only looks at the affix + stem juncture of individual forms and checks whether the sound combination found at the juncture is also attested stem-internally. If it is not, then the affixed word will be stored in the parsed form with the affix as an independent unit. The more often (in terms of the number of stems it attaches to) a given affix

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comparable frequency.

produces illegal transitions, the more separable it is. In the case of relative frequency, we try to establish how independent the base of an affixed word is. The larger the group of words with a specific affix where the base is more frequent than the complex word, the more independent the base is and consequently the affix is more independent as well. Relative frequency only indirectly predicts the separability of the affix: the affix is highly separable only because the base it attaches to is very frequent as an independent word and hardly ever takes on any affixes. Effectively, there is no need to introduce levels of derivation into grammatical explanation. The explanation of language behaviour is provided by functional approaches, like the one outlined here. Formal grammatical accounts, such as OT, are elegant attempts to capture the main generalisations regarding language behaviour. In this sense, formal and functional grammars complement each other: functional grammars account for linguistic behaviour, while formal grammars provide the formal machinery to describe linguistic behaviour.

In chapter 3, we will see that speakers use phonotactics to make the prefix-stem boundary more prominent. As we shall also see in chapter 4, phonotactics also play a crucial role in the formation of truncates. Language users are guided by the existing word-initial consonant clusters when forming truncates. Truncates built on the right edge of the base will not fully preserve word medial consonant clusters found in the base. They will keep only these clusters that look like typical word onsets.

4.3. Frequency

It is generally assumed that the more frequent a word is, the less decomposable it is. Previous research (e.g. Modor 1992, Baayen 1992, 1993, 1994, Bybee 1988, 1995) shows that morphologically complex high frequency words tend to be accessed whole, are not easily decomposed and do not contribute to the productivity of the affixes they contain. Hay (2003) suggests that the emphasis on absolute frequency is too strong. Absolute frequency of the derived form is not as important as its frequency relative to the base form. Maximally decomposable forms should be those that are less frequent than the parts they contain. Subjects are much more likely to rate forms with higher frequency bases as complex, than matched counterparts with relative lower frequency bases. For example, *unleash* was judged as less complex than *unscrew*. The frequency of *unleash* is 65 as compared to the base frequency (*leash*) of 16. In *unscrew*, the ratio is reversed: *unscrew* has the frequency 44, while *screw* 187. Effectively, *unscrew* was judged as highly complex. In general, 65% of responses favoured the form for which the base was more frequent than the whole. Comparable results were obtained for suffixed words: 66% of responses favoured the form where the base was more frequent than the whole.

There is also a correlation between frequency and semantic drift. The dictionary definition of words for which the derived form is more frequent than the base is significantly less likely to mention the base of the derived word than the dictionary definition of words for which the derived form is less frequent than the base. Similarly, derived forms that are more frequent than their bases tend to be associated with more meanings than derived forms that are less frequent than their bases. Once a derived form overtakes its base in frequency, it tends to proliferate in meaning. These generalisations, however, hold only for words of below-average frequency. If a derived word reaches a certain threshold of frequency, then it is likely to acquire new meanings even if it remains less frequent than its base. Thus, the set of words that are most likely to resist polysemy are prefixed words of below-average frequency that are also less frequent than the bases they contain. In case of semantic drift, words for which the derived form is more frequent than the base are significantly less likely to mention their base in their definition than words for which the derived form is less frequent than the base. Here, however, absolute frequency plays no role. Above-average frequency prefixed forms are no more likely than below-average frequency forms to mention their bases explicitly in their dictionary definition.

The pattern observed in prefixed words is also present in suffixed words. The relative frequency effect can be observed in semantic drift, while absolute frequency is irrelevant to decomposition. In case of polysemy, both relative and absolute frequency needs to be take in consideration (same as in prefixed words). Thus, the two factors, i.e. relative and absolute frequency, seem to interact in the same manner for prefixed and suffixed forms.

Since relative frequency is related to decomposition, we might expect to see a correlation with phonotactics. Hay demonstrated that the phonetic implementation of derived forms that are more frequent than their bases tends to minimise cues to juncture. Speakers are more willing to simplify cross-morpheme boundary clusters in complex words that are more frequent than their bases. Hay studied /t/ deletion in a consonant cluster that straddled a morpheme boundary. /t/ is more likely to be produced in *softly* (*softly* is much less frequent than its base *soft*) than in *swiftly* (*swiftly* is more frequent than *swift*). Both *swiftly* and *softly* occur with roughly equivalent absolute frequency but they differ in their relative frequency to the base. Thus, it is the relative frequency that plays an important role in morphological decomposition. This experiment explains the lack of the influence of phonotactics on the semantic drift or polysemy of suffixed words. Because the juncture comes late in suffixed words, the phonetics is malleable. 'Illegal' phonotactics across a morpheme boundary can be easily resolved in the phonetics and so listeners do not necessarily get any cue to juncture. In this way, suffixed forms with illegal phonotactics across the boundary could more easily acquire the properties of whole-word access than comparable prefixed ones. Note that this observation runs against the prediction that suffixed words should be stored as parsed due to left-to-right processing. The fact that suffixed words try to 'get rid of' illegal juncture phonotactics does not necessarily mean that they are stored as whole words. Due to the syntactic, semantic and pragmatic contexts, language users will be able to 'guess' the stem-ending. The cross-boundary phonotactics is, to a large extent, irrelevant to them in processing suffixed words and that is why they will try to facilitate the junctural cluster in production. However, the phonetic simplification does not entail whole-word storage of suffixed words.

Phonotactically well-formed words are more easily liberated from their bases than words which contain a cue to juncture. As the relationship between the representation and semantics of the two forms weakens, we might expect the frequency dependency to also weaken. We should expect to find the following conspiracy in the lexicon: words that display word-internal phonotactics across morpheme boundary should be more likely to be liberated from (and so more frequent than) their bases. Hay looked at 515 prefixed words and found that derived forms that are more frequent than their bases are extremely unlikely amongst prefixed forms containing illegal transitions. However, no such correlation was found for suffixed words.

Frequency played no role in the affixation experiments discussed in chapter 3 as the test material consisted of nonce-words and very recent borrowings. However, frequency helps to explain the discrepancy between the occurrence of palatal assimilation in the tested material and in real Polish words. As we will see in chapter 4, frequency plays a vital role in the formation of truncates. Speakers rely on the frequency of word-initial onsets when deciding which truncate onsets are acceptable.

4.4. Metrical structure

The metrical structure of speech is another source of information for speech segmentation. Thus, in French, Catalan and Spanish, where the syllable is the basic metrical unit, native speakers use syllabic information in segmentation (Cutler et al. 1986, 1992; Mehler et al. 1981; Pallier et al. 1993; Sebastián-Gallés et al. 1992). In Japanese, where the basic metrical unit is the mora, listeners use moraic information in segmentation (Cutler & Otake 1994; Otake et al. 1993). Speakers of stress-timed languages like English or Dutch use the rhythmic distinction between strong and weak syllables for segmentation (Vroomen & de Gelder 1995, Vroomen et al. 1996 for Dutch). In English over 90% content words begin with stressed syllables (Cutler & Carter 1987). Experimental data shows that speakers posit word boundaries before strong syllables (Cutler 1990, Cutler & Butterfield 1993, Cutler & Norris 1988, Jusczyk et al. 1993, 1999). Similarly, words in which a strong syllable directly follows the morpheme boundary are more likely to be decomposed than words in which that syllable is weak (Schreuder & Baayen 1994).

Hay argues that the degree of decomposability of a prefixed form can also be gauged by the degree to which subjects are prepared to place a contrastive pitch accent on the prefix. If a form is highly decomposable, the prefix is a meaning-bearing unit and can easily attract stress. If subjects do not put a pitch accent on a prefix under contrastive focus, this indicates that a given word is resistant to a decomposed parse and is stored as a whole. She shows that prefixes on words whose derived form is more frequent than the base were significantly less likely to attract a pitch accent than their counterparts.

As we shall see in the next chapter, metrical structure can be affected by morphology in Polish. However, this statement holds true for only a small class of nouns with irregular stress. In general, stress in Polish is not affected by morphological structure and vice-versa. As we shall see in chapters 3 and 4, the same applies to affixation and truncation.

4.5. Possible Word Constraint

The Possible Word Constraint (Norris et al. 1997) is operative in the segmentation of speech and requires that wherever possible the input should be segmented so as to produce a string of feasible words. This constraint suppresses activation of candidate forms which would lead to a segmentation resulting in impossible words. In two word-spotting experiments, listeners found it much harder to detect *apple* in *fapple* (where [f] is an impossible word in English), than in *vuffapple* (where *vuff* is a possible English word). Hay claims that this will have implications for the processing of affixes which themselves cannot be words. More words containing word-like affixes (e.g. *–ness*) will be decomposed during online processing than words containing affixes which could not be phonological words (e.g. *–th*).

This constraint will affect the parsing of prefixed words in Polish, as Polish prefixes have the same form as prepositions. Thus, prefixes should be easily separable from the following stems, as they overlap in shape with existing free-standing words. The Possible Word Constraint also affects the formation of truncates. As mentioned above, truncates built on the right edge of the base will keep as their onsets only clusters that look like typical word onsets.

4.6. Conclusions

The factors set out in this section make conflicting predictions regarding the behaviour of prefixes and suffixes, which, to a large extent, explains why the asymmetries between prefixes and suffixes cannot be easily captured by formal grammars or by rules that do not allow any exceptions. Psycholinguistics only provides a set of preferences that can but do not need to be observed by all languages. The extent to which each of these preferences is observed depends how it interacts with other preferences, i.e. the solutions or language behaviour predicted by one preference can be masked by the language behaviour predicted by another preference. The order of preferences in a given language depends on the complexity of the syntactic, morphological, phonological, etc. structures of that language. The three chapters below will demonstrate how language users resolve these conflicting preferences in three different but related areas of language: stress assignment, affixation and truncation.

The following predictions can be made with regards to the Polish data studied here. I will enumerate then in the order that the triggering factors were introduced above:

- *Phonological transparency and temporality*: Speech is processed left-to-right, which, again, indicates that the onsets of words/stems are more important than word/stem codas. Distortions at word or stem onsets should be avoided as they may have an adverse effect on word recognition. Distortions at word or stem ends will have very little, if any, effect on word recognition.

Predictions: Affixation should be more likely to alter stem-codas than stem-onsets. In the case of truncation, we would expect left alignment/anchoring to be more frequent than right alignment/anchoring. Left-to-right processing would also predict that the left edge of the word or stem should be clearly marked by prosody to make the identification of the left edge of a given category easier. These predictions were borne out.

- *Phonotactics*: Forms containing consonant sequences that are not frequently attested in morphologically simple words are more likely to be analysed as morphologically complex.

Predictions: Affixes should not trigger any alternations in the stem and stems should not trigger any alternations in the affixes. In this way, 'unusual' consonant clusters will be created and language users will be more aware of existing affix/stem boundaries. The 'phonotactic' factor can, however, be influenced by temporality, i.e. word and stem onsets play the major role in word recognition and so affixation will affect the stem-initial consonant structure less than stem-final clusters. In the case of truncation, we would expect the truncated stem to have the shape of a typical unaffixed stem. Thus, the truncate will take from the base only consonantal sequences that are commonly found in monomorphemic words. Again, here the phonotactic requirements may be overridden by temporality and effectively we could find very rare consonant clusters at the left edge of the truncate if the left edge of the corresponding base also contains a very rare consonant cluster. These predictions were borne out.

- *Relative frequency*: Words with high frequency bases should be more decomposable than forms with low frequency bases.

Predictions: Frequency was not taken into account as the subjects were tested on nonce forms. The elimination of this factor allowed us to concentrate on other factors, i.e. phonological transparency or phonotactics. I will leave the study of relative frequency for feature research. However, we might predict that the prefix will assimilate more easily in words where the base is less frequent than the derived (prefixed) word.

- *Metrical structure*: Prosodic structure affects segmentation in that speakers posit word boundaries before stressed syllables.

Predictions: In affixation, the metrical structure of the affixed words was kept constant. The prosodic factor was only tested in truncation. It was predicted that the head foot of the base should be fully preserved in the truncate. The prediction refers only to the head foot as only the head foot has to be fully contained within the MWord (or the base of the truncate). Feet containing secondary stresses can straddle MWord boundaries and do not need to be properly contained within the MWord. The prediction was not borne out.

- *Possible Word Constraint*: The input should be segmented in such a way as to produce a sequence of possible words.

Predictions: Prefixes, which have the same form as prepositions, should be easily separable from the stem. In truncation, truncates whose left edge does not coincide with the left edge of the base should only keep base-medial material that will form a typical (attested in a large number of forms) word or stem-initial cluster. The predictions were borne out.

To summarise, in this chapter we discussed six factors that play a role in language processing/parsing: phonological transparency, temporality, phonotactics, frequency, metrical structure and *Possible Word Constraint.* Word-frequency, temporality and *Possible Word Constraint* are independent factors that can affect phonological transparency, phonotactics and the metrical structure. In fact, temporality and phonological transparency and inextricably related as in most cases temporality determines which parts (edges) of grammatical categories need to be more transparent in order to facilitate lexical access. The main factors affecting affixation and truncation in Polish are phonological transparency and temporality. They predict that assimilation should be more frequent across the prefix-stem boundary than across the stem-suffix boundary, and that left-anchored truncates should be more frequent than right-anchored truncates. Temporality and phonological transparency will have an impact on juncture phonotactics: illegal clusters will be more likely to be preserved across the prefix-stem boundary than across the stem-suffix boundary. In this way, illegal phonotactics across the prefix-stem boundary will indicate where the stem onset is located within a word, which will facilitate the lexical access to the stem. There is also a correlation between phonotactics and the *Possible Word Constraint*: affixes, stems and truncates should be possible words and thus follow the language specific rules of phonotactics. Temporality and phonological transparency will also interact with the metrical structure in that speakers will posit morphological boundaries that coincide with the boundaries of metrical constituents and will try to preserve stressed syllables of the input form in the derived form. Lastly, phonotactics should also be affected by frequency (though frequency was not studied in this dissertation): illegal juncture phonotactics should be eliminated in very frequent words or in derived (prefixed) words that are more frequent than their bases.

CHAPTER 2

FOOT ALIGNMENT AND THE POLISH STRESS SYSTEM

0. Introduction

Alignment constraints (or other edge domain oriented rules) play an important role in the assignment of stress (e.g. Halle & Vergnaud 1987, Idsardi 1992, Hayes 1995, Gordon 2002). Primary stresses are usually aligned with either edge of a word due to their demarcatory functions, i.e. stress facilitates the recognition of word edges if it regularly falls on the same syllable of a word. The aim of this chapter is to establish the role of alignment in the assignment of stress in Polish, in particular, in morphologically complex words. First, I look at the placement of the regular (penultimate) stress. I show that primary and secondary stresses can be sensitive to different prosodic domains in a single grammar. The primary stress is sensitive to the right edge of the Morphological Word, while secondary stress is sensitive to both the right and the left edges of the Prosodic Word. Further, I investigate the mode of violation of the alignment constraints and argue, contra (McCarthy 2003), that violation of constraints cannot be categorical.

A substantial part of the chapter is devoted to the study of the irregular stresses (antepenultimate and final), an issue that has not been dealt with within OT. It is argued that Polish irregular stresses result from lexical foot head marking as well as positional noun faithfulness. Further, I propose that nouns with bisyllabic inflectional endings never receive irregular stress due to *Lexicon Optimisation*: the lexical (penultimate) stress marking on the affix always overrides the irregular stress marking on the stem

1. Penultimate stress

1.1. Basic facts

Polish is a quantity insensitive language. A typical Polish foot has the shape of a syllabic trochee. Primary stress is penultimate (cf. e.g. Rubach & Booij 1985, Hayes &

Puppel 1985, Kraśka-Szlenk 2003, Dogil 1979). It is assigned after the attachment of all morphological endings: stress in Polish is insensitive to morphological boundaries. Secondary stress is assigned after the assignment of primary stress. It is generally assumed that the secondary stress falls on every other syllable of the word starting with the leftmost one[1]. If there are an uneven number of syllables in the word, the syllable immediately preceding the primary stress remains unfooted. In this way the formation of degenerate feet is avoided. However, a recent acoustic study of Polish stress (Dogil 1999b) indicates that there is only one (initial) secondary stress in a prosodic word in Polish. This approach will be adopted in the present analysis and consequently, I will mark only the initial secondary stress. Thus, the Polish stress pattern looks roughly as in 1. below (where **X** indicates a syllable carrying primary stress and X a syllable carrying secondary stress):

1. x(**X**x)
(Xx)(**X**x)
(Xx)x(**X**x)
(Xx)xx(**X**x)
(Xx)xxx(**X**x)

Examples are given below:

2.

(grý.mas)	*grimace, nom. sg.*
gry.(máś.ny)	*fussy, adj. masc. nom. sg.*
(grỳ.maś.)(ní.ca)	*fussy girl, nom. sg.*
(grỳ.maś).ni.(cá.mi)	*fussy girl, instr. pl.*

(Rochoń 2000)

(koǹ.stan.)ty.no.po.li.(táń.czyk)	*inhabitant of Constantinople, nom. sg.*
(koǹ.stan.)ty.no.po.li.tań.(czý.ka)	*inhabitant of Constantinople, gen. sg.*
(kòn.stan.)ty.no.po.li.tań.czy.(ká.mi)	*inhabitant of Constantinople, instr. pl.*

(Rubach & Booij 1985: 297)

Monosyllabic words are stressed on their sole syllable, as in *sýn* 'son'.

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[1] Halle & Vergnaud (1987: 100 ft 10) propose that secondary stress in Polish should be analysed in the same way as Spanish, where secondary stresses fall on every other syllable preceding the main stress. However, this analysis wrongly predicts that in a word with an odd number of syllables the first one should be unstressed, e.g. *x(Xx)(Xx).

1.2. Secondary stress

1.2.1. Secondary stress in morphosyntactic words

Despite Dogil's data, as pointed out by Rubach & Booij (1985: 283–285), there are optional word-medial secondary stresses (also called rhythmic stresses). Dłuska (1974) claims that rhythmic (word-medial secondary) stresses are characteristic of poetry citation. They are present in slow or careful speech but tend to disappear as the speech becomes faster and more casual. Word internal secondary stresses are evened out sooner than the initial secondary stress. A hypothetical six-syllable word can have the following variants, depending on the style of speech, with variant b. being the most widespread one:

3. a. (Xx)(Xx)(**X**x)
b. (Xx)xx(**X**x)
c. xxxx(**X**x)

Dogil (1999a, b) provides additional evidence for the prominence of initial secondary stress as compared to non-initial secondary stresses. In Polish, a word can switch the prominence values of primary and secondary stresses when under focus. Thus, in narrow focus a word like *màrmoladówy* is pronounced *mármoladòwy*. The pattern (Xx)xx(**X**x) shifts to (**X**x)xx(Xx). Note that (**X**x)xx(Xx) is exactly the accentual system observed in other West Slavic languages like Sorbian and colloquial Czech (Dogil 1999a: 836).

Hayes (1995: 98-99) proposes that Polish can show quantity sensitivity in the assignment of secondary stress. He points out that in marginal cases Polish forms feet consisting of only one syllable. The particular dialect of Polish discussed by Hayes exemplifies a case where all syllables must be parsed by feet even if that would lead to the emergence of non-canonical monosyllabic feet, e.g. (dò)(róta). The vowel in such feet is lengthened, which leads Hayes to conclude that in some instances Polish shows quantity sensitivity. Vowel lengthening, however, is considered to be a phonetic cue of stressed syllables in Polish (cf. Dłuska 1974) and it occurs in the stressed syllables in disyllabic feet as well. There is no evidence that Polish makes a distinction between light and heavy syllables and that heavy syllables should attract stress. If anything, Polish might be called a language with Stress-to-Weight principle, where syllables become heavy when they are stressed. However, even this generalisation becomes problematic once we consider stressed syllables containing a coda. By definition, such syllables are already heavy and no vowel lengthening is necessary to make them heavy, but still vowel lengthening takes place. Therefore, I assume that vowel lengthening is only a phonetic manifestation of stress. In this respect, Polish differs from other languages, such as English, German or Dutch, where phonological lengthening is common. In such languages, stress falls only on heavy syllables and a phonological process of vowel lengthening takes place stressed open syllables.

1.2.2. Clitics and stress

Despite the substantial literature on cliticisation (e.g. Zwicky 1977, 1985, Zwicky & Pullum 1983, Kaisse 1985, Klavans 1985, Nevis 1986, Di Sciullo & Williams 1986, Marantz 1988, 1989, Sadock 1991, Anderson 1996, 2000, Grimshaw 1997, Franks & King 2000, Billings 2002), there does not seem to exist a clear-cut definition of a clitic. Sadock (1991: 52) enumerates the following properties of clitics:

I. Morphology

- Clitics are bound morphemes.
- They attach outside inflection.
- They block further morphology.
- They attach without regard to the morphological class of the host (although in certain cases preferences or strict restrictions are found, e.g. ‘verbal’ clitics).
- They are completely productive.

II. Syntax

- Clitics are independent elements of syntax.
- They are syntactically adjacent to their morphological host.

III. Semantics

- Clitics have semantic functions.
- They take the meaning of a phrase as argument.

IV. Phonology

- Clitics are phonologically dependent.

- They are agglutinative.
- They are stressless. (In the sense that they do not bear the lexical stress or the primary stress in a domain.)
- They are subject to automatic phonological rules only.

V. Lexicon

- Host plus clitic forms are not lexicalised.
- Clitics alternate with free words, e.g. personal pronouns *he*, *she*.

It is beyond the scope of this dissertation to discuss in detail the semantic and morphosyntactic properties of clitics (see e.g. Mikos & Moravcsik 1986, Grzegorczykowa et al. 1998, Franks & King 2000). Here, I will concentrate only on their metrical properties. However, by the above definitions, prepositions and pronouns (e.g. demonstrative, possessive, reflexive) are clitics. It is disputable whether a number of verbal clitics denoting tense and conditional mood still count as clitics as they attract primary stress and have a fixed position in the VP. The issue will be addressed in section 1.2.3. below.

Phonologically, clitics may affect the placement of stress in the MWord. For example, in Serbo-Croatian, morphemes can either have one high tone or be toneless underlyingly. In Neo-Štokavian (NŠ) dialects of Serbo-Croatian (Schütze 1997), non-initial high-tone is subject to spreading one mora to the left. MWords that lack underlying tone always undergo a process of default initial high-tone insertion when uttered in isolation. Where the dialects differ is on the application of the initial high tone insertion to a MWord when preceded by a clitic. In NŠ-1, the domain of application of the high tone insertion is the Prosodic Word (PWord) comprising both the MWord and the preceding clitic, i.e. the high tone falls on the clitic:

4. u= graad *in (the) town*
|
H

In NŠ-2, the domain comprises only the MWord, i.e. the high tone falls on the first syllable of the MWord and never on the preceding clitic:

5. u= graad *in (the) town*
|
H

In NŠ-3, both options are available:

6. u =glaavu *or* u =glaavu *into (the) head*
| |
H H

Thus, in the first dialect the domain of high tone placement is the PWord, in the second dialect it is the MWord, and in the third one both.

Nespor (1999) proposes the following typology of stress in clitics:

1) No stress rule applies to the clitic group and the stress in the MWord is not affected.
2) The clitic affects the placement of main stress in the MWord.
   a) Stress falls two syllables from the original place of stress.
   b) Stress falls on the syllable preceding the clitic.
   c) Stress falls on a specific syllable with respect to the edge of the whole PWord domain.
3) The clitic group obeys the rules of secondary stress assignment.

The first group is represented by Italian, where there is no stress assignment rule applying within the clitic group (Nespor 1999:141):

7.	teléfona	*call!*
	teléfona=me=lo *call me it*	*call me about it*
	péttina	*comb!*
	péttina = ti =ci *comb yourself with it*	*come yourself with it*

In Italian, in the MWord, the primary stress is restricted to the final trisyllabic window. This restriction does not hold for the cliticised phrase. In the above examples, there are sequences of four unstressed syllables at the right edge. Other languages behaving in a similar way are Barcelona Catalan and most varieties of Slovene and Bulgarian. Nespor also, incorrectly, puts Polish in this category. However, as discussed below in section 1.2.3., Polish clitic groups receive secondary stress. Therefore, I will put Polish in the third class.

The second category is the most varied one. Group 2a is represented by Greek, where the obligatory stress rule applies to the cliticised phrase, changing the location of the MWord's primary stress. The stress falls on the penultimate syllable of the cliticised phrase, either a clitic (8a) or the MWord (8b), and no further than two syllables from the original primary stress (Nespor 1999: 142):

8.	a)	fére	*bring!*
		fére= to	*bring it!*
		fère= mú =to	*bring it to me!*
	b)	δjávase	*read!*
		δjàvasé =to	*read it!*

A similar pattern can be observed in Neapolitan (Nespor 1999:143):

9.	pórta	*bring!*
	pórta=lo	*bring it!*
	pòrta=tíl=lo	*bring it for yourself!*

Class 2b is represented by Turkish. Here, the stress is assigned to the syllable directly preceding the clitic (Nespor 1999: 143):

10.	köpék	le	köpék=le	*with the dog*
	dog	*with*		
	báşbakan	la	bàşbakán=la	*with the prime minister*
	head-minister	*with*		

In group 2c, the cliticised phrase is treated in the same way as the MWord. In French, the stress is assigned to the last syllable of the domain, just like in MWords:

11.	comprénd	*understand*$_{sg.imp}$	comprend=mói	*understand*$_{sg.imp.}$ *me*
	comprenéz	*understand*$_{pl.imp.}$	comprenez=mói	*understand*$_{pl.imp.}$ *me*

In several Southern Calabrian dialects, stress falls on the penultimate syllable of the cliticised phrase (Nespor 1999: 143):

12.

mángia *eat*	lu *it*		mangiá=lu	*eat it!*
mangiári *eat*	si *for oneself*	indi *of it*	mangiari=sí=ndi	*eat for oneself of it!*

In Macedonian[2], stress falls on the antepenultimate syllable, even in forms with clitics. The stressability of a clitic is determined by its location. Clitics that follow their host are stressable, i.e. enclitics count for stress and the stress with forms containing enclitics is antepenultimate. After the attachment of the enclitic, the stress in the preceding MWord is shifted (Beasiley & Crosswhite 2003: 366):

13.

brátutʃed	*cousin*	bratútʃed=mu	*his cousin*
dónesi	*bring!*	donési=ja	*bring it!*
dónesi	*bring!*	donesí=mi=go	*bring it to me*

Clitics that precede their host do not count for stress: even if a proclitic is attached to a word of one or two syllables and is therefore in penultimate or antepenultimate position, it cannot bear stress and so the stress in the following stem is not affected (Beasley & Crosswhite 2003: 366):

14. (tój)= oti = dóʃol *(he) came from there*
he thence walked

*(tój)= otí = doʃol

In class 3, the place of the primary stress is not affected after the formation of the cliticised phrase, however, the clitic group receives a secondary stress as long as it contains enough phonological material to form a foot. In Spanish, an obligatory rule adds a secondary stress to the syllable at the right edge of the clitic group if more than two unstressed syllables would occur at the right edge of the word (Nespor 1999: 144):

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[2] Contrary to Nespor (1999), I classify Macedonia as type 2c language rather than type 2a language. I follow Beasley & Crosswhite (2003), where they point out that in cliticised phrases stress falls on the antepenultimate syllable, irrespective of its original place.

15.	dándo	*giving*
	dándo=nos	*giving us*
	dándo=nos=lòs	*giving them to us*
	teléfona	*call!*
	teléfona=mè	*call me!*
	teléfona=me=lò	*call me about it!*

A similar behaviour can be observed in Finnish only that the stress falls on the penultimate syllable rather than the final (Nespor 1999: 144):

16.	péruna	*the potato*
	pérunà=han	*the potato, you know*

Other languages that pattern in this way are Lappish, certain varieties of Greek and Polish.

17. Typology of stress in clitic groups (largely based on Nespor (1999: 145)

No stress rule	*Rule of primary stress assignment*			*Rule of secondary stress assignment*
	On second σ to the right	*Before the clitic*	*Edge of domain*	
Italian Slovene Bulgarian Barcelona Catalan	Greek Neapolitan	Turkish	French Calabrian Serbo-Croatian Baleari Catalan	Spanish Greek varieties Finnish Lappish Polish

1.2.3. Stress in Polish clitics

In this section, I will discuss the influence of clitics on the place of stress in MWords Second, I will outline the basic facts regarding stress assignment in clitic groups. Lastly, I will look at cases of clitics that from the phonological point of view should be analysed as affixes.

Clitics may stand before or after the MWord carrying the main stress. A monosyllabic clitic has no stress if it precedes a syllable carrying the main stress. Compare the behaviour of the clitic *nasz* (our) in various phrases below:

18.	nasz=(dóm)	*our house*	*(nász=dom)
	nasz=(dóm+ek)	*our little house*	

Similarly, a single monosyllabic clitic receives no stress if it follows a MWord. In the examples below the clitic *nasz* follows the noun carrying the main stress (the place of the clitic within the PP brings no change in meaning) :

19. (dóm)= nasz[3] *our house*
(dóm+ek)=nasz *our little house*
pro(fésor)= nasz *our professor*

Theoretically what we might expect is refooting the whole phrase and shifting the main stress to the penultimate syllable of the complex, i.e. the final syllable of the MWord:

20. * do(mék=nasz) *our little house*
*(pròfe)(sór=nasz) *our professor*

This never happens in spite of the fact that in the second example refooting would allow all the material to be metrified.

However, the addition of clitics to a MWord can affect the distribution of secondary stresses in the MWord:

21. (rèwo)lucjo(nísta) *revolutionary*
(tèn= re)wolucjo(nísta) *this revolutionary*
(Rubach & Booij 1985)

After the inclusion of the pronoun *ten* (this) a new foot comprising the pronoun and the first syllable of the noun is formed, while the leftmost foot of the noun disappears. The behaviour of stresses in MWords when preceded by clitics indicates that the right edge of the MWord is much 'stronger', in terms of alignment, than the left edge. The rightmost metrical foot of the MWord is never affected by the presence of following clitics. The leftmost foot of the MWord can be easily shifted, even if, due to the change, the left boundary of the foot no longer aligns with the left edge of the MWord.

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[3] There are certain lexicalised prepositional phrases consisting of a monosyllabic preposition and a monosyllabic noun, where the main stress falls on the preposition rather than the noun, e.g. *ná wsi* 'out in the country' (lit. in the village). However, in such cases the prepositional phrase functions as a lexical item rather than a phonological phrase. There is a semantic difference between *ná wsi* (out in the country) and *na wsí* (in the village). Following Rubach & Booij (1985) and Kraśka-Szlenk (2003: 43), I assume that such lexicalised phrases constitute compounds.

A clitic will also receive secondary stress if it forms a part of a bisyllabic foot:

22. a. on=[(zróbił)]$_{\text{MWord}}$ *He did.*

b. (òn= to)= [(zróbił)]$_{\text{MWord}}$ *He did that.*
(tò= on)= [(zróbił)]$_{\text{MWord}}$
[(zróbił)]$_{\text{MWord}}$ = (òn= to)
on= [(zróbił)]$_{\text{MWord}}$=to

c. (òn=by)= to= [(zróbił)]$_{\text{MWord}}$ *He would do this.*
(tò= on)= by= [(zróbił)]$_{\text{MWord}}$

d. (òn= by)=wam=to= [(zróbił)]$_{\text{MWord}}$ *He would do this for you.*
he would you this $do_{past,3ps,sg,masc}$

(tò=by)= on= wam= [(zróbił)]$_{\text{MWord}}$

e. [(zróbił)]$_{\text{MWord}}$ = on= by= (wàm= to)

f. (òn= by)= [(zróbił)]$_{\text{MWord}}$= (wàm= to)

As the examples above show, stress is not associated with any particular clitic. In 22a., the clitic does not receive any stress because it consists only of a single syllable standing right in front of a syllable carrying the main stress. The phrase in 22b. contains two monosyllabic clitics, which, when combined together, can constitute a disyllabic foot. In this phrase, the stress falls on the first clitic in the clitic group, whether the whole clitic group precedes or follows the MWord. If the two monosyllabic clitics are separated by a MWord, neither of them receives stress. Similarly, in 22c., the trisyllabic proclitic group receives only one stress, as it has enough material to form one disyllabic foot. In 22d., we have a quadrisyllabic proclitic group. Here, again, a single initial foot is formed in spite of the fact that there is enough material to form two feet. As 22e. shows, the same rule applies to the enclitic group: a foot is formed at the right edge of the PWord containing the enclitic group. If, however, the whole clitic group is split into two groups (22f.), i.e. a disyllabic proclitic group and a disyllabic enclitic group, then each group forms a foot and receives a stress.

Prosodic words consisting only of clitics are metrified into bisyllabic trochees, according to the general rule of stress assignment:

23. (dó=nas) *to us*
o(dé= mnie) *from me.*

This follows from the general rule that prosodic words should carry a stress. If a prosodic word contains no MWord, then, by default, the stress must fall on a clitic.

In conclusion, clitics form bisyllabic trochees if there is enough material available. The footing proceeds from either the left or the right edge of the cliticised phrase depending on the location of the clitic group with respect to the MWord. The main stress in the MWord is not affected[4].

There are cases where clitics may seem to induce a shift of the main stress in the MWord:

24. [(zróbił)]$_{\text{MWord}}$ *he did*
[(zróbił)]$_{\text{MWord}}$ =by *or* [zro(bíł+by)]$_{\text{MWord}}$ *he would do*

[zro(bíli)]$_{\text{MWord}}$ *they did*
[zro(bíli)]$_{\text{MWord}}$ =śmy *or* [zrobi(lí+śmy)]$_{\text{MWord}}$ *we did*
[zro(bíli)]$_{\text{MWord}}$ =(bỳ=śmy) *or* [zro(bìli)+(bý+śmy)]$_{\text{MWord}}$ *we would do*

This type of variation applies to expressions containing two types of clitics, i.e. the past tense plural clitics *–śmy, -ście*, and the conditional clitics *–bym, -byś, -by*. This stress shift is accompanied by syntactic changes. Past tense and conditional clitics are gradually becoming less mobile and they are acquiring a fixed place in a sentence. They are most often attached to the right edge of the verb stem and as such they tend to be reanalysed as suffixes. Phonologically, they behave in the same way as suffixes, i.e. they became a part of the MWord and affect the placement of stress[5].

The numerals for 400, 500, 600, 700, 800 and 900 also fall into this category. These forms are composed of the base numeral followed by the genitive plural *sto* (a hundred). They have antepenultimate stress in the nominative case where *sto*, even

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[4] However, see the discussion below regarding the conditional suffix *–by*.

[5] Oliver & Grice (2003) collected data from 40 native speakers and showed that all of them used penultimate stress in forms with *–by* in colloquial speech and more than three quarters used penultimate stress when reading a literary text.

when inflected, is still monosyllabic. In the examples below, *sto* takes the form *sta* and *set*:

25.	(cztéry)=sta	*four hundred*
	(siédem)=set	*seven hundred.*

However, the instrumental case *(cztèry)=(st+óma)* (with a disyllabic inflectional ending) has the regular stress pattern. Greenberg (1986: ft 6) suggests that the *sto* particle should be analysed as clitic, which would explain why it fails to undergo regular stress pattern. The clitic *–set* cannot move around the sentence in the same fashion as past tense and conditional clitics can, but it does not decline; it is the stem *siedem* (seven) that declines. Thus, we have ***siédem**set* (700 nom.) in the nominative but ***siédmiu**set* (700 gen.) in the genitive. In both cases, *-set* remains unchanged, but the stem *siedem* changes. I conclude that *–set* is another case of clitic/particle that is on the way to being morphologised into an inflectional/derivational suffix.

There are also instances where particles behave like prefixes. For example, the negative particle *nie* (not) attracts the main stress when attached to a monosyllabic verb, adjective or noun:

26.	(wiém)	*I know*	(nié wiem)	*I don't know*
	(złý)	*bad*	(niézły)	*not bad*
	(tákt)	*tact*	(niétakt)	*tactlessness.*

The above examples contrast with the examples in 18., where a monosyllabic proclitic does not induce the main stress shift.

If, however, *nie* is attached to a disyllabic word, it remains unstressed:

27.	(wiédział)	*He knew*	nie (wiédział)	*He didn't know.*
	(dóbry)	*good*	nie(dóbry)	*not good*
	(wiédza)	*knowledge*	nie(wiédza)	*ignorance*

The data clearly show that the particle *nie* is best analysed as a prefix (cf. Rubach & Booij 1985). It affects the main stress placement in the same fashion as prefixes do. The morphosyntactic change of the particle *nie* into an affix is more advanced than the change of past tense and conditional clitics. While the latter can still be movable, the place of the former is fixed. The particle *nie* can stand only right next to the left edge of its host.

1.3. Acoustic correlates of stress in Polish

There is no general agreement as to what phonetic cue(s) can be attributed to stressed syllables in Polish. The earliest studies of Polish stress (Benni 1923, Dłuska 1950) claim that stressed syllables can be characterised by a slight rise of loudness. Jassem's (1962) acoustic analysis shows that Fo contour is the only correlate of stress. However, Jassem's study was limited to primary stress only. According to Dłuska (1974), vowel lengthening is a phonetic cue of stressed syllables in Polish. Vowel lengthening can be observed in syllables carrying primary stress as well as secondary and rhythmic stresses. Crosswhite (2003) shows that spectral tilt is a cue to word stress in Polish.

Dogil (1999b) is the latest experimental analysis of Polish stress that studies both primary and secondary stress. He looked at the following stress cues: fundamental frequency, intensity, length of the stressed syllable and vowel quality. Acoustic correlates of stress were studied in three contexts: out of focus, in broad focus and in narrow focus. When a word is out of focus, the only parameter correlating with the main stress is the occurrence of the highest Fo together with a sharp Fo slope. This is shown in 28. below, where the word *marmoladowymi* is under investigation. Secondary stress falling on the word initial syllable is marked by the length of the syllable and fully articulated vowel. Non-initial secondary stresses do not seem to have any phonetic cues.

28. Taca z marmoladowymi ciastkami leży [na stole]$_F$.
H*L H*L
The tray with marmalade cookies is on the table.

No pitch accent on either penultimate (primary stress) or initial syllable (secondary stress) has been observed when the investigated word was a part of broadly focused context, such as in the phrase below that was elicited as an answer in a constructed dialogue (The word *marmoladowymi* is under investigation). Again, the main stress was only marked by the highest Fo together with a sharp Fo slope:

29. [Taca z marmoladowými ciastkami]F leży na stole.
H*L
The tray with marmalade cookies is on the table.

Under narrow focus the positions of primary and secondary stresses are switched. The highest Fo, which is the main correlate of main stress when a word is pronounced out of focus, is now on the initial syllable. This syllable also has a sharply changing Fo contour:

30. Taca z [mármoladowỳmi]F ciastkami leży na stole.
H*L

In the word *mármoladowỳmi*, which is in the narrow focus, the main stress falls on the initial syllable and the secondary stress on the penult. When the word is out of focus, the stresses shift, i.e. the main stress falls on the penult and the secondary stress on the initial syllable.

Dogil also conducted a separate experiment to determine what cues can be associated with secondary non-initial (rhythmic) stresses in Polish. The tested word was *(hìpo)(pótam)* (hippopotamus, nom. sg.). The word can be lengthened through adding inflectional suffixes. Since the main stress always falls on the penult, the rhythmic pattern of the word will change once it is inflected:

31. a. (hìpo)(pótam) *hippopotamus, nom. sg.*
b. (hìpo)po(táma) *hippopotamus, gen. sg.*
c. (hìpo)(pòta)(mámi) *hippopotamus, inst .pl.*

The syllable under investigation was *po*, which in each case is in a different stress position. In (a) it bears the main stress, in (b) it is unstressed, and in (c), according to most accounts of Polish stress system, it should have secondary stress. The experiment revealed that secondary rhythmic stress is not implemented in Polish at all. Neither any of the phonetic cues nor changes in the articulatory trajectories showed any correlation with heads of secondary rhythmic feet. The measurements showed no significant differences between rhythmically stressed *po* (example c.) and unstressed *po* syllables (example b.). Only primarily stressed *po* in example a. showed higher Fo, but that is merely a repetition of previous experiments' results.

In conclusion, Dogil's study does not show any phonetic correlates of non-initial secondary stresses. It is questionable whether non-initial secondary stresses exist at all in Polish. Dogil's experiment casts doubt on most of the findings of early (impressionistic) analyses of Polish stress, such as Benni and Dłuska which are clearly in favour of proper trochaic rhythm in Polish. Most Polish phonologists, mostly under the influence of Dłuska, still hold the view that Polish should be classified as a language with trochaic rhythm. The new evidence provided by Dogil necessitates reanalysis and typological reclassification of the Polish stress system. In the rest of the chapter, Polish will be analysed as a language with primary stress on the penult and secondary stress on the initial syllable with no other secondary or tertiary stresses. I will follow Dogil's suggestion and analyse Polish as a language that has non-iterative secondary stresses.

1.4. An OT analysis of Polish stress

In this section, I will provide an OT analysis of Polish stress. I will start off with outlining the differences between my approach and Kraśka-Szlenk (2003), which is a previous OT account of Polish stress. Further, I will analyse the regular stress pattern in MWords. The next section will be devoted to an in-depth analysis of stress in cliticised phrases. Lastly, I will discuss the possibility of analysing Polish as an iterative stress system by using categorical non-gradient constraints (McCarthy 2003).

Throughout this section, I will refer to Kraśka-Szlenk (2003)[6], an earlier OT approach to Polish stress. Below, I will point out the main differences between the two analyses.

- The regular penultimate stress in Polish is rather simple, or even uninteresting, and in this respect our analyses overlap to a large extent. We both use the standard OT constraints like FT-BIN, FT-FORM=TROCHEE or PARSE-SYLL. However, I borrowed the constraint MWORD ⊃ FOOT from Kraśka-Szlenk (see discussion below).

- One of the crucial differences between our approaches is the assignment of secondary stress. Following the recent findings by Dogil (1999), I assume that Polish has a non-iterative secondary stress. Kraśka-Szlenk (2003), on the other hand, follows earlier approaches and analyses Polish as having alternating secondary stresses.
- Kraśka-Szlenk briefly discusses the assignment of irregular stresses in Polish. She mentions only words with antepenultimate stress containing the vowels [–i/-y] followed the consonant [k] and her analysis heavily relies on Comrie (1976) (see also section 2.5 below). Kraśka-Szlenk does not address the following issues related to the assignment of irregular stress. All these points constitute a large portion of this chapter:
    - antepenultimate stress in words other than those containing *–ik/-yk*, e.g. *bibliòteka*;
    - final stress, e.g. *menú*;
    - restriction of irregular stress to nouns only;
    - the relationship between irregular stress and inflection.
- We apply different alignment constraints in our analyses of cliticised forms (see section 1.4.2 below for more details and comparison).
- Kraśka-Szlenk (2003) devotes much attention to stress in compounds, as well as to the relative stress prominence. I devote very little attention to the stress in compounds and none to relative stress prominence.

1.4.1. Stress in Morphosyntactic Words

In this section, I will offer an OT analysis of the regular stress in Polish. As mentioned above, a typical Polish foot has the shape of a syllabic trochee. Primary stress is penultimate and is insensitive to morpheme boundaries, i.e. it falls on the penult of the MWord. It is, however, sensitive to clitic boundaries (see discussion in the next section). Secondary stress falls on the initial syllable of the PWord. Unlike primary stress, it is insensitive to both morpheme and clitic boundaries. Polish stress is non-

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[6] Kraśka-Szlenk (2003) is a published version of Kraśka-Szlenk (1995), a PhD thesis written at University of Illinois, Urbana-Champignon.

iterative, i.e. a PWord or a MWord will have the primary stress and at most one secondary stress.

In OT terms, the basic generalisations can be expressed by means of the following two constraints (e.g. McCarthy & Prince 1993, Prince & Smolensky 2002):

32. FT-FORM=T: *Trochaic Foot Form*
Align the left edge of a foot with the left edge of its head (a stressed syllable).

33. FT-BIN: *Foot Binarity*
Feet are binary at syllabic level

An additional constraint, PARSE-SYLL, will ensure that any input word is actually parsed into feet:

34. PARSE-SYLL: *Parse syllables*
All syllables are parsed into feet.

According to the above constraints, any bisyllabic word will take the shape of a syllabic trochee and have initial stress. A problem arises in connection with monosyllabic words, e.g. *dom* (house, nom. sg.), because they do not satisfy FT-BIN. This can be achieved if we assume that FT-BIN and FT-FORM=T are outranked by the following constraint (reworded from Kraśka-Szlenk 2003: 17)[7]:

35. MWORD ⊃ FOOT[8]: Every Morphosyntactic word must properly contain a foot.

The ranking MWORD ⊃ FOOT >> FT-BIN, FT-FORM=T, PARSE-SYLL will allow monosyllabic words to surface with a stress.

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[7] Full justification for introducing a constraint referring to MWord rather than a general one referring to PWord will be provided in the next section where cliticised phrases will be discussed.

[8] Cf. also WRAP-XP demanding that each XP be contained in a phonological phrase (Truckenbrodt 1999). This constraint interacts with edge alignment constraints to account for coarse-grained patterns of phrasing in Tohono O'odham and Chichewa. Here, however, the prosodic category, i.e. the phonological phrase, must contain the grammatical category, i.e. XP. In Polish, it is the other way round, i.e. the grammatical category, i.e. the MWORD, must contain the prosodic category, i.e. the foot.

Further, we also need to make sure that the right edge of the foot coincides with the right edge of the word. This is clearly an edge-marking effect that in OT terms is expressed by means of alignment constraints. Prince & Smolensky (2002) proposed a metrical alignment constraint called EDGEMOST, which requires co-occurrence of the strongest foot (the main stress bearing foot) at a word edge. Polish has right edge oriented alignment (as far as primary stress is concerned). The specific constraint is RIGHTMOST:

36. RIGHTMOST *Align (Hd-Ft, R, MWd, R)*
The head foot coincides with the right edge of MWord.

RIGHTMOST is visible in words composed of more that two syllables. Only in this type of inputs is it possible to locate the head foot further away from the right word edge. RIGHTMOST will force the alignment of the head foot with the word right edge. Words with an odd number of syllables also indicate that FT-BIN and FT-FORM=T must be ranked above PARSE-SYLL in order to rule out outputs containing monosyllabic degenerate feet[9]:

37. FT-BIN, FT-FORM=T >> RIGHTMOST, PARSE-SYLL

dorota	FT-BIN	FT-FORM=T	RIGHTMOST	PARSE-SYLL
☞a. do.(ró.ta)				*
b. (dó.ro)ta			*!	*
c. (dò)(ró.ta)	*!			

The ranking FT-BIN >> PARSE-SYLL crucially rules out candidate (dò)(ró.ta) with the first syllable forming a degenerate foot. Candidate (b) has the same number of violations of PARSE-SYLL as the winner, however, candidate (b) additionally violates RIGHTMOST.

A slight complication arises when it comes to the analysis of five-syllable candidates. After the formation of the head foot, there are three syllables left, which will allow us

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[9] Similar effects can be obtained by introducing *CLASH that prohibits two stressed syllables standing next to each other. However, *CLASH cannot be highly ranked as it is not always obeyed in Polish. In phonological phrases consisting of two monosyllabic MWords, both of them carry stresses, e.g. *złý piés* (fierce dog).

to create another foot. One syllable must be left unparsed due to highly ranked FT-BIN. PARSE-SYLL will allow two outputs with different locations of the non-head foot to win:

38. PARSE-SYLL

pomarańczowy (orange, adj.)	PARSE-SYLL
☞a. (pò.ma.)rań(czó.wy)	*
☜b. po(mà.rań)(czó.wy)	*
c. po.ma.rań.(czó.wy)	**!

Both (a) and (b) violate PARSE-SYLL once. Candidate (b) could be successfully ruled out by a left-edge oriented alignment constraint (Prince & Smolensky 2002, McCarthy & Prince 1993), such as ALL-FT-L:

39. ALL-FT-L: *Align (Ft-L, PrWd-L)*
The left edge of every foot coincides with the left edge of PrWd.

Note that ALL-FT-L requires every foot to be word-initial. This constraint can be satisfied by candidates with exactly one foot that coincides exactly with the left edge of the word. A language with ALL-FT-L top ranked would have initial stress. Polish does not fall into this category; therefore ALL-FT-L must be outranked by RIGHTMOST. The ranking RIGHTMOST >> ALL-FT-L will produce the correct output, i.e. a form with penultimate main stress and initial secondary stress.

40. RIGHTMOST >> ALL-FT-L, PARSE-SYLL

pomarańczowy	RIGHTMOST	ALL-FT-L	PARSE-SYLL
☞a. (pò.ma.)rań(czó.wy)		***	*
b. (pó.ma.)rań.czo.wy	*!**		***

Five-syllable words do not provide any evidence for the ranking of ALL-FT-L and PARSE-SYLL with respect to each other. In whichever way these two constraints are ranked, candidate (a) is the winner. However, once we consider six-syllable inputs, the ranking of ALL-FT-L and PARSE-SYLL does matter. If the two constraints remain unranked, then we will have two winners:

41. ALL-FT-L, PARSE-SYLL

pomarańczowymi (orange, adj., inst.)	ALL-FT-L	PARSE-SYLL
☞a. (pò.ma.)rań.czo.(wý.mi)	****	**
☞b. (pò.ma.)(ràń.czo.)(wý.mi)	****,**	

Both candidates have the same number of violations. Ranking ALL-FT-L above PARSE-SYLL will produce only one winner.

42. ALL-FT-L >> PARSE-SYLL

pomarańczowymi (orange, adj., inst., pl)	ALL-FT-L	PARSE-SYLL
☞a. (pò.ma.)rań.czo.(wý.mi)	****	**
b. (pò.ma.)(ràń.czo.)(wý.mi)	****,*!*	

The ranking for the Polish regular stress pattern looks as follows:

MWORD ⊃ FOOT >> FT-BIN, FT-FORM=T, RIGHTMOST >> ALL-FT-L >> PARSE-SYLL

Note that *(pò.ma.)(ràń.czo.)(wý.mi)* is the output reported by phonologists who claim that Polish has non-initial secondary stresses. This candidate will emerge as the winner under reverse ranking, i.e. when ALL-FT-L is below PARSE-SYLL. This ranking requires maximal parsing of syllables:

43. PARSE-SYLL >> ALL-FT-L

pomarańczowymi (orange, adj., inst., pl)	PARSE-SYLL	ALL-FT-L
a. (pò.ma.)rań.czo.(wý.mi)	*!*	****
☞b. (pò.ma.)(ràń.czo.)(wý.mi)		****,**

1.4.1.1. Typology

Each of these two grammars (42 and 43 above) makes different predictions about Polish as far as rhythmic typology is concerned. Elenbaas & Kager (1999) distinguish three basic rhythmic patterns: unbounded stress systems, binary rhythmic systems, and ternary rhythmic systems. I will not discuss ternary rhythmic systems as they bear no relevance to the Polish data dealt with in this section. The Polish stress system can be classified either as unbounded or binary. The crucial difference between the two systems lies in the ranking of PARSE-SYLL and ALL-FT-L. ALL-FT-L >> PARSE-SYLL will result in an unbounded system, while PARSE-SYLL >> ALL-FT-L in a binary rhythmic system. If ALL-FT-L >> PARSE-SYLL are undominated, then a system with a single foot at the left edge will emerge. This would be a language with initial stress and no secondary stresses. This single-edge unbounded pattern can be modified into a double-edged Polish pattern by ranking a version of ALIGN-RIGHT above ALL-FT-L. In the case of Polish the specific alignment constraint is RIGHTMOST. This is a language with penultimate stress and non-iterative secondary stress. Elenbaas & Kager (1999: 309) call this pattern 'penult + initial'. The other option is 'initial + penult' pattern with initial main stress and penultimate secondary stress.

When PARSE-SYLL dominates ALL-FT-L, the footing is exhaustive, except for words with an odd number of syllables, where a single syllable cannot be parsed due to FT-BIN. Three types of binary systems can be distinguished by reranking ALL-FT-X and ALIGN-Y.

1. unidirectional

PARSE-SYLL >> ALL-FT-X

Main stress falls on the initial or penultimate syllable and secondary stresses on every alternate syllable. In an odd-number-syllable word, one syllable at the word-edge is unfooted. The selection of edge depends on the direction of ALL-FT-X:

PARSE-SYLL >> ALL-FT-R: x(Xx)(Xx)(**X**x)

2. bidirectional simple

ALIGN-X, PARSE-SYLL >> ALL-FT-Y

The main stress-bearing foot is fixed at one edge and iterative footing is constructed from the opposite edge. In words with an odd number of syllables, the syllable directly preceding or following the head foot is unparsed:

ALIGN-RIGHT, PARSE-SYLL >> ALL-FT-L: (Xx)(Xx)x(**X**x)

3. bidirectional complex

ALIGN-X, PARSE-SYLL >> ALIGN-Y >> ALL-FT-X

The stress is fixed at both edges with rhythmic stresses in between. Main stress is fixed at one edge, secondary stress at the other. Non-edge secondary stresses 'copy' the head foot. In a word with an odd number of syllables, the edgemost foot with secondary stress is separated from the remaining secondary-stress bearing feet by an unparsed syllable:

ALIGN-R, PARSE-SYLL >> ALIGN-L >> ALL-FT-R: (Xx)x(Xx)(**X**x)

The literature on Polish stress reviewed above does not give a clear-cut answer as to which category Polish stress falls into: unbounded or binary bidirectional simple. Latest analyses point to the ALL-FT-L >> PARSE-SYLL ranking (Dogil 1999), while the older ones (e.g. Rubach & Booij 1995), indicate that Polish should be classified as a language with bidirectional simple stress with the ranking PARSE-SYLL >> ALL-FT-L.

Since we have two conflicting opinions on the subject, then maybe the two constraints should remain unranked, which would result in two winners:

44. PARSE-SYLL, ALL-FT-L

xxxxxxx	PARSE-SYLL	ALL-FT-L
☞ a. (Xx)xxx(**X**x)	***	*****
☞ b. (Xx)(Xx)x(**X**x)	*	*****,**

This approach, however, indicates optionality, i.e. speakers could randomly select either candidate (a) or candidate (b) This degree of optionality has not been reported in the literature. Dłuska (1974) points out that the loss of secondary stresses can be associated with the speech style, the faster and casual the speech is, the more likely it is that secondary stresses will be lost. The problem is that her (impressionistic) analysis is not supported by acoustic measurements. Dogil, on the other hand, does not report any optionality in this respect. In my analysis of Polish stress, I rely on the most recent experimental findings in the area of Polish rhythm and stress (Dogil 1999) and I will assume that Polish is an unbounded system language with the 'penult + initial' pattern.

1.4.2. Stress in cliticised phrases

As mentioned above, clitics in PWords can attract secondary stress. As shown in 21. above, a proclitic will attract stress if it is at the very left edge of the PWord and if there is enough material at the left edge of the PWord to form a disyllabic foot. The leftmost foot in the PWord can comprise only the proclitic (22b. above) or it may consist of a monosyllabic proclitic and the initial syllable of the MWord following the proclitic (21. above). In this way, proclitics can affect the placement of secondary stress in the MWord. In contrast, the enclitic group will attract secondary stress only if it is minimally bisyllabic. In case of enclitics, the foot bearing the secondary stress must be properly contained within the enclitic group so as not affect the placement of the primary stress in the preceding MWord.

As Kraśka-Szlenk (2003: 40-41) points out, clitics can be footed and thus receive stress only if there is enough phonological material to form binary feet. That is because clitics are not subject to MWORD ⊃ FOOT, and FT-BIN is the highest constraint of the 'foot' family they are subject to. PARSE-SYLL will impose the footing of clitics where possible. I will start with proclitics. Recall that ALL-F-L refers to the PWord so secondary stress will now migrate to the left edge of the whole complex. Thus, ALL-F-L is also responsible for the shift of secondary stress in a MWord. This is presented below:

45. FT-BIN, RIGHTMOST >> ALL-F-L >> PARSE-SYLL

ten= rewolucjonista (this revolutionary)	FT-BIN	RIGHTMOST	ALL-F-L	PARSE-SYLL
☞ (tèn=re)wolucjo(nísta)			*****	***
ten=(rèwo)lujo(nísta)			*****,*!	***

The tableau below shows that MWORD ⊃ FOOT must be top-ranked and that the domain of this constraint must be a MWord rather than a PWord. When wholly footed, a PWord consisting of a monosyllabic clitic and a monosyllabic MWord would satisfy all the 'foot' well-formedness constraints. If the domain of MWORD ⊃ FOOT was a PWord, then (nász=[dom]$_{\mathrm{MWord}}$) would satisfy it and the stress would fall on the clitic rather than on the noun. However, this candidate violates MWORD ⊃ FOOT because the MWord *dom* is not exhaustively footed on its own and it does not receive stress.

46. MWORD ⊃ FOOT >> FT-BIN, RIGHTMOST >> ALL-F-L >> PARSE-SYLL

nasz=dom (our house)	MWORD ⊃ FOOT	FT-BIN	RIGHTMOST	ALL-F-L	PARSE-SYLL
☞ nasz=[(dóm)]$_{\text{MWord}}$		*		*	*
(nász=[dom]$_{\text{MWord}}$)	*!				

Similarly, a monosyllabic clitic also remains unfooted when followed by a disyllabic MWord because it fails FT-BIN:

47. MWORD ⊃ FOOT >> FT-BIN, RIGHTMOST >> ALL-F-L >> PARSE-SYLL

on= zrobił (he did)	MWORD ⊃ FOOT	FT-BIN	RIGHTMOST	ALL-F-L	PARSE-SYLL
☞ on=[(zróbił)]$_{\text{MWord}}$				*	*
(òn)=[(zróbił)]$_{\text{MWord}}$		*!		*	

A disyllabic sequence of clitics can be wholly footed: there is enough material to form a foot:

48. FT-BIN, RIGHTMOST >> ALL-F-L >> PARSE-SYLL

on= to= zrobił (he did that)	FT-BIN	RIGHTMOST	ALL-F-L	PARSE-SYLL
on=to=[(zróbił)]$_{\text{MWord}}$			**	*!*
☞ (òn=to)=[(zróbił)]$_{\text{MWord}}$			**	

A trisyllabic sequence of clitics in the tableau below can have only one disyllabic foot. Here, the place of the foot in the clitic sequence is determined by ALL-F-L:

49. FT-BIN, RIGHTMOST >> ALL-F-L >> PARSE-SYLL

on= by= to= zrobił (he would do it)	FT-BIN	RIGHTMOST	ALL-F-L	PARSE-SYLL
on=by=to=[(zróbił)]$_{\text{MWord}}$			***	**!*
☞(òn=by)=to=[(zróbił)]$_{\text{MWord}}$			***	*
on=(bỳ=to)=[(zróbił)]$_{\text{MWord}}$			***,*!	*

In longer sequences (four syllables or more), it is possible to form more than one disyllabic foot. However, due to the ranking ALL-F-L >> PARSE-SYLL only one foot at the left edge of the PWord is created:

50. FT-BIN, RIGHTMOST >> ALL-F-L >> PARSE-SYLL

on= by= wam=to= zrobił (he would do this for you)	FT-BIN	RIGHTMOST	ALL-F-L	PARSE-SYLL
☞(òn=by)=wam=to=[(zróbił)]$_{\text{MWord}}$			****	**
(òn=by)=(wàm=to)=[(zróbił)]$_{\text{MWord}}$			*****!*	

I now turn to enclitics. Recall that RIGHTMOST can block refooting of the MWord because it refers specifically to the right edge of MWord, in contrast to ALL-F-L which requires the alignment with the left edge of a PWord, not necessarily a MWord. RIGHTMOST ensures that the main stress is not shifted when a MWord is followed by a clitic.

51. RIGHTMOST >> ALL-F-L >> PARSE-SYLL

zrobił=to (he did that)	RIGHTMOST	ALL-F-L	PARSE-SYLL
☞ (zróbił)=to			*
zro(bíł=to)	*!	*	*

The present grammar, however, incorrectly predicts that if a MWord is followed by a disyllabic, or longer, sequence of clitics, then the whole sequence should be unfooted, even though there is enough material to form a foot. The expected winner crucially fails ALL-F-L, a constraint that disfavours the formation of feet on the right edge of a word. The second candidate cannot be salvaged by RIGHTMOST as RIGHTMOST refers only to MWords.

52. RIGHTMOST >> ALL-F-L >> PARSE-SYLL

zrobił=to=wam (he did that for you)	RIGHTMOST	ALL-F-L	PARSE-SYLL
☜ [(zróbił)]$_{\text{MWord}}$ =(tò=wam)		*!*	
[(zròbił)]$_{\text{MWord}}$ =(tó=wam)	*!	**	
☞ [(zróbił)]$_{\text{MWord}}$ =to=wam			**

McCarthy & Prince (1993) propose the following constraint to align the right edge of a PWord with the right edge of a foot. The constraint does not specify whether it has to be a foot bearing the primary stress.

53. ALIGN-PWD-R: *Align (PWd-R, Ft-R)*
The right edge of PrWd is aligned with the right edge of a foot.

When sandwiched between RIGHTMOST and ALL-F-L, the constraint will render the correct output:

54. RIGHTMOST >> ALIGN-PWD-R >> ALL-F-L >> PARSE-SYLL

zrobił=to=wam (he did it for you)	RIGHTMOST	ALIGN-PWD-R	ALL-F-L	PARSE-SYLL
☞ [(zróbił)]$_{\text{MWord}}$ =(tò=wam)			**	
[(zròbił)]$_{\text{MWord}}$ =(tó=wam)	*!		**	
[(zróbił)]$_{\text{MWord}}$ =to=wam		*!*		**

ALIGN-PWD-R cannot force footing of monosyllabic enclitics due to highly ranked FT-BIN:

55. FT-BIN, RIGHTMOST >> ALIGN-PWD-R >> PARSE-SYLL

zrobił=to (he did that)	FT-BIN	RIGHTMOST	ALIGN-PWD-R	PARSE-SYLL
☞ (zróbił)=to			*	*
(zróbił)=(tò)	*!			

After the addition of ALIGN-PRWD-R to the grammar, the final ranking for the regular stress assignment in Polish looks as follows:

56. MWORD ⊐ FOOT >>
FT-BIN, FT-FORM=T, RIGHTMOST >>
ALIGN-PWD-R >>
ALL-FT-L >>
PARSE-SYLL

1.4.2.1. Previous analyses

Cliticised phrases were also analysed by Kraśka-Szlenk (2003). There are similarities between our approaches. Both of us recognise the necessity of having separate constraints referring to MWords and to larger prosodic units in order to account for different stress placement in PWords consisting only of MWord(s) and PWords containing clitics. In my analysis this is achieved by three constraints: RIGHTMOST, ALL-F-L and ALIGN-PWD-R. Kraśka-Szlenk employs the following three constraints: ALIGN-MWORD, ALIGN-CIG(R) (Align-CliticGroup) and ALIGN-CIG(L). She considers ALIGN-PWD-R and ALL-F-L irrelevant. There are a few problems with her approach. First, in Kraśka-Szlenk's definition of ALIGN-MWORD there is no reference to primary stress. The constraint only requires an alignment of the right edge of the MWord with a foot. Thus, this constraint will be satisfied even if the right edge of the MWord is aligned with the foot carrying the secondary stress. Effectively, in PWords where the MWord is followed by a disyllabic sequence of clitics, ALIGN-MWORD will allow the primary stress to fall on a clitic and the secondary stress on the MWord, e.g. *[(zròbił)]$_{\text{MWord}}$ =(ón=to). In my analysis, ALIGN-MWORD has been replaced by RIGHTMOST requiring the alignment of the head foot with the right edge of the MWord. In this way the primary stress will not fall outside the MWord.

Further, Kraśka-Szlenk introduces two specific alignment constraints ALIGN-CIG(R) and ALIGN-CIG(L) to account for the fact that secondary stresses are aligned with the left and right edges of clitic groups. It is not clear to me why these two specific constraints should be introduced. A more general constraint like ALIGN-PWD-R will do the work equally well.

Similarly, Kraśka-Szlenk uses ALIGN-CIG(L) to account for the fact that in PWords with proclitics, the foot bearing the secondary stress is aligned with the left edge of the PrWord and not the left edge of the MWord. In my analysis, this role is played by ALL-FT-L. Again, ALL-FT-L refers to the PWord, not the clitic group. Being a more general constraint, ALL-FT-L ensures that a foot is aligned not only with the left edge of the proclitic group but also with the left edge of the MWord if it is not preceded by a proclitic. Thus, in a PWord consisting only of a 5-syllable MWord, ALL-FT-L will place the secondary stress on the initial syllable, rather than the peninitial. Kraśka-Szlenk has no way of explaining this phenomenon. In her analysis, the secondary stress in a 5-syllable MWord can fall either on the initial or peninitial syllable. FT-BIN >>

PARSE-SYLL will produce two winners: x(Xx)(**X**x) and (Xx)x(**X**x). She would have to employ yet another alignment constraint referring either to the right edge of the PWord or the MWord.

Opting for a more universal constraint, such as ALIGN-PWD-R, instead of ALIGN-CIG has the following advantages:

- ALIGN-PWD-R is a universal constraint found in most world languages, while ALIGN-CIG seems to be a language specific constraint and as such it should be avoided unless its work cannot be done by other more general constraints.
- If we apply ALIGN-PWD-R, the complex relationship between the various levels of the prosodic hierarchy becomes more transparent. We can see clearly that the right edge of the MWord is much stronger than its left edge. The right edge cannot be influenced by constraints referring to higher levels, e.g. PWord. The left edge, on the other hand, is more susceptible to changes in the stress placement in order to satisfy edge alignment constraints referring to higher levels, such as PWord.

1.4.3. Discussion

The grammar we have established in this chapter employs three different alignment constraints, namely RIGHTMOST, ALIGN-PWD-R, ALL-F-L, to account for the varying sensitivity to stress of the left and right edges of MWords and PWords. Clearly, the right edge requires an absolute alignment of the MWord and the main foot edge. The left edge of the MWord is more flexible. Here, refooting can easily apply, even if the resultant foot runs across the MWord/foot boundary.

The difference between ALL-F-L and RIGHTMOST, ALIGN-PWD-R is straightforward. ALL-F-L refers to the left edge of the word, while the other two constraints refer to the right edge of a word. Having constraints relating to the opposite edges of a word allows locating one foot at the right edge and one at the left edge. It may be less obvious why two different right alignment constraints are required. There are crucially three differences between RIGHTMOST and ALIGN-PWD-R.

- *Domain*: RIGHTMOST refers to MWord, while ALIGN-PWD-R refers to PWord. Thus, RIGHTMOST will assign stress to MWords only, regardless of the number and length of clitics following it. It will not assign any stress to sequences consisting only of clitics. ALIGN-PWD-R will make sure that longer sequences of clitics following the MWord are footed and similarly, it will force footing on any free-standing sequence of clitics if it is at least two-syllable long.
- *Type of stress*: RIGHTMOST refers only to the head foot (primary stress), while ALL-F-L refers to any type of foot, i.e. carrying either primary or secondary stress.
- *Type of alignment*: RIGHTMOST requires alignment of the head foot with the right edge of the MWord, i.e. it refers to the location of the foot within a word. ALIGN-PWD-R requires alignment of the right edge of a word with a foot, i.e. it prevents any stray syllables from occurring at the right edge of a word.

Employing these two constraints allows preservation of the primary stress in the MWord even if a number of clitics follow it. At the same time, sequences of clitics can be footed without affecting the place of primary stress in the preceding or following MWord.

RIGHTMOST can also be defined as ALIGN(HD-FT,R,MWD,R) (McCarthy & Prince 1993). Due to a large number of alignment constraints used in this chapter, I decided to use the name RIGHTMOST rather than ALIGN(HD-FT,R,MWD,R) in order to make it easier to differentiate between all the constraints. McCarthy (2003) claims that ALIGN(HD-FT,R,MWD,R) or RIGHTMOST are never used gradiently, although alignment constraints are gradient. In my analysis RIGHTMOST is also used categorically. McCarthy proposes replacing edge alignment constraints referring to the head foot with the categorical ENDRULE-L/R constraints saying that the head foot is not preceded/followed by another foot within the PWord. The specific constraint needed for our data would be:

57. ENDRULE-R(MWORD): The head foot is not followed by another syllable within the MWord.

Note that I replaced the word 'foot' present in McCarthy's definition with the word 'syllable'. This was to ensure that the head foot is not separated from the right edge of the MWord by a stray unfooted syllable.

There is, however, a problem with the ENDRULE definition. ENDRULE, as defined by McCarthy, must obey EXHAUSTIVITY (Selkirk 1995, 1996) prohibiting non-strict layering within the prosodic hierarchy. Otherwise, the head foot could be separated from the left/right edge of a domain by a number of unfooted syllables. For example, a candidate like xx(Xx)xx will satisfy both ENDRULE-L and ENDRULE-R. In this candidate, the head foot is not separated from either the left or the right edge of the PWord by another foot. This candidate will, however, fail EXHAUSTIVITY because the PWord will have to dominate the foot level containing the head foot and syllable level containing the unparsed syllables. EXHAUSTIVITY is satisfied if PARSE-SYLL is ranked above ENDRULE-R(MWORD). In this way, all the syllables in the PWord are footed and the PWord directly dominates the foot level, which is the next level below the level of PWord. This is problematic in systems with non-iterative footing, where PARSE-SYLL must be quite low in the ranking. That is why my definition of ENDRULE-R(MWORD) does not obey EXHAUSTIVITY. Here, the MWord has to dominate the foot level and the lower syllable level at the same time.

Additionally, the ENDRULE is problematic in grammars with the ranking FT-BIN >> PARSE-SYLL >> ENDRULE. In a word with an odd number of syllables, one syllable will remain unfooted and this syllable may be situated at the left/right edge of a word, thus separating the head foot from the left/right edge. Will the ENDRULE, as defined by McCarthy, still be satisfied in such cases?

McCarthy (2003) questions the existence of any gradient constraints. This seems to be natural in case of constraints dealing with the assignment of the primary stress. So far, these constraints have been used categorically although theoretically their violation could be gradient, thus allowing for unattested stress systems. Gradient alignment constraints are necessary in stress systems with non-exhaustive footing, like Polish. If they dominate PARSE-SYLL, alignment constraints will prevent iterative foot parsing.

Consequently, in Polish the three alignment constraints RIGHTMOST, ALL-F-L and ALIGN-PWD-R dominate PARSE-SYLL.

McCarthy, however, questions the existence of non-iterative foot parsing. If there are no languages with non-iterative foot parsing, then all the gradient alignment constraints can be replaced by categorical constraints. In his system, all alignment constraints, such as ALL-F-L/R or ALIGN-X-L/R have been replaced with one simple constraint, namely ENDRULE-L/R. ENDRULE-L/R refers only to the placement of the primary stress. Secondary stresses surface thanks to the ranking PARSE-SYLL >> ENDRULE-L/R. PARSE-SYLL does not, however, make any reference to secondary stresses. It simply forces exhaustive footing of all the existing metrical material. In a system where alignment refers only to the primary stress, iterative footing is necessary to allow any secondary stresses. Following McCarthy's proposal, the ranking for Polish would look as follows: FT-BIN >> PARSE-SYLL >> ENDRULE-R. This is shown in the tableau below with a 6-syllable input:

58. FT-BIN >> PARSE-SYLL >> ENDRULE-R

xxxxxx	FT-BIN	PARSE-SYLL	ENDRULE-R
a. xxxx(Xx)		**!**	
b. ☜ (Xx)xx(Xx)		**!	
c. ☞ (Xx)(Xx)(Xx)			

As you can see, the grammar will select candidate (c) where all the syllables have been exhaustively parsed. The expected winner, i.e. candidate (b) will fail PARSE-SYLL.

A slight complication arises when we analyse an input with an odd number of syllables. The ranking predicts that one syllable should be left unfooted but it is not clear which one. The system does not provide any mechanism that would specify which syllable should be unparsed. Consequently, the grammar produces three potential winners. Generally, all the analyses of the Polish stress system that advocate iterative footing agree that in a word with an odd number of syllables, it is the one right next to the head foot that is unparsed. Clearly, McCarthy's system needs some further adjustment/development to ensure that the correct syllable is unfooted:

59. FT-BIN >> PARSE-SYLL >> ENDRULE-R

xxxxxxx	FT-BIN	PARSE-SYLL	ENDRULE-R
a. (Xx)xxx(Xx)		**!*	
b. (Xx)(Xx)(X)(Xx)	*!		
c. ☞ (Xx)(Xx)x(Xx)		*	
d. ☞ (Xx)x(Xx)(Xx)		*	
e. ☞ x(Xx)(Xx)(Xx)		*	
f. (Xx)(Xx)(Xx)x		*	*! (?)

There is another problem with the above tableau. ENDRULE-R, as defined by McCarthy, measures the distance of the head foot from the edge of the PWord in terms of feet. In candidate (f)., the head foot is separated from the right edge of the word by one syllable so theoretically the candidate satisfies ENDRULE-R and is another potential winner.

There is yet another different problem with McCarthy's approach. According to McCarthy, it is only a coincidence that some languages have no obvious phonetic manifestation of secondary stress. For example, Cairene Arabic has no systematic secondary stress but still it must have an iterative foot parsing because otherwise the position of the main stress could not be explained. McCarthy concludes that even solid evidence for the absence of secondary stress does not permit the inference that words do not have such stresses, because the range of ways in which metrical structure can be realised phonetically is so broad. I do not find this line of argumentation convincing enough. In Polish, secondary stresses do not depend on the place of the primary stress or vice versa and there does not seem to be any concrete evidence for the existence of word-medial secondary stresses. Further, if we assume that Polish has iterative secondary stresses, we would have to explain why only the initial secondary stress is audible and the middle ones are not. I am not sure how McCarthy can account for these facts. Theoretical analysis not supported by concrete data leaves the analysis easily open to criticism or even questionable. Therefore, in my analysis, I still relied on the (gradient) alignment constraints rather than the categorical ones proposed by McCarthy (2003). I admit, however, that two of the alignment constraints used in this chapter, i.e. RIGHTMOST and ALIGN-PWORD-R effectively function as categorical constraints. The only gradient constraint is All-Ft-L. As already mentioned, this constraint must be gradient in order to account for the fact that Polish has a non-iterative secondary stress. Alternatively, it may be the case that only certain alignment constraints are invariably categorical, e.g. constraints referring to the placement of primary stress, as suggested by McCarthy, while others are gradient.

Another issue taken up in this section was the alignment of prosodic and grammatical categories: ALIGN(PCAT, GCAT). McCarthy & Prince (1993) mention the possibility of aligning a PCat with the edge of a root or stem. Here, I show the necessity of aligning the right edge of the head foot with the right edge of the MWord. Further, I demonstrate that in Polish primary and secondary stresses are sensitive to the edges of different categories. Primary stress is sensitive to the right edge of the GCat of MWord. The left edge of the MWord plays no role in stress assignment in Polish. Secondary stress, on the other hand, is sensitive to the edges of the PCat of PWord. Here, both edges of the PWord are crucial in the placement of secondary stress, i.e. feet bearing secondary stress align with the right as well as the left edge of the PWord, thus marking the boundaries of PWords. In a sense, we might say that the primary stress belongs to the level of morphosyntax and that is why it must always be contained within the MWord and that is why it is insensitive to the edges of any prosodic categories. It is only the secondary stress that fully belongs to the prosodic level. However, the assignment of secondary stresses can be affected by the morphosyntactic level: secondary stresses are always assigned after the assignment of the primary stresses and only when the assignment of secondary stresses will not affect the place of the primary stress. Thus, there is a strict hierarchy in the Polish stress system in that the morphosyntactic level dominates the prosodic level.

2. Irregular stress in Polish

In this section, I analyse irregular stress in Polish. First, I outline the distribution of antepenultimate and final stresses in the Polish lexicon. I discuss in more detail the relationship between nominal inflection and the occurrence of irregular stresses. Next, I provide an OT analysis of Polish irregular stress, where I briefly touch upon the issue of the trisyllabic window effect in systems with non-iterative footing. I argue that Polish irregular stresses result from lexical foot head marking and that irregular stresses are limited only to nouns due to positional faithfulness. I also argue that nouns with a bisyllabic inflectional ending receive the regular penultimate stress due to *Lexicon Optimisation.* Lastly, I discuss previous analyses of Polish irregular stress.

As discussed above, the regular stress in Polish is penultimate. In certain words, however, the final or antepenultimate syllable bears the main stress. There are no cases where primary stress would fall outside this trisyllabic window. The irregular lexical stress interacts with inflectional morphology. Surfacing of the lexical stress depends also on the length of the inflectional ending. Consequently, primary stress in the marked cases alternates between final/penultimate and antepenultimate/penultimate syllables, respectively.

The following generalisations can be drawn as far irregular stress is concerned.

- Bare stems (with no overt inflectional ending) can have primary stress on the final, penultimate or antepenultimate syllable:

60.	Final:	reżím	*regime, nom. sg.*
	Penultimate:	matemátyk	*mathematician, nom. sg*
	Antepenultimate:	uniwérsytet	*university, nom. sg..*

At this point, lexical marking on the penult might seem superfluous since the default stress is penultimate as well. Placing a diacritic accent on the penult will prove necessary in the next set of examples.

- Monosyllabic inflectional endings have no effect on the placement of irregular stress as long as the main stress remains within the final trisyllabic window. Thus we have

61.	a.	reżím	*regime nom. sg.*	reżím+u	*gen. sg*
	b.	matemátyk	*mathematician, nom. sg*	matemátyk+a	*gen. sg*
	but				
	c.	uniwérsytet	*university, nom. sg.*	uniwersytét+u	*gen. sg.*

In 61 a-b, the stress in the stem is unaffected by the addition of suffixes, while in 61c. the stress in the inflected stem is shifted. Example 61a. may seem ambiguous. Here, stress in the inflected noun is penultimate and so it may look as if stems with final stress become regular once an inflectional ending is attached. This regularity is only apparent: preserving the stress on the stem final syllable after the attachment of a monosyllabic inflectional ending will result in penultimate stress of the whole complex. In 61b., the stress is penultimate in the uninflected stem. The stress does not change its position in the stem once a monosyllabic inflectional ending is attached. Consequently, the inflected form has antepenultimate stress. Preservation of stress on the same syllable in the inflected noun in 61c. would result in the stress falling outside the trisyllabic window. Stems with antepenultimate stress when uninflected automatically receive the regular penultimate stress when inflected.

- Words with a bisyllabic suffix always surface with the regular penultimate stress:

62.	reżím	*regime, nom. sg.*	reżim+ówi	*dat. sg.*
	matemátyk	*mathematician, nom. sg*	matematyk+ówi	*dat. sg*
	uniwérsytet	*university, nom. sg.*	uniwersytet+ówi	*dat. sg..*

2.1. Antepenultimate stress

The table below summarises the patterns of occurrence of antepenultimate stress in Polish (antepenultimate stresses shaded).

63. Antepenultimate stress in Polish

Pattern	*Bare stem*	*Stem + x*	*Stem + xx*
1a	(**X**x)	(**X**x)+x	(Xx)(+**X**x)
1b	x(**X**x)	x(**X**x)+x	(Xx)x(+**X**x)
1c	(Xx)(**X**x)	(Xx)(**X**x)+x	(Xx)(Xx)(+**X**x)
2a	(**X**x)x	(Xx)(**X**+x)	(Xx)x(+**X**x)
2b	(Xx)(**X**x)x	(Xx)(Xx)(**X**+x)	(Xx)(Xx)x(+**X**x)

There are two groups of words that have antepenultimate stress:

- 1a-c. Masculine, feminine and neuter nouns with penultimate stress in forms with zero or disyllabic morphological ending and antepenultimate stress in every surface form where there is a monosyllabic inflectional ending (examples in 65 below);
- 2a-b Masculine loanwords with antepenultimate stress in cases where no inflectional ending is present and penultimate stress in cases with an inflectional ending - either monosyllabic or disyllabic (examples 65 below).

64. *Penultimate -antepenultimate stress alternations in forms 1a-c.*

a. *Feminine nouns*:

1a)	ó.pe.r+a	*opera, nom. sg.*
	ó.pe.r+y	*gen. sg.*
	ó.per	*gen. pl.*
	ò.pe.r+ámi	*inst. pl.*
1b, c)	màtemátyk+a	*mathematics, nom. sg.*
	màtemátyk+i	*gen. sg.*
	màtemátyk	*gen. pl.*
	màtematyk+ámi	*inst. pl.*

b. *Masculine nouns*:

1b, c)	màtemátyk	*mathematician, nom. sg.*
	màtemátyk+a	*gen. sg.*
	màtematyk+óvi	*dat. sg.*
	màtematyk+ámi	*inst. pl.*

c. *Neuter nouns*:

1a)	rýzyk+o	*risk, nom. sg.*
	rýzyk+a	*gen. sg.*
	rýzyk	*gen. pl.*
	rỳzyk+ámi	*inst. pl.*

65. *Antepenultimate – penultimate stress alternations in forms 2a-b.*

.	ùniwérsytet	*university, nom. sg.*
	ùniwersytét+u	*gen. sg.*
	ùniwersytet+ámi	*inst. pl.*

For all the nouns in 64. and 65. above, the stress shifts to the penultimate syllable if a derivational suffix is attached, even a monosyllabic one:

66.	gramátyk+a	gràmatýcz+ny	*grammatical, nom. masc. sg.*
	ùniwérsytet	ùniwersytéc+ki	*university, adj. nom. masc. sg.*

In *gramátyk+a* and *gramatýcz+ny,* both forms contain the same number of syllables, so we might expect the same stress pattern in both the basic nominal form and the derived adjectival form. However, the form with the derivational suffix takes the regular penultimate stress.

To summarise, lexical antepenultimate stress wins over the default penultimate pattern as long as it is marked on one of the last three syllables of either inflected or non-inflected noun and as long as the noun containing the lexical stress does not undergo any morphological derivations. Otherwise, the regular stress pattern surfaces.

2.2. Final stress

Final stress occurs in three classes of words: acronyms, a small number of compounds, and borrowings (final stresses shaded).

67. Final stress in Polish.

Bare stem	*Stem + x*	*Stem + xx*
(x**X**)	x(**X**+x)	(Xx)(+**X**x)
(Xx)(**X**)	(Xx)(**X**+x)	(Xx)x(+**X**x)
(Xx)x(**X**)	(Xx)x(**X**+x)	(Xx)(Xx)(+**X**x)

Acronyms take stress on the last syllable of a sequence. The rule is perfectly productive and exceptionless:

68.	ONZ	[ɔ.ɛn.zɛ́t]	*UN*
	RPA	[ɛr.pɛ.á]	*The Republic of South Africa.*

When an overt inflectional ending is attached, the stress is penultimate, irrespective of the length of the suffix:

69.	UJ	[u.jɔ́t]	*Jagiellonian University, nom. sg.*
	UJ+u	[u.jɔ́.t+u]	*gen. sg.*
	UJ+owi	[u.jɔ.t+ɔ́.vi]	*dat. sg.*

It has been argued (Sawicka 1995: 179) that acronyms should be analysed as mini phonological phrases in which each syllable constitutes a separate word. In a phonological phrase the last word bears the main stress. Since in acronyms all the constituents are monosyllabic, main stress will always be final. The addition of an inflectional ending automatically lengthens the last word and enough material is available to form a bisyllabic trochee. In other words, acronyms behave like phonological phrases consisting of three separate monosyllabic lexical items and there is nothing exceptional as far as stress assignment is concerned.

It might well be possible to analyse acronyms as compounds. There is a class of compounds in Polish where the stress always falls on the last constituent. Consequently, in compounds with a monosyllabic last constituent, the stress will be final:

70.	eks+mąż	*ex-husband*
	wice+místrz	*vice-champion.*

Needless to say, once they are inflected, the stress is penultimate:

71.	eks+mąż	wice+místrz
	eks+mąż+a	wice+místrz+a
	eks+mąż+ámi	wice+mistrz+ámi

Rubach & Booij (1985) report that in compounds primary stress is penultimate and, just like in morphologically simple words:

72.	a.		rzecz+o+znáwca	*expert*
		from	rzécz + znáwca	*thing + knowledgeable person*
			ciśnieni+ó+mierz	*pressure indicator*
		from	ciśniénie + miérzyć	*pressure + to measure*
			fal+ó+chron	*breakwater*
		from	fála + chrónić	*wave + to protect*
	b.		kanadyjsk+o+pólski	*Canadian-Polish*
		from	kanadýjski + pólski	*Canadian + Polish*
			łam+í+strajk	*strikebreaker*
		from	łámać + stŕajk	*to break + strike*
			dus+í+grosz	*penny-pincher*
		from	dúsić + grósz	*to press + penny*
	c.		póczt+mistrz	*postmaster*
		from	póczta + místrz	*post office + master*
			kúch+mistrz	*chef*
		from	kúchnia + místrz	*kitchen + master*

Note that the examples in 70-71. and 72. do not have the same morphological make-up. The two parts of the compounds in 72. are connected by the infix *-o-* (72a) or *-i-* (72b), or the first constituent is truncated (71c). The words in 70-71 do not contain any such infix. It may well be the case that the forms in 70-71 and 72 are parsed in a different way. Those in 72 are treated as simple words from the prosodic point of view, while those in 70-71 are more like phonological phrases where the stress pattern of each individual component is preserved[10].

The best test cases would be compounds consisting of two nouns not connected by an infix where the first noun functions as a modifier of the second noun, roughly speaking an equivalent of English compounds such as *history teacher*. It is not easy to find examples of this type. Typically, compound constituents are conjoined by infixes, the only productive class of exceptions being the ones discussed in 71., but in this class the first constituent of the compound is an adjective. Grzegorczykowa & Puzynina (1998) observe that this type of compounding is infrequent in Polish and results from the gradual lexicalisation of certain phrases, e.g. *majster-klepka* from *majster* (master) and *klepka* (DIY work). Recently, a few compounds like *history teacher* have appeared in Polish, largely due to the influence of English. Here, the second (monosyllabic) constituent bears the primary stress:

73.		auto-złóm	*used car parts recycle point*
	from	aúto + złóm	*car + junk*
		biuro-lánd	*office equipment shop*
	from	biúro + lánd	*office + area*

These compounds are recent so, of course, with time they may become lexicalised and acquire penultimate stress.

Another class of words with final stress is constituted by borrowings. Polish has a number of borrowings (mostly of French origin) that have final stress, e.g. *attaché,*

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[10] Rubach & Booij (1985: 304) claim that compounds do not entirely behave like simple words from the prosodic point of view. In longer compounds the basic word stress of both constituents is preserved, yet the second part of the component is stronger and it bears the primary stress. They give the following example: *kònstytucỳjno-pàrlamentárny* (constitutional parliamentary) from *kònstytucýjny* + *pàrlamentáryny*. Rubach & Booij assume the existence of secondary stresses, in which case the expected stress pattern of the compound should be *kònstytùcyjnò-parlàmentárny*. The authors do not provider any acoustic evidence to support their analysis. The latest acoustic analysis of Polish stress (section 1.3.) cast doubt on the existence of non-initial secondary or rhythmic stresses.

jurý, menú, reżím, Camús. Words the spelling of which ends in a vowel are indeclinable and have invariably final stress. Words that end in a consonant behave like acronyms. They have final stress in cases with no overt inflectional ending and penultimate stress once an overt monosyllabic or disyllabic inflectional suffix is attached:

74.	reżím	*regime, nom. sg.*
	reżím+u	*gen. sg.*
	reżim+ówi	*dat. sg.*

As noted above, the addition of a bisyllabic inflectional ending always triggers regular penultimate stress, irrespective of the type of stress marking on the stem. We might expect antepenultimate stress when a bisyllabic inflectional ending is attached to a stem with final stress. In such cases, the lexical stress in the stem would be preserved and the trisyllabic window requirement would not be violated. This issue will be discussed in the next section.

To summarise, final stress is fully productive only in acronyms. However, we argued that, from the phonological point of view, acronyms should be analysed as phonological phrases rather than MWords, which would exclude them from the class of nouns with the irregular final stress. Thus, final stress would be limited only to a small number of compounds and French borrowings. Any word with final stress will automatically receive the regular penultimate stress once an inflectional ending is attached to it, irrespective of the length of the inflectional ending.

2.3. Nouns, inflection and irregular stress

2.3.1. Bisyllabic suffixes

One explanation for why nouns with bisyllabic inflectional suffixes always have penultimate stress might be that bisyllabic inflectional endings are also marked for stress in the same way as stems are. A similar proposal was put forward by Hammond (1989). When there are two constituents with lexical stress marking, the rightmost one wins. Once an inflectional ending with stress marking is attached to a stem that has stress marking as well, the stress marking on the stem is 'deleted'.

This hypothesis seems to be highly plausible when analysed from the perspective of language acquisition. An overwhelming majority of Polish vocabulary has main penultimate stress. Nouns with irregular stress tend to be specialised and as such they hardly ever, if ever, occur in child-directed speech. In regular cases, stress is assigned after all the derivational and inflectional morphology has taken place. Inflectional suffixes are always at the very end of the MWord. If an inflectional suffix is monosyllabic, it will never receive stress. If it is bisyllabic, it will always carry primary stress. The child may store this information in their mind. In this sense, it might be claimed that bisyllabic suffixes are lexically marked for stress. Thus, when a child comes across a loanword with final or antepenultimate stress and attaches a bisyllabic inflectional ending to it, they will create a constituent with two lexically marked stresses: one on the stem and one on the affix. The choice will go for the rightmost stress. If they opt for the stem stress, they may end up with a word where the main stress is somewhere in the middle, e.g. *uniwérsytet* → *uniwérsytet+ami*. The stress is 5 syllables from the right edge and 3 syllables form the left edge. One of the main functions of stress is to aid speech parsing by marking the edges of MWords. Needless to say, a stress that is 5 syllables from the edge of the MWord will not be of much use in determining the location of the right word boundary. Consequently, the lexically marked stress on the affix will win.

2.3.2. Loanword adaptation

A related issue is loanword adaptation. As nouns with irregular stress are gradually incorporated into the Polish inflectional system, they are also gradually losing their phonological (foreign) idiosyncrasies. When a foreign noun is borrowed into Polish, it is initially indeclinable. If it has non-penultimate stress, this irregularity may be[11]

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[11] Note that I said that the stress of the donor language 'may be' rather than 'is' preserved in Polish. Mańczak-Wohlfeld (1995: 54) in her study of English loanwords in Polish observes that most loanwords receive penultimate stress. There are, however, a few exceptions where the stress remains antepenultimate in Polish, e.g. *chésterfield*. It is beyond the scope of this dissertation to study the numerous cultural and sociolinguistic factors connected with loanword adaptation. A borrowing undergoes a different phonological treatment depending on whether it was first brought into Polish by somebody who speaks the source language or speak a dialect of Polish that allows non-penultimate primary stress.

preserved, as long as it falls on the final or antepenultimate syllable[12]. With time, the item is assigned to one of the inflectional classes and it is inflected in the same fashion as the rest of the Polish vocabulary. However, even if a noun is incorporated into the inflectional system, it may still preserve some of its phonological idiosyncrasies. Certain grammatical cases, e.g. masculine nominative, have no overt inflectional ending. A loanword remains faithful to its original stress pattern in cases with no inflectional endings but it shifts to the regular Polish penultimate pattern in grammatical cases with an overt ending. As time passes by, all the foreign characteristics of the borrowing are obliterated altogether and it receives penultimate stress even in grammatical cases with no overt inflectional ending. This is what is happening to the noun *reżím*. It is fully declinable. It also has the regular penultimate stress in all cases, including those with no overt inflectional ending, for many native speakers of Polish, even those who allow antepenultimate and final stress in their dialect.

It seems that this hypothesis fails as soon as we look at cases like *(ó.per)+a* (opera, nom. sg.) → *(ó.per)* (gen. pl.) or *(mà.te)(má.tyk)* (mathematician, nom. sg.) → *(mà.te)(má.tyk)+a* (gen. sg.) Here, the stress is antepenultimate in cases with an overt inflectional marker and penultimate in cases with a zero inflectional marker. In certain instances, a loanword contains some sort of phonological material that can be reanalysed as an inflectional suffix in Polish, such as *–a* in *oper+a.* When borrowed into Polish, *ópera* had antepenultimate stress. The noun ends in the vowel *–a* that is a typical nom. sg. suffix of feminine nouns. The noun was reanalysed morphologically as the stem *oper* and the suffix *–a*, but the antepenultimate stress remained. We must allow for slightly different ways of adaptation of loanwords ending in a consonant and of loanwords ending in vowels that are identical to Polish case/gender markers. Mańczak-Wohlfeld (1995: 57) notes that a great majority of English borrowings

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[12] When a borrowing contains primary stress falling outside the trisyllabic window, it is usually adopted into Polish with the regular penultimate stress. It may also happen that the stress of the borrowed item is neither preserved in Polish nor does it switch to penultimate. For example, Elson (1985: 443) reports that Russian names with preantepenultimate stress are polonised by some speakers with antepenultimate stress. He suggests that antepenultimate stress is associated with foreign or more marked items.

receive masculine gender in Polish. She adduces it to the fact that most English borrowings end in a consonant and a consonantal ending is typical of Polish masculine nouns. Feminine gender is assigned to nouns terminating in *–a*, e.g. *gwinea* (from English *guinea*). Nouns ending in *–i* or *–o*, e.g. *bikini, disco* are reanalysed as neuter. This is, again, by analogy with Polish neuter nouns that typically end in these vowels.

The nativisation hypothesis would also explain why adjectives formed from nouns with irregular stress, e.g. *gramátyk+a* → *gramatýcz+ny*, always surface with the regular penultimate stress. A borrowing that undergoes any derivational morphology processes must be fully or almost fully adopted into the Polish lexicon. The derived adjective takes the adjectival suffix *–ny* and it is also affected by all the related morphophonological changes, i.e. palatalisation of the stem final *–k*. The morphophonological process is a sign of a high degree of assimilation into the Polish grammatical system. It is not surprising that at this stage any idiosyncrasies, such as irregular stress, are obliterated.

Further, the literature on Polish irregular stress discusses only nouns. No cases of adjectives with irregular stress have been reported. The explanation is straightforward once we look at the frequency of grammatical forms of, e.g., English loanwords into Polish. Among approximately 1700 borrowings from English (Mańczak-Wohlfeld 1995: 54), we have 94.2% of nouns and only 2.4% adjectives. Recent studies in lexical diffusion, e.g. Pinker & Prince (1992) and Bybee (2001 and references therein), observe that irregular language patterns are affected by frequency. High-frequency items grow strong, while low-frequency items tend to fade away and become regularised. Pinker & Prince (1992) also suggest that irregular non-productive patterns are encoded in the form of a connectionist network. The higher the frequency, the stronger a given network connection grows. Their observation can be easily applied to the Polish data. A great majority of borrowings into Polish are nouns and consequently it is this particular category that is associated with any phonological or morphological irregularities. Adjectives or verbs are hardly ever borrowed into Polish and so they are not associated with any grammatical irregularities. Similarly, adjectives derived from borrowed (irregular) nouns are simply treated as regular Polish words. They no longer fall into the lexical category associated with irregular stress.

This saliency of nouns is not specific to Polish. In a number of languages, nouns show phonologically privileged behaviour compared to verbs, i.e. nouns may license more phonological contrasts than other words or resist phonological processes that apply to other words (Smith 1997, 1999, 2001). In Fukuoka Japanese, there are differences between nouns as opposed to verbs and adjectives in the phonology of pitch accent. Nouns have contrastive accent: they can be unaccented or have penultimate or initial lexical accent. In verbs and adjectives, on the other hand, the accent always falls on the syllable containing the penultimate mora.

In Spanish, the location of stress for nouns and adjectives is lexically contrastive, although restricted to the final trisyllabic window. However, the location of the stress in a verb is completely predictable, given its conjugational class and form.

In Sinhala, underlying vowel hiatus at root-suffix boundaries is always repaired. The preferred repair strategy depends on the lexical category of the root involved. Nouns always resolve hiatus by glide insertion: no input material is deleted. Verbs preferentially resolve hiatus by deletion of an input vowel. These patterns suggest that there is more pressure to preserve input material belonging to nouns than to verbs in Sinhala (Smith 2001).

There is also evidence outside phonology supporting the claim that the category noun is cross-linguistically salient (Smith 1997 and references therein). The results of several experiments performed with aphasic subjects, including native speakers of Italian, English and Chinese, provide evidence that there is some kind of cognitive difference between nouns and predicates. In general, patients were better at naming objects than at naming actions. Noun preference was also observed in processing in normal subjects. In word-association tasks, subjects were more likely to respond to a predicate stimulus with a noun response than they are to respond to a noun stimulus with a predicate response. This shows that noun responses are easier or faster to produce than predicate responses. Similarly, in list-recall experiments, subjects were better at recalling nouns than verbs. Finally, there is evidence from language acquisition that suggests nouns are more salient than predicates for very young children. The children in the receptive stage demonstrated comprehension of at least three times as many nouns as they actually produced, whereas the children in the productive stage produced most of the nouns they comprehended. On the other hand, children in the receptive stage comprehended some verbs but produced none at all. The children in the productive stage did produce some verbs, but they comprehended more verbs than they produced. Further, the children at this stage still produced well over twice as many nouns as verbs.

2.4. An OT analysis of irregular stress in Polish

This section provides an OT analysis of the penultimate-antepenultimate/final alternations in the Polish stress system. Irregular antepenultimate and final stresses result from the same type of lexical marking. No separate rule of extrametricality is required for words with antepenultimate stress as was argued in some of the previous analyses (e.g. Rubach &Booij 1985, Halle & Vergnaud 1987, Franks 1985, Kraśka-Szlenk 2003). Further, I assume that there is no separate grammar for the part of vocabulary where irregular stress is attested. Words with irregular stress differ from words with regular penultimate stress only in one characteristic, i.e. one of their syllables is lexically marked. All the constraints and constraint ranking are the same for the whole of Polish lexicon. Therefore, the ranking arrived at in this section should accommodate words with regular penultimate stress as well as irregular antepenultimate and final stresses.

Before I present my analysis, I want to outline briefly the typology of lexical accent proposed by Revithiadou (1999), which is the theory of lexical stress marking adopted in this dissertation. Revithiadou (1999: chapter 2) defines lexical accent as an autosegment like tone that is sponsored by a morpheme and provides no cues about its phonetic manifestation. It is assigned phonetic interpretation if it is included in the prosodic organisation of the word, in which case it is realised as stress in stress-accent languages or as pitch in pitch-accent languages[13]. A lexical accent can be associated to the sponsoring morpheme or be floating. A lexical accent has two valencies: 'strong' or 'weak'. The specifications 'weak' and 'strong' do not refer to the relative prominence of stress. The theory predicts that not only accented syllables/morphemes can be marked in the lexicon but also the unaccented ones. A strong accent is marked as a head and is phonetically realised as stress. In foot-based languages, like Polish, a strong accent defines the head position of a foot and the position of primary stress in a word. A weak accent lacks prominence and it takes dependent position in the metrical structure, namely that of a foot-tail. Weak accents never receive stress.

The difference between lexically marked and unmarked morphemes is that the former is linked to the accent it introduces, while that latter lacks any type of accent specification:

75.	*accented*		*unaccented*
	strong	*weak*	
	*	.	
	|	|	
	σ	σ	σ

Foot-tail specification makes no claims about the position of foot-head. The place of the stress (and the head-foot) is decided by the overall accentual system of the language in conjunction with the foot-tail specification. Thus, in a language like Polish, weak accent specification would only say where the foot has to end when put in combination with the precise shape of the foot as defined by constraints such as FT-BIN and FT-TROCHEE, while the position of the main stress in the MWord is decided by RIGHTMOST. Morphemes with tail specification in a trochaic system might also be called pre-accenting. Pre-accenting morphemes can be found, e.g. in Greek, where feet are trochaic and in unmarked cases the stress is antepenultimate, e.g. *kro(kóði)los* (crocodile, nom. sg.), *(ánθro)pos* (man nom. sg.). Some inflectional suffixes in Greek, such as the genitive suffix *–u,* attract stress to the preceding syllable. If this suffix combines with an unmarked root, the stress is penultimate, e.g. *kroko(ðíl+u),*

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[13] In what follows, I will only discuss lexical stress with reference to stress-accent languages and I will

an(θróp+u). The suffix *–u* is a morpheme that imposes the restriction that it must be parsed in a weak position. It does not specify at all where the main stress falls. The foot-head syllable is selected by the requirements that feet must be binary, syllabic trochees.

For completeness, some languages may also have unaccentable morphemes (it does not apply to Polish). Such morphemes 'reject' stress. All major category words must be stressed on some syllable. In such cases, the unaccentable morpheme will 'push' the stress to the morpheme preceding or following it. Unaccentable morphemes are the trigger of the so-called floating lexical accents. This type of morphemes can be found, e.g. in Russian and in Greek which have post-accenting morphemes. The root *uran-* in the Greek word *urano+ós* (sky, nom. sg.) is an example. The root itself is unaccentable and it forces the stress on to the inflectional ending:

76.	urano+ós	*sky, nom. sg.*
	urano+ú	*gen. sg.*
	urano+ó	*acc. sg.*

In conclusion, four types of morphemes can be distinguished:

77. Typology of stress marking

unmarked	*marked*	
σσ	strong: (σσ ; *output (σ́σ)* weak: σσ); *output (σ́σ)*	unaccentable σσ

Unmarked syllables/morphemes are those that do not have any sort of lexical stress marking and undergo the rules of regular stress assignment operating in a particular language. There are three types of lexical stress marking: marking syllables for strong or weak stress and marking morphemes as unaccentable.

A remark seems to be in order at this point. I will use the following notation. Left bracket '('indicates a strong accent. As discussed above, a strong lexical accent marks the head of a foot. Right bracket ')' indicates a weak accent. A syllable or morpheme with this type of specification must occupy a foot-tail position and it cannot receive

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disregard pitch-accent languages.

prominence. In case of a syllabic trochaic system, both types of marking will place the stress on the correct penultimate syllable, which is represented in the above table. Weak accent does not assign prominence to the preceding syllable either. Preaccentuation is a by-product of the interaction of weak accent marking and the foot structure specification. In a language with a syllabic trochaic system, such as Polish, weak accent specification will have the effect of preaccentuation. This would not be the case in languages with iambic feet. However, the lexical accent marking, as defined in this section, will work only for languages with trochaic feet. For languages with iambic feet opposite bracket specifications must be assumed. Since Polish is a typical trochaic language, I will not deal with languages with iambic feet here.

The distinction between strong and weak accented morphemes on the one hand and unaccentable morphemes on the other seems to be somewhat asymmetrical. In each case a different entity is affected by the marking. The 'strong/weak' specification applies to a particular syllable, while the specification 'unaccentable' applies to the whole morpheme. Note that although unaccentable morphemes and weak stress bracketing have similar effects as far as the unstressed syllable is concerned, they make different predications about the primary stress placement. Unaccentable morphemes cannot be footed and primary stress can fall anywhere in the word outside the unaccentable morpheme. Weak accent morphemes impose footing and as such they indirectly predict that primary stress should fall on a syllable adjacent to the weak accent morpheme. Revithiadou does not specify whether unaccentable morphemes can have a foot tail within its boundaries, i.e. $(\acute{\sigma}+\underline{\sigma)\sigma\sigma.}$ In this example, the main stress falls outside the unaccentable morpheme but the morpheme contains a footed syllable.

Further, theoretically, it might also be possible to distinguish a fourth type of marked morphemes not mentioned by Revithiadou, i.e. morphemes that must be obligatorily stressed. This is a different category from the strong/weak specification. It does not target a specific syllable but the whole morpheme. This type of marking simply states that a particular morpheme must bear primary stress without specifying exactly on which syllable. The place of the stress would be selected by the language specific stress parameters.

Following McCarthy & Prince (1995) and McCarthy (2000)'s *Correspondence Theory*, Revithiadou argues that lexical accents are a set of correspondent elements that can be referred to by faithfulness constraints. The following faithfulness constraint is responsible for the realisation of lexical accent:

78. MAX-LA: A lexical specification of 'primary stress' corresponds to primary stress in the output.

I assume that Polish has a diacritic lexical accent marking in words with non-penultimate stress. Words with antepenultimate or final stress have their respective syllables lexically marked as foot-heads. I also assume that foot-head lexically marked accents can only be realised as primary stress. If a lexically marked syllable is in the head of a foot bearing secondary stress, it violates the above constraint. Revithiadou (1999: 45) claims that secondary stresses are independent of lexical specification.

Following the assumption that there is no separate grammar for the part of vocabulary with irregular stress, I take the ranking established earlier in section 1. as the starting point of my analysis. The ranking looks as follows:

79. MWORD ⊃ FOOT >>
FT-BIN, FT-FORM=T, RIGHTMOST >>
ALIGN-PWD-R >>
ALL-FT-L >>
PARSE-SYLL

Our task is to put MAX-LA in the right place in this ranking. MAX-LA cannot be lower than RIGHTMOST because that would lead to the erasure of almost any lexical marking: we could only have lexical marking on the penultimate syllable because only this marking would satisfy RIGHTMOST. All the output forms would have to adhere to the penultimate stress pattern. Thus, in order to have any impact on the stress pattern of Polish, MAX-LA must be above RIGHTMOST. Let us first consider forms without any inflectional suffixes and with the antepenult lexically marked. They clearly show that MAX-LA will impede forms with regular penultimate stress from winning.

80. Max-LA >> Rightmost

uni(wersytet (univerisity, nom. sg.)	Max-LA	Rightmost
☞ (ù.ni)(wér.sy).tet		*
(ù.ni)wer.(sý.tet)	*!	

This ranking is, however, predicts that the attachment of an inflectional ending should not affect the placement of primary stress. This prediction is wrong. Once an inflectional ending is added to *(ù.ni)(wér.sy).tet,* main stress shifts to the penult, as in (a) below, but the grammar wrongly leaves it intact, as in (c):

81. Max-LA >> Rightmost >> Align-PWd-R

uni(wersytet+u (university, gen. sg.)	Max-LA	Rightmost	Align-PWd-R
☜ a. (ù.ni)wer.sy.(té.t+u)	*!		
b. (ù.ni)(wér.sy.)te.t+u		**	*!*
☞ c. (ù.ni)(wér.sy.)(tè.t+u)		**	

What is more problematic is the fact that highly ranked Max-LA will allow surfacing of lexical stress even if it is placed on a fourth or even fifth syllable from the right edge of a word:

82. Max-LA >> Rightmost

x(xxxx	Max-LA	Rightmost
☞ a. x(x́x)xx		**
☜ b. (x̀x)x(x́x)	*!	

We need a constraint that would allow us to preserve the trisyllabic window effect that we find in Polish. In OT, this effect can be achieved by *Lapse, a constraint that is violated by a sequence of three or more weak (or unstressed) syllables (e.g. Green & Kenstowicz 1995, Elenbaas & Kager 1999, Gordon 2002) or by Non-Final, a constraint inducing extrametricality of the word final syllable. Non-Final (Prince & Smolensky 2002: Ch. 4) will not solve the problem. Words that surface with antepenultimate stress sometimes shift the stress to the penult, so it is not the case that a certain group of words can be lexically marked for the extrametricality.

The *LAPSE constraint is usually employed in the study of ternary stress systems. When ranked above MAX-LA, it will prevent any words with stresses more than three syllables from the right edge from surfacing. The problem with *LAPSE is that it requires iterative footing, thus forcing non-initial secondary stresses. Polish, however, does not have iterative footing. The hypothetical ranking *LAPSE >> MAX-LA >> RIGHTMOST >> ALIGN-PWD-R will produce the incorrect output for Polish:

83 *LAPSE >> MAX-LA >> RIGHTMOST >> ALIGN-PWD-R

xxxx(**x**xx	*LAPSE	MAX-LA	RIGHTMOST	ALIGN-PWD-R
☞ a. (x̀x)(x̀x)(**x́**x)x			*	
b. x(x̀x)x(**x́**x)x			*	*!
☜ c. (x̀x)xx(**x́**x)x	*!			
d. (x̀x)(x̀x)(**x**(x́x)		*!		

Top-ranked *LAPSE excludes candidate (c), the desired winner, from further evaluation. The winner is candidate (a), where the footing is exhaustive and *LAPSE is satisfied.

Recent studies of ternary stress systems (e.g. Beasley & Crosswhite (2003) for Macedonian, Das (2002) for Tripura Bangla) indicate that a separate edge-orientated *LAPSE constraint should be recognised. Kager (2001) also suggests that lapses are less marked in two positions: word-finally and adjacent to the primary-stress-bearing syllable. The *LAPSE in Polish satisfies exactly these two conditions. The problem with Kager's approach again is that he studies all the *LAPSE constraints in the iterative foot parsing languages. What we need for Polish is a constraint that would capture the final trisyllabic window effect without enforcing iterative footing. A similar problem was encountered by Green & Kenstowicz (1995) in their study of the trisyllabic window effect in Pirahã, a language where only the main stress is manifested phonetically. They assumed, however, that secondary stresses are present underlyingly though they lack any phonetic or phonological manifestation. In this way, they could successfully analyse Pirahã by incorporating *LAPSE into the grammar of the language. This is not the path I want to follow in my analysis of Polish. I think that it is not a coincidence that the primary stress is confined to the final three syllables of a word. Having it any further away from the edge of the prosodic domain would be of little help in language parsing. The stress would be too far away from the edge to provide any cues as to where a given domain ends. Further, a preantepenultimate would only surface regularly in words that have five syllables or more, because in shorter words, which would undoubtedly constitute a large part of the vocabulary, it would always be initial. Consequently, language learners might have a difficult task deciding which stress pattern is the default one: initial or preantepenultimate.

If in a given language the primary stress regularly falls on the antepenultimate syllable, it will mark the word edge in the same way as penultimate or final stress: speakers will know that the stress always falls on the third syllable from the end of the word and this information will help them to locate the right edge of the word. The Polish trisyllabic window is quite 'erratic' in the sense that the antepenultimate stress does not constantly apply to one and the same word. A given word has the irregular stress only in a subset of its forms. Thus, it is hard to claim that the antepenultimate stress has any demarcatory function. It is therefore not surprising that both final and antepenultimate stress marking is almost extinct in present-day Polish and is used only by a very small subset of the population. Even those who know when to use antepenultimate and final stresses often do so only in formal speech and revert to the regular penultimate stressing in all words in more informal occasions. Irregular stress in Polish does not really aid speech segmentation; it has more of a social function, comparable to the RP accent of British English. This may be the reason why it is so difficult to capture by formal linguistic rules. It is, however, indisputable that Polish irregular stresses still observe the trisyllabic window effect. I think that the explanation of the trisyllabic window lies in language processing and language perception, though more experimental research needs to be conducted in this are. We also need to look in more detail at more languages with the trisyllabic window effect to fully understand this phenomenon. I leave it for future reasearch. However, I think it is legitimate to propose a constraint that restricts the main stress to the final trisyllabic window and that is independent of the secondary stresses. In my analysis, I will adopt the *EXTENDED LAPSE RIGHT constraint proposed by Gordon (2002: 503). I will limit the application of this constraint to the location of primary stress within the MWord:

84. *EXTENDED LAPSE RIGHT — A maximum of two unstressed syllables separates the primary stress from the right edge of the MWord.

Note that *EXTENDED LAPSE RIGHT refers specifically to the right edge of MWord. If *EXTENDED LAPSE RIGHT referred to a PWord, then in cases where a noun with an antepenultimate stress is followed by a monosyllabic clitic, the clitic and the noun final stray syllable would have to be footed to avoid a sequence of two unstressed syllables at the end of a PWord:

85. *(ù.ni)(wér.sy)(tèt=ten) *this university*
university *this*

(ù.ni)(wér.sy)tet=ten

This would create a situation where the last syllable of the noun bears secondary stress, which does not happen. The above example suggests that the domain of *EXTENDED LAPSE RIGHT is a MWord rather than a PWord.

When ranked above MAX-LA, *EXTENDED LAPSE RIGHT will prevent any main stresses outside the final trisyllabic window from surfacing:

86. *EXTENDED LAPSE RIGHT >> MAX-LA >> RIGHTMOST >> ALIGN-PWD-R

uni(wersytet+u (university, gen. sg.)	*EXTENDED LAPSE RIGHT	MAX-LA	RIGHTMOST	ALIGN-PRWD-R
☞ (ù.ni)wer.sy.(té.t+u)		*		
(ù.ni)(wér.sy.)te.t+u	*!		**	**
(ù.ni)(wér.sy.)(tè.t+u)	*!		**	

The above ranking will also accommodate forms with final stress:

87. *EXTENDED LAPSE RIGHT >> MAX-LA >> FT-BIN, RIGHTMOST

re(żim (regime, nom. sg.)	*EXTENDED LAPSE RIGHT	MAX-LA	FT-BIN	RIGHTMOST
☞ re(żím)			*	
(ré.żim)		*!		

In words with final stress, the only two constraints that play any role are MAX-LA and FT-BIN. The winner satisfies MAX-LA but fails FT-BIN, which indicates that FT-BIN is outranked by MAX-LA.

When a monosyllabic inflectional suffix is attached to a MWord with final stress, the stress automatically becomes penultimate, e.g. *re(żí.m+u)* (gen. sg.). All the top-ranked constraints: *EXTENDED LAPSE RIGHT, MAX-LA, FT-BIN and RIGHTMOST are satisfied. A slight complication arises when a disyllabic inflectional ending is added, e.g. *re(żí.m+owi* (dat. sg.). This form has exactly the same shape as *uni(wersytet.* Accordingly, antepenultimate stress might be expected. However, contrary to the predictions, the stress is penultimate: *reżim+ówi.* As already mentioned above, I want to argue that bisyllabic inflectional endings also carry lexical marking. Consequently, in a word like *reżim+ówi* two syllables would be marked as foot heads: *re(żi.m+(o.wi.* Only one of the underlying lexical accents can be realised. A form with only one lexical accent surfacing (either penultimate or antepenultimate) will always incur a violation of MAX-LA. The choice between penultimate and antepenultimate stress is made by RIGHTMOST. In penultimate stress, the foot is aligned with the right edge of the word. In antepenultimate stress, one syllable separates the foot from the right word edge[14]:

88. MAX-LA >> RIGHTMOST

re(ż**i**m+(**o**wi	MAX-LA	RIGHTMOST
☞ a. (rè.ż**i**m)(**ó**.wi)	*	
b. re.(ż**í**m**o**)wi	*	*!

The ranking for Polish stress we established so far looks as follows:

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[14] The rightmost syllable with lexical marking would not win in a hypothetical candidate where the last two syllables are marked as foot-heads, e.g. (x(x. There are two possible candidates: x(x́) and (x́x). They both tie on RIGHTMOST as well as on MAX-LA, but FT-BIN will select the candidate with penultimate stress.

89. MWORD ⊃ FOOT >>
*EXTENDED LAPSE RIGHT >>
MAX-LA >>
FT-BIN, FT-FORM=T, RIGHTMOST >>
ALIGN-PRWD-R >>
ALL-FT-L >>
PARSE-SYLL

This grammar accommodates both the regular stress pattern and irregular occurrences of stress.

So far, we assumed that in Polish certain syllables are lexically marked as foot heads. The other possibility would be marking certain syllables as foot-tails. In case of items with antepenultimate stress, the penultimate syllable would be marked as a foot-tail. Foot-tail marking on the penult in conjunction with the Polish trochaic foot structure will result in antepenultimate stress on the surface. Foot-tail marking makes exactly the same predictions as foot-head marking. Note, however, that, e.g. in a word like *uniwersy)tet* antepenultimate stress is 'a by-product' of marking the penultimate syllable as foot-tail. In *uni(wersytetu*, on the other hand, antepenultimate stress falls out directly from the fact that the antepenult is marked as stressed.

Further, foot-tail marking cannot be applied to the class of words with final stress. Here, the correct output can only be arrived at through foot-head marking on the last syllable. Clearly, foot-tail marking on the last syllable will produce penultimate stress. Therefore, I will not apply foot-tail marking in my analysis of Polish stress.

2.5. Lexicon Optimisation and bisyllabic suffixes

So far, we assumed that bisyllabic suffixes are marked underlyingly for stress. Marking irregular accents somehow in the lexicon is uncontroversial, but marking regular penultimate stress might seem slightly redundant. This section will show that *Lexicon Optimisation* allows for prespecification of predictable features as well.

According to the *Richness of the Base*, the set of possible underlying forms is universal for all languages. It does not matter which of the possible underlying forms is selected for a given morpheme as long as this representation leads to the correct surface form. Prince & Smolensky (2002, Ch. 9, see also Itô, Mester & Padgett 1995; Inkelas 1994;

Inkelas, Orgun, Zoll 1997) address the problem of learning language specific underlying forms of morphemes. They propose a device called *Lexicon Optimisation* which basically says: choose the underlying representation that gives the most harmonic mapping. In short, *Lexicon Optimisation* is a learning strategy that minimises the deep/surface disparities. The underlying representation is determined by the surface form. Each morpheme has exactly one underlying representation which is established by comparing and analysing entire paradigms (Tesar & Smolensky 1998). If a morpheme has a property that is not present in the rest of the vocabulary and thus its surface representation cannot be computed by the grammar established for that language, *Lexicon Optimisation* will make sure that this exceptional property is encoded in the underlying representation of a morpheme. *Lexicon Optimisation* determines the underlying form of a morpheme and at the same time allows exceptions to be handled by means of lexical marking or prespecification.

Lexicon Optimisation is closely connected with language acquisition. The OT literature on language acquisition (e.g. Demuth 1995, Gnanadesikan 1995, Tesar & Smolensky 1998, Alderete & Tesar 2002, Tzakosta 2004) makes two basic assumptions: (i) markedness constraints dominate faithfulness constraints and (ii) the child's input is close to the adult form. The second assumption is crucial to my argument about lexical marking of stress in disyllabic inflectional endings in Polish. The second premise in connection with *Lexicon Optimisation* makes it possible for the disyllabic suffixes that are always word-final and always bear the primary stress to be prespecified in the lexicon.

Consider the forms of the noun *papier* (paper) and *szkoła* (school) below:

90.	pápier	*nom. sg.*	szkół+a	*mon. sg.*
	papiér+u	*gen. sg.*	szkół	*gen. pl.*
	papier+ámi	*inst. pl.*	szkoł+ámi	*inst. pl.*

and their adjectival derivatives:

91.	papier+ów+y	*paper, adj. masc. nom. sg.*
	papier+ow+égo	*masc. gen. sg.*
	papier+ow+ými	*inst. pl.*

szkół+n+y	*school-like, masc. nom. sg.*
szkol+n+égo	*masc. gen. sg.*
szkol+n+ými	*inst. pl.*

In each case the stress falls on the penultimate syllable of the word disregarding the morphological make-up of the word. The stress can fall on any syllable of the stem (except words with a bisyllabic inflectional suffix, where the suffix bears the stress). Effectively, the learner assumes that there is no lexical marking on stems. The learner also observes that each time a bisyllabic inflectional suffix is attached to a stem, it always bears the primary stress. This information must be stored in the lexicon. A *Lexicon Optimisation* tableau for a bisyllabic inflectional suffix is shown below. Whether the bisyllabic inflectional suffix is marked for stress or not, the surface stress will always be penultimate. The two inputs (one marked and one with no marking) will yield the same output. However, that input will be selected as the underlying representation that has the smallest number of violation marks. In the tableau des tableaux (Itô, Mester, Padgett 1995) only FAITH is shown. FAITH is understood as a ban on any disparities between input and output, both in terms of substance and in structure.

92. *Tableau des tableaux: underlyingly marked stress*

	Input	*Output*	FAITH	*Comments*
☞a.	(ami	ámi		Head-foot specification faithful between input and output
b.	ami	ámi	*!	Head-foot specified in the output only

The winner is the input (a) that is more faithful to the output form than the input (b). In (a), the information about the location of the syllable carrying the main stress is marked in the input, while in (b) the stress is assigned by the grammar only in the output. Penultimate stress is assigned to the initial syllable of the suffix according to the rules of the Polish stress assignment and the so head-foot prespecification may seem redundant. However, due to *Lexicon Optimisation,* this prespecification is stored lexically. Thus, *Lexicon Optimisation* predicts that even redundant information, such as regular stress placement, may be stored in the Underlying Representation.

2.6. Noun faithfulness

As mentioned above, irregular stress applies only to nouns. Other lexical categories, even if borrowed, always surface with the regular penultimate stress. In OT, the presence or absence of a phonological contrast depends on faithfulness and markedness constraints. A well-known source of asymmetries of contrast within a language is positional neutralisation, in which contrast appears only in a set of 'strong' positions but is neutralised in the corresponding 'weak' positions. This idea was translated into OT as positional faithfulness. This theory recognises general (M)arkedness constraints, general (F)aithfulness constraints and Faithfulness constraints for strong positions (e.g. Beckman 1998). Following on this idea, Smith (1999, 2001), proposes a family of noun faithfulness constraints (F_{noun}). If a language contains a constraint ranking of the form F_{noun} >> M >> F, nouns will show greater phonological privilege than other grammatical categories.

The relevant F_{noun} constraint for the Polish data discussed in this chapter is MAX-LA$_{NOUN}$, which I will formulate as follows:

93. MAX-LA$_{NOUN}$: A lexical specification of 'primary stress' in a noun corresponds to primary stress in the corresponding output noun.

The above constraint must be below the *EXTENDED LAPSE RIGHT to prevent lexical accents outside the final trisyllabic window from surfacing. Effectively, MAX-LA$_{NOUN}$ will take place of the general MAX-LA in the ranking discussed above. The general MAX-LA, on the other hand, will fall at the bottom of the ranking below all the markedness constraints referring to the foot structure and foot alignment. Thus, the effects of MAX-LA will be visible only in nouns and they will be blocked in all other grammatical categories, like verbs or adjectives.

The final ranking for irregular stress in Polish nouns looks as follows:

94. MWORD ⊃ FOOT >>
*EXTENDED LAPSE RIGHT >>
MAX-LA$_{\text{NOUN}}$ >>
FT-BIN, FT-FORM=T, RIGHTMOST >>
ALIGN-PWD-R >>
ALL-FT-L >>
PARSE-SYLL >>
MAX-LA

2.7. Previous analyses of irregular stress in Polish

Forms with antepenultimate stress have been widely discussed in the literature (e.g. Comrie 1976, Rubach & Booij 1985, Kraśka-Szlenk 2003, Franks 1985, 1991, Tsay 1990, Idsardi 1992, Hammond 1989, Elson 1985, Halle & Vergnaud 1987, Dogil 1999). In what follows I will review these approaches.

2.7.1. Franks (1985, 1991)

As Franks (1985) rightly observes, there are no words in Polish with stress more than three syllables from the end. This can be easily explained within the framework of Metrical Theory, where a final syllable can be extrametrical. Antepenultimate stress is the expected result of exceptionally marking the final syllable extrametrical and then constructing a binary foot at the right edge of the domain, according to the regular stress rules. However, the Metrical Theory Peripherality Condition predicts that if the word final syllable is extrametrical, then the word marked for extrametricality should always have antepenultimate stress. This is not the case of Polish, where one and the same word alternates between penultimate and antepenultimate stress. For example, if the stem final syllable in *matematyk* was extrametrical, then we would expect **matématyk* with antepenultimate stress. In this particular case, the stress is penultimate, i.e. *matemátyk*, but it shifts to the antepenultimate syllable when a monosyllabic inflectional suffix is added, i.e. *matemátyk+a.*

Franks suggests that in Polish extrametricality is a property of a particular syllable in a word. Thus, in *matemátyk,* the stem final syllable should be marked with the feature [+F] that has the property of assigning extrametricality to the preceding syllable, i.e. *matemátyk*$^{[+F]}$. When the feature [+F] occurs on the stem final syllable, as in *matemátyk*$^{[+F]}$*+a*, the first poststem syllable becomes extrametrical and the resultant form has antepenultimate stress. If there is no inflectional ending attached to the stem, the stress is penultimate. In words like *uniwérsytet* not the stem final syllable but the penultimate syllable is marked with the feature [+F], i.e. *uniwérsy*$^{[+F]}$*tet*. That is why the antepenultimate rather than the penultimate syllable bears the stress.

Extrametricality is not attested in derivation. The adjective formed from *matemátyk+a* is *matematýcz+ny* from underlying /matematyk-En-y/ (where E represents the palatalising yer that triggers palatalisation of the stem final *–k-*). According to Franks, *–E-* is marked [+Extrametrical] but without effect on stress assignment because it gets deleted. Derived forms provide evidence that extrametricality rule must precede yer-deletion, which precedes stress assignment.

In a later article, Franks (1991) slightly reformulates his proposal. He associates extrametricality with the suffix *–yk-/-ik-* that should be represented lexically with an empty extrametrical vowel slot. Then, whatever vowel (including yers) is associated with that slot will be extrametrical.

There are a few problems with this approach. First, the approach fails without rule ordering (the case of derived adjectives). Second, the type of lexical marking assumed by Franks looks very much like the old-fashioned SPE approach where syllables are given a + or – [Stress][15] diacritic without any reference to the Polish foot structure or any morphological/phonological/phonetic properties of stressed syllables.

Franks' (1991) attempt to provide a uniform approach to all the words with antepenultimate stress through analysing *–yk-/-ik-* as a suffix looks interesting. The only problem is that under this approach some words without *–yk/-ik-* and with antepenultimate stress are unaccounted for, e.g. *bibliόteka, mínimum*. It is also not clear to me how words with final stress would fit into Franks' analysis. [+F] specification can only work for words with antepenultimate stress. The feature specifies that the main stress has to fall on the preceding syllable. Thus, [+F] cannot assign stress to the

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[15] See Comrie (1976) for an early approach to Polish stress very much in the spirit of SPE.

final syllable. In a way, [+F] is comparable to foot-tail marking discussed in section 2.4. above.

2.7.2. Kraśka-Szlenk (2003)

Kraśka-Szlenk (2003) is the most recent analysis of Polish regular as well as irregular stress and this is by far the most important reason why a separate heading is devoted to her work. The analysis dwells largely on the findings of Comrie (1976), later developed by Franks (1991), who analyses *i/y* vowels in a great majority of Polish nouns with irregular stress as 'unstressability' or [-Stress]. Basically, the author translates these rules into an OT constraint called *Unstressability of [Ik]*:

95.
$$* \quad \begin{array}{c} \sigma_s \\ | \\ V_{[Ik]} \end{array}$$

This approach, however, faces the same problems as Franks (1991) outlined above.

2.7.3. Rubach & Booij (1985), Halle & Vergnaud (1987)

Rubach & Booij's as well as Halle & Vergnaud's analyses also employ extrametricality to account for the exceptional antepenultimate stress (final stress is not discussed). Rubach & Booij's article contains a discussion of Halle & Vergnaud's manuscript and pinpoints certain overgeneralisations present in the manuscript. Some of the issues raised by Rubach & Booij were considered in Halle & Vergnaud's (1987) final version. In this section, I will concentrate on the longer and more detailed work by Rubach & Booij (1985). The authors argue that words that surface with antepenultimate stress must be divided into two classes. Class I comprises words like *gramátyk+a* or *óper+a.* (antepenultimate stress when a monosyllabic inflectional ending is present). Class II comprises nouns like *uniwérsytet* (antepenultimate stress when no inflectional ending present). Two extrametricality rules are proposed for Polish.

96. *Extrametricality I*
Mark as extrametrical the poststem syllable in class I nouns, e.g.
gramatyk+a (*a* is extrametrical).

97. *Extrametricality II*
Mark as extrametrical the last stem syllable in class II nouns, e.g. *uniwersytet* (***et*** is extrametrical).

Thus, for example, in the instr. pl. case *gramatyk+ámi,* Extrametricality I is inapplicable because the inflectional ending is disyllabic, hence the syllable that follows the stem is not the final syllable of the constituent and only constituent final entities may be extrametrical. On the other hand, in the gen. pl. *gramátyk* there is no suffix following the stem, hence the rule cannot apply. The treatment of class II nouns is reminiscent of that of Franks'. In the nominative case, the syllable marked [+Extrametrical] is word final and is unmetrified. In oblique cases of *uniẃersytet,* inflectional endings are appended and the last syllable of the stem is no longer final and so Extrametricality II does not apply.

Rubach & Booij's analysis of derived forms, such as *gramatycz+ny* is similar to Franks'. The suffix *–n-* is underlyingly /En/. At some stage in the derivation, the stem is followed by two syllables, i.e. *–Eny,* and the rule of extrametricality is blocked. Consequently, the rule of extrametricality must precede the rule of yer deletion. Similarly, words like *katolic+yzm* are derived from underlying /katolik + yzmE/ with a final yer that does not surface. The stem is followed by two syllables and Extrametricality I does not apply.

My critique of Rubach & Booij's extrametricality rules is more or less the same as that of Franks' extrametricality diacritics, i.e. the rules seem to be arbitrary and make no reference to Polish foot structure. Further, Rubach & Booij's approach requires two extrametricality rules, which weakens their analysis.

2.7.4. Elson (1985)

Elson observes that the stress is antepenultimate only when it falls on the stem (not the inflectional ending). It is regular when there is enough substance following the stem to prevent the stress from reaching it, e.g. when there is a disyllabic inflectional ending. Antepenultimate stress does not result from extrametricality. Certain morphemes have fixed stresses. If after attaching an inflectional ending, the penultimate syllable of the whole MWord is within the stem with a fixed stress, the marked syllable of the stem is stressed. E.g. the penultimate syllable is within the stem with a fixed stress in *fórmuł+a* and so the syllable marked in the lexicon is stressed rather than the penultimate syllable of the word. In *formuł+ámi* the penultimate syllable is outside the stem and so the penult of the whole MWord receives stress and not the marked syllable of the stem. This rule applies only to words not containing the suffix *–yk/-ik.*

In nouns containing the suffix *–yk,* the stress is considered to be the function of *–yk*, i.e. the suffix induces a stress on the preceding syllable. If the penultimate syllable of a word falls within a stem that entails fixed stress elsewhere in the stem, the entailed syllable is stressed. In *matemátyk+a,* the penultimate syllable reaches the stem with the suffix *-yk* that entails stress on the preceding syllable. Consequently, the antepenultimate syllable is stressed. Stress does not reach the stem in *matematyk+ámi*, hence it remains penultimate.

In accordance with the above rule, words like *uniwersytet+u* should have preantepenultimate stress. The penultimate syllable of the word falls within the stem containing the suffix *–y-* and this suffix should 'push' the stress to the preceding syllable. This does not happen. Elson concludes that preantepenultimate stress is not acceptable in Polish. Within the MWord there is a stress zone constituted by the final three syllables, with the central one unmarked and the marginal ones marked. Preantepenultimate stress would fall outside this stress zone and that is why it is not acceptable.

What remains to be accounted for are the adjectival forms, e.g. *matematýcz+ny* (mathematical) that have the regular penultimate stress. The underlying form of the adjective is /matematyk-En-y/. In *matematýcz-ny,* stress should fall on the syllable with the derivational suffix *–n-*, but is forced to *–yk* instead (realised as *–ycz*) because *–n-* is nonsyllabic on the surface (the underlying yer does not surface).

The article offers some interesting proposals. The approach does not involve any intricate interaction of extrametricality and lexical marking in order to derive antepenultimate stress as proposed by Franks. Elson's analysis relies solely on marking certain syllables of the stem for stress. However, the analysis is unnecessarily complicated by introducing two types of lexical marking: morphemes with fixed stress and morphemes that entail fixed stress elsewhere within the word. But again, as in previous cases, the marking makes no reference to any phonological or phonetic features of stress.

2.7.5. Hammond (1989)

Hammond abandons the extrametricality analysis and suggests that class I and class II nouns should bear penultimate and antepenultimate lexical stress, respectively. Hammond assumes that the final syllable is always extrametrical in Polish. Second, he introduces the notion of a revised obligatory branching (ROB) foot whose head must dominate a syllable lexically marked for stress. ROB feet are left-headed and binary and they are built right to left. If a given word has no lexically marked stress, no ROB foot is built. In such cases, a right-headed word tree would seek out the penult and stress it. After the assignment of main stress, either through ROB footing or Word Tree construction, left-headed secondary stresses are built left to right. According to Hammond, the binary ROB footing captures the generalisation that lexical stress is relevant only in the trisyllabic window. For example, in words like *gramatyka* the lexically marked syllable can be reached, after the application of the extrametricality rule, by the final foot. In *gramatykami*, on the other hand, the lexically marked syllable cannot be reached by the final foot.

Hammond also makes a preliminary attempt to analyse words with final stress (though his discussion of final stress is limited to footnotes). He suggests that this class of words should bear final accent. Additionally, in order to arrive at the correct results, bisyllabic inflectional suffixes also bear lexical accents on the penultimate syllable. The analysis, however, is not fully developed.

Hammond's theory of lexical marking that would cover all types of words with antepenultimate stress looks interesting, but some of his rules unnecessarily complicate the analysis. The introduction of an obligatory extrametricality rule leads to the analysis of primary stress in words without lexical accent in terms of iambs rather than trochees. On the other hand, secondary stresses as well as primary stresses in words with lexical accent would be analysed in terms of trochees[16]. Consequently, Polish would have to be classified as a language with a mixture of iambic and trochaic feet within one and the same word. Typologically this is not a widespread phenomenon. Second, there is no evidence that iambs play any role in Polish phonology or morphophonology. Hammond's analysis could be less complicated if, instead of introducing lexical marking and then building a foot on top of it, the foot structure was encoded directly in the lexicon.

2.7.6. Tsay (1990)

Tsay applies a parametric theory of stress assignment in Polish. The difference between regular and irregular stress is derived through different parameter settings. Morphemes are pre-specified lexically for a given parameter setting. Words with antepenultimate stress have the extrametricality parameter 'on', while words with regular stress have it 'off'. The foot-headedness parameter is responsible for the difference between words with (ante)penultimate and final stress. In words with (ante)penultimate stress, the left-headed parameter is 'on', while in words with final stress the right-headed parameter is 'on'. The problem is that in Polish irregular stress is not present uniformly in the same word throughout the whole inflectional paradigm. Consequently, the extrametricality parameter would have to be 'on' only in certain grammatical cases. Further, the left/right-headed parameter predicts that Polish contains both iambic as well as trochaic feet.

2.7.7. Idsardi (1992)

Idsardi[17] provides a grid-projection model of Polish stress. Syllable boundaries are marked in the lexicon and they are projected onto the grid. The following parameter settings are responsible for regular stress in Polish:

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[16] See Franks (1991) for an extended critique of Hammond's analysis.

[17] The model was also adopted by Dogil (1999). In this section I will concentrate on Idsardi's original proposal. The main difference between Dogil's and Idsardi's analyses of Polish is that Dogil employs additional machinery to account for secondary stresses.

98. **Line 0**:

Edge-Marking Parameter: LLL
Place a left boundary to the left of the leftmost element on line 0.

Iterative Constituent Construction Parameter: R
Insert a left bracket before every two elements starting from the rightmost one.

Headedness Parameter: L
Project the leftmost element of each constituent onto the next higher line of the grid.

Line 1:

Edge-Marking Parameter: RRR
Place a right boundary to the right of the rightmost element onto line 1.

Headedness Parameter: R
Project the rightmost element of each constituent onto the next higher line of the grid.

The derivation of regular penultimate stress looks as follows:

99.

	Head: R	x	x	x
Line 1	Edge: R:	x x)	x x x)	x x x)
Line 0	Head: L	x x	x x x	x x x
	ICC: R	(x x (x x	(x(x x (x x	(x x (x x (x x
	Edge: LLL	(x x x x	(x x x x x	(x x x x x x
		hipopotam	hipopotam+a	hipopotam+ami

The stems of nouns with exceptional stress carry a lexical Edge specification:

100.	Edge: RRR	Edge: RLR	Edge: LLR
	x x x x)	x x x x)x	x(x
	matematyk	uniwersytet	reżim

The derivations of stresses in these candidates are represented below:

101. a.

	Head: R	x	x	x
Line 1	Edge: R:	x x)	x x)	x x x)
Line 0	Head: L	x x	x x	x x x
	ICC: R	(x x (x x)	(x x (x x) x	(x x (x x) (x x
	Edge: LLL	(x x x x)	(x x x x) x	(x x x x) x x
		x x x x)	x x x x) x	x x x x) x x
		matematyk	matematyk+a	matematyk+ami

b.

	Head: R	x	x	x
Line 1	Edge: R:	x x)	x x x)	x x x)
Line 0	Head: L	x x	x x x	x x x
	ICC: R	(xx (x x)x	(x x (x x)(x x	(x x (x x) x (x x
	Edge: LLL	(xx x x)x	(x x x x) x x	(x x x x) x x x
		x x x x)x	x x x x) x x	x x x x) x x x
		uniwersytet	uniwersytet+u	uniwersytet+ami

c.

	Head: R	x	x	x
Line 1	Edge: R:	x x)	x x)	x x x)
Line 0	Head: L	x x	x x	x x x
	ICC: R	----------	---------	(x (x (x x
	Edge: LLL	(x (x	(x (x x	(x (x x x
		x (x	x (x x	x (x x x
		reżim	reżim+u	reżim +ami

In words like *matemátyk* the stem final syllable carries a lexical Edge specification. The monosyllabic inflectional ending in *matemátyk+a* remains unmetrified due to the parenthesis placed by Edge marking at the end of the stem and so antepenultimate stress results. When there are two syllables following the stem, there is enough material to build a bisyllabic foot and so penultimate stress results. Note, however, that in order for the antepenultimate stress to surface, we must assume that ICC: R is sensitive to the lexical Edge specification. Thus, in *matemátyk+a,* ICC: R must ignore the extrametrical syllable because otherwise the primary stress will be penultimate:

102. *Incorrect derivation of stress in* matemátyk+a

	Head: R	x
Line 1	Edge: R:	x x x)
Line 0	Head: L	x x x
	ICC: R	(x (x x (x) x
	Edge: LLL	(x x x x) x
		x x x x) x
		matematyk+a

In forms like *uniwérsytet* the Edge mark is located after the penultimate syllable. The last syllable is unmetrified and the stress is antepenultimate. When a monosyllabic or disyllabic inflectional ending is attached, there is enough material to construct a foot and the stress is penultimate.

In words with final stress, line 0 Edge configuration LLR forces the last syllable of the stem to be the leftmost constituent. With no material following, the leftmost constituent is monosyllabic and final stress results. With a monosyllabic suffix attached, the final constituent is bisyllabic and penultimate stress results. When a bisyllabic inflectional ending is added, again, there is enough material to build a bisyllabic foot and the stress is penultimate.

Idsardi's theory successfully captures the extrametricality effect invoked in previous analyses without resorting to any extrametrical marking. It is superior to Hammond's lexical marking theory because it does not require the co-existence of iambic and trochaic feet in Polish. It is also able to account for the non-occurrence of preantepenultimate stress. Idsardi's theory excludes a scenario where two or more syllables remain unmetrified. Preantepenultimate stress could only result if the last two syllables in a word were unmetrified. The final trisyllabic window effect is elegantly captured by a combination of edge marking and a specific parameter setting. The theory predicts that even if there was a word with edge marking (either left or right bracketing) on the preantepenultimate syllable, it would surface with the regular penultimate stress. The ICC: R enforces metrification of the last two syllables.

The problem with Idsari's approach is that in order to derive antepenultimate stress, we must assume that ICC: R is sensitive to the rightmost bracket set up the lexical Edge marking. If ICC: R was sensitive to the right edge of the word, then the lexical marking would be overridden and penultimate stress would surface.

One disadvantage of Idsardi's approach is that it requires different type of bracketing for words with antepenultimate stress and words with final stress. In words with antepenultimate stress, there is right bracketing on the penultimate syllable, while in words with final stress, there is left bracketing on the last syllable. It is impossible to apply uniform bracketing to both classes of words with irregular stress. Left bracketing on the antepenultimate syllable results in penultimate stress:

103. *Incorrect derivation of stress in* uniwérsytet

	Head: R	x
Line 1	Edge: R:	x x x)
Line 0	Head: L ICC: R Edge: LLL	x x x (xx (x (x x (xx (x x x
		x x (x x x uniwersytet

On the other hand, right bracketing on the final syllable results in penultimate stress in words without suffixation and antepenultimate in words with a monosyllabic suffix:

104. *Incorrect derivation of stress in* réżim

	Head: R	x	x
Line 1	Edge: R:	x)	x)
Line 0	Head: L ICC: R Edge: LLL	x ---------- (x x)	x --------- (x x) x
		x x) reżim	x x) x reżim-u

Another problem with Idsardi's approach is that it requires cancellation of all secondary stresses arrived at by Head: L in Line 0. The theory makes incorrect predictions even if one assumes the existence of non-initial secondary stresses in Polish. Secondary stresses derived in this model do not correspond to the hypothetical secondary/rhythmic stress of Polish (see section 1). For example, in case of five-syllable words, Idsardi's theory predicts the following stress pattern: *hìpòpotáma* (with secondary stresses on the first and on the second syllable), while the actual output should be *hìpopotáma* with only one secondary stress on the initial syllable.

3. Summary

In this section, we looked at the role that alignment plays in the assignment of primary and secondary stresses. We have shown that different alignment constraints are necessary to account for the placement of secondary and primary stresses. It has also been argued that the two types of stresses are assigned at different prosodic levels. The primary stress is sensitive to the right edge of the MWord and in this way it also marks the right edge of the MWord. The place of the primary stress is determined by RIGHTMOST, a constraint that requires the alignment of the right edges of the head foot and the MWord. There is no constraint referring specifically to the left edge of the MWord. Effectively, the left edge of the MWord is not marked in any way. Secondary stress is assigned at a higher prosodic level, i.e. the PWord comprising a MWord and clitic(s). ALL-FT-L in conjunction with PARSE-SYLL marks the left edge of the PWord. ALL-FT-L is insensitive to the edges of the MWords and allows outputs where the foot bearing the secondary stress crosses the left edge of the MWord. If the PWord does not contain any proclitics, then, by default, ALL-FT-L will mark the left edge of the MWord. The right edge of the PWord is also marked by an alignment constraint: ALIGN-PWD-R. The operation of the constraint is blocked if the phonological material following the MWord contains less than two syllables, i.e. if there is not enough material to form a foot. Thus, the two prosodic levels, the MWord and the PWord, interact with each other only as far as the right edge o the PWord is concerned. Any alignment with the left edge of the MWord is always overridden by the alignment with left edge of the PWord.

In conclusion, the prosodic alignment constraints indicate the following information:

- The right edge of the MWord
- The left edge of the PWord and, if the PWord does not contain any proclitics, by chance, the left edge of the MWord
- The right edge of the PWord if there is enough material following the MWord within the PWord to form a foot.

CHAPTER 3

PLACE ASSIMILATION IN PREFIXATION AND SUFFIXATION

0. Introduction

The phenomenon studied in this chapter is palatal assimilation in consonant clusters containing a prefix/suffix boundary. Palatal assimilations have been documented in a variety of languages (e.g. Kochetov 2002 and references therein). Polish is generally described as a language where consonant clusters agree with respect to palatalisation (e.g. Wierzchowska 1980, Sawicka 1995). There are, however, certain exceptions, e.g. consonant clusters containing nasals or a morpheme boundary do not need to be wholly palatal. The chapter looks at the effects of nasalisation, place of articulation and morphological boundaries on palatal assimilation in Polish. Specifically, I will look at place assimilation triggered by alveolars, alveolo-palatals and palatal(ised) labials[1] in clusters resulting from prefixation and suffixation, where the phonotactic restrictions applicable to monomorphemic words are violated.

Previous studies of this phenomenon (e.g. Karaś & Madejowa 1977, Wierzchowska 1980, Madejowa 1990, Szpyra 1992, Sawicka 1995) are based on very limited experimental data and more often than not on the author's subjective opinion. They report a great deal of variation in the application of place assimilation (palatalisation) in clusters resulting from prefixation and suffixation. However, they fail to establish whether the assimilatory processes apply to the same degree in prefixed and suffixed words, or whether the nasality and place of articulation of the triggering consonant have any effect on the spreading of palatalisation. Another question is to what extent phonotactic restrictions applicable to monomorphemic words are really violated in morphologically complex words. Four experiments including nonce words and loanwords were constructed to elicit production of

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[1] Palatalised velars, dentals and alveolars will not be discussed here as these sounds are found mostly in borrowings and/or have a limited distribution. See Rochoń (2000) and references therein for comments and discussion on the status of palatal(ised) velars in Polish.

prefixed and suffixed words and thus verify the status of palatalisation and place assimilation in consonant clusters resulting from prefixation and suffixation.

The chapter is organised as follows. First, I will outline the distribution of alveolo-palatals and palatalised labials in monomorphemic words as well as morphologicall complex ones (as reported in the previous literature). Next, I will outline the set-up, the aims and the results of the four experiments mentioned above. Section 7 provides a general discussion and functionally-based explanation(s) of the experimental results. Finally, section 8 is an OT analysis of the data.

1. Inventory of Polish consonants

1. *Inventory of Polish consonants*

Place / *Manner*	*Labial*	*Palatalised labials*	*Dental*	*Alveolar*	*Alveolo-palatal*	*Palatal*	*Velar*
Plosives	p b	(pʲ) (bʲ)	t d				k g
Fricatives	f v		s z	ʃ ʒ	ɕ ʑ		
Affricates			ts dz	tʃ dʒ	tɕ dʑ		x
Nasals	m	(mʲ)	n		ɲ		
Laterals			r	l			
Glides	w					j	

As the above table shows, Polish has a rich obstruent system, with three contrastive (phonemic) fricative/affricate series produced in the dental, alveolar and palatal regions. Dentals are produced with the tip of the tongue on the front teeth. Alveolars are produced with the blade of the tongue on the alveolar ridge. Polish alveolar obstruents are more front than the corresponding palato-alveolar obstruents found in English. Polish alveolars are sometimes classified as retroflexes, although this term is confusing as Polish alveolar obstruents do not necessarily involve the curling of the tongue, which is characteristic of retroflexes. Alveolo-palatals are produced with the front of the tongue approaching the region of the roof of the mouth located between the back of the alveolar ridge and the hard palate. Their place of articulation is definitely further back than that of the corresponding English palato-alveolars, but not as far back as, e.g., that of the palatal fricatives found in German. Palatalised labials are put in parentheses. Additionally, we have a set of coronal plosives /t d/,which are traditionally described as dentals. There are not phonemic alveolar or alveolo-palatal stops. Not all phonologists recognise palatal(ised) labials as separate phonemes due to their limited distribution (see section 2.2. below) and the fact that they are realised phonetically as a /Cj/ sequence with a distinct glide following the labial (see spectrograms 32-34 in section 5.2. below). In this dissertation, I will adopt the approach that palatalised labials constitute a single unit phonologically in spite of the fact that they constitute a sequence of two consonants phonetically.

Additionally, Polish has a set of secondary palatalised consonants: dentals[2], alveolars and velars. These sounds will not be discussed here.

2. Distribution

2.1. Alveolo-palatals

Alveolo-palatals can occur in all positions in a word: onset and coda, pre-vocalically and post-vocalically, pre-consonantally and post-consonantally:

2. *Distribution of alveolo-palatals*

Onset			*Coda*		
_V	_CV	C_V	V_	VC_	V_C
/ʑ/emia *soil* /ɕ/ano *hay* /tɕ/erć *thorn* /dʑ/eń *day* /ɲ/ebo *sky*	/ʑ/le *badly* /ɕ/led| *herring* /tɕ/ma *moth* /dʑ/wig *crane*	/gʑ/ik *cheese* /kɕ/iądz priest /fɕ/e *villages* /pɕ/ak *puppy* /gdʑ/e *where* /kɲ/eje *bushes* /mɲ/ej *less*	gę/ɕ/ *goose* by/tɕ/ *to be* dzie/ɲ/ *day*	ga/rɕtɕ/ *handful* /śmie/rtɕ/ *death*	pró/ɕp/ *requests* wie/dʑm/ *witches*

There are, however, certain co-occurrence restrictions on the distribution of alveolo-palatals in consonant clusters in monomorphemic words (see the discussion below) that do not apply to polymorphemic words. The aim of this chapter is to analyse the effects of morpheme boundaries on palatal assimilation in two specific contexts: word-initially when a monoconsonantal prefix is added and word-medially when a palatalising vowel-initial suffix is added to a stem ending in a consonant cluster. The clusters resulting from these morphological operations often violate phonotactic restrictions applicable in monomorphemic consonant clusters. Therefore, I will only look in more detail at the distribution of palatal(ised) consonants in word-initial and word-medial CC clusters.

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[2] Secondary palatalised dentals differ from alveolo-palatals not only in the place of articulation but also in the fact that in dentals palatalisation is realised asynchronously as a separate glide-like element, while in alveolo-palatals palatalisation is realised synchronously. Effectively, palatalised dentals are often analysed as two segments, i.e. a dental consonant followed by a palatal glide. Secondary palatalised dentals have a limited distribution, i.e they occur only before a vowel, mostly in words of foreign origin, e.g. *[tʲ]ara* (tiara, nom. sg.).

2.1.1. Word-initial position

3. *Coronal consonants in word-initial position*[3]

C_1 \ C_2	A-P	A	D	ɲ
A-P	√			√ (only voiceless fricative)
A	√	√	√	√ (only voiced fricative)
D		√	√	√ (only voiced fricative)
ɲ				

A-P[4] - alveolo-palatal obstruents
A - alveolar obstruents
D – dental obstruents

As table 3 above shows, alveolo-palatal obstruents cannot be followed by alveolars and dentals: */ɕʃ/ or */ɕs/. They cannot be preceded by dental stops or fricatives: */dʑ/, */tɕ/, */zʑ/, */sɕ/. Instead, dental + alveolo-palatal clusters are always realised as fully palatal:

4.	[ɕtɕ]ana	*wall, nom. sg.*
	[ʑdʑ]ebko	*pinch, nom. sg.*

Alveolars are acceptable before alveolo-palatals, but they optionally assimilate to the place of articulation of the following alveolo-palatal obstruent:

5.	[tʃtɕ]ić ~ [tɕtɕ]ić	*worship, inf.*

The alveolo-palatal nasal /ɲ/ can combine with other consonants more freely than alveolo-palatal obstruents can. /ɲ/ can occur after almost any obstruent:

6.	a. [pɲ]ak	*tree-trunk, nom. sg.*
	[bɲ]ec	*melandrium, nom. sg.*
	[tɲ]e	*cut, pres. 3 sg.*
	[dɲ]ówka	*day's wage, nom. sg.*
	[kɲ]eja	*forest, nom. sg.*
	[gɲ]ew	*anger, nom, sg.*
	[vɲ]osek	*conclusion, nom. sg.*
	b. [ɕɲ]eg	*snow, nom. sg.*
	[zɲ]ewaga	*offence, nom. sg.*
	[ʒɲ]iwo	*harvest, nom. sg.*

---

[3] Labials will be discussed in the next section.

[4] The notation represents the whole class of sounds with a particular place of articulation. If a certain sound is not considered, it will be indicated in parenthesis. The same technique will be used throughout the rest of this chapter.

There is a correlation between the voicing and the place of articulation of the fricative preceding /ɲ/ (6b above). When the fricative is dental or alveolar, it is always voiced. When it is alveolo-palatal, it is voiceless. Thus, clusters like */sɲ/, */ʃɲ/ or */ʑɲ/ are not permitted word-initially. This voicing restriction does not apply to obstruent + /n/ clusters. Both /sn/ and /zn/ stem initial clusters are allowed:

7.	[sn]op	*sheaf, nom. sg.*
	[zn]ak	*sign, nom. sg.*

To summarise, A + A-P obstruent clusters are allowed word-initially, while D + A-P are not. In case of the consonants preceding /ɲ/, no place restrictions apply. The alveolo-palatal nasal can preceded by a consonant of any place of articulation.

2.1.2. Word-medial position

In this section, I consider word-medial CC clusters in either stem-medial position or when followed by a non-palatalising suffix.

CC clusters can be mixed with respect to palatalisation. If the alveolo-palatal consonant occurs in C_1 position, the following of C_2 can have almost any place of articulation.

8.	rze[ʑb]+a	*sculpture, nom. sg.*
	hu[ɕt]+ać	*rock, inf.*
	my[ɕl]+ę	*think, pres. 1 sg.*
	rze[ɕk]+a	*awake, fem. sg.*
	ha[ɲb]+a	*disgrace, nom. sg.*
	ta[ɕm]+a	*ribbon, nom. sg.*

There is only one restriction: C_2 cannot be an alveolar obstruent. Hence, clusters like */ɕʃ/ are not permitted.

Crucially, clusters where only C_2 is palatal are allowed only if C_2 is a nasal sonorant:

9.	ku[xɲ]+a	*kitchen, nom. sg.*
	kłu[tɲ]+a	*argument, nom. sg.*
	cie[rɲ]+ami	*thorn, instr. pl.*

or if C_1 is a sonorant:

10.	żó[wtɕ]+ą	*gall, instr. sg.*
	pie[rɕ]+ą	*breast, instr. sg.*
	cie[rɲ]+ami	*thorn, instr. pl.*

Needless to say, fully palatal clusters are also allowed:

11.	gar[ɕtɕ]+ami	*handful, instr. pl.*
	pie[ɕɲ]+ami	*song, instr. pl.*
	boja[ʑɲ]+ami	*fear, instr. pl.*

Additionally, words with fully palatal medial CC clusters may also result from the process of denasalisation of nasal vowels, i.e. the nasal vowels /ɛ̃ ɔ̃/ are realised as /VN/ sequences before plosives and affricates. The nasal assimilates to the following consonant. Thus, if an underlying nasal vowel occurs before a palatal affricate, the following palatal clusters will arise:

12.	ką[ɲd͡ʑ]el	*distaff, nom. sg.*
	pię[ɲt͡ɕ]+u	*five, gen.*

Table 13 below summaries the distribution of coronals in word-medial position.

13. *Coronal consonants in word-medial position*

C_1 \ C_2	A-P	D	A	ɲ	Son
A-P	√	√		√	√
A		√	√	√	√
D		√	√	√	√
ɲ	√	√	√	√	√
Son	√	√	√	√	√

A-P - alveolo-palatal obstruents
A - alveolar obstruents
D – dental obstruents
Son - sonorants

2.1.3. Words with morpheme boundaries

2.1.3.1. Prefixation

When a prefix containing a dental obstruent, e.g. *z-*, *pod-*, *nad-*, is attached to a stem beginning with an alveolo-palatal obstruent, the prefix optionally assimilates:

14.	[s+ɕ]ąść ~	[ɕ+ɕ]ąść	*dismount, inf.*
	[z+dʑ]ałać ~	[ʑ+dʑ]ałać	*achieve, inf.*

The non-assimilated pronunciation is considered hyper-articulated (Karaś & Madejowa 1977) but it does occur. Note, however, that this type of pronunciation gives rise to clusters of coronal obstruents whose members do not agree in their palatal specification. Such clusters are banned in monomorphemic words.

When a stem beginning with the nasal /ɲ/ is prefixed, the prefix never palatalises. In this respect, clusters consisting of an obstruent and the nasal /ɲ/ behave uniformly in monomorphemic as well as prefixed words[5].:

15.	[z + ɲ]eść	*[ʑ + ɲ]eść	*bear, inf.*
	po[d + ɲ]eść	*po[dʑ + ɲ]eść	*lift, inf.*

It should be pointed out that the dental stops /t d/ palatalise into the corresponding alveolo-palatal affricates /tɕ dʑ/. Palatalisation of dental stops entails not only a change in the place of articulation but also in the manner of articulation.

2.1.3.2. Suffixation

The suffix analysed in this chapter has the form $-^{pal}e$. *Pal* is a floating feature [-back] (cf. Gussmann 1992b), which in Polish is realised either as a glide-like element /j/[6] after the stem-final consonant, or, in the case of coronal obstruents, a change of their place of articulation to alveolo-palatal. Thus, the dentals /s z n/ change into the alveolo-palatals /ɕ ʑ ɲ/, respectively. The dental plosives /t d/ change into the corresponding alveolo-palatal affricates /tɕ dʑ/. There are no alveolo-palatal plosives in Polish and so /t d/ change into alveolo-palatal sounds, which, phonetically, are most closly related to plosives,i.e. affricates.

When a palatalising suffix, e.g. $-^{pal}e$ is added to a stem ending in a cluster of coronal consonants, then the whole cluster is palatalised. There is no variation here:

16.	mo[st]	mo[ɕtɕ]+e	*mo[st͡ɕ]+e	*bridge, nom. sg./ gen. sg.*
	u[zd]+a	u[ʑd͡ʑ]+e	*u[zd͡ʑ]+e	*mouth piece, nom. sg./ gen. sg.*

In Fricative (F) + /n/ clusters, the nasal is palatalised along with the obstruent:

---

[5] Polish does not have a prefix /s-/ (or any other prefix ending in a voiceless dental/alveolar obstruent). It would be interesting to see whether such a prefix would obligatorily palatalise to /ɕ/ or whether it would remain as a plain /s-/. Note that in monomorphemic words clusters like */sɲ/ are not allowed.

[6] In certain dialects of Polish palatalisation on labials is realised as /ɕ/ or /ʑ/, depending on the voicing of the consonant (Dejna 1994), e.g. *[pj]es* → *[p^{ɕ}]es* (dog).

17. so[sn]+a so[ɕɲ]+e *so[sɲ]+e[7]. *birch tree, nom. sg./ gen. sg.*

Polish does not have monomorphemic stem-final plosive + /n/ clusters of the type /tn/ or /dn/. It would be interesting to see whether in these clusters the nasal would palatalise along with the plosive into /tɕɲ/ and /dʑɲ/ or whether the plosive would remain unaffected, i.e. /tɲ/ and /dɲ/. I will look at plosive + /n/ clusters in more detail in the experimental part of the chapter.

It would also be interesting to see what happens in /n/ + F clusters. Such clusters, however, occur only in borrowings, e.g. *se[ns]*. In native or fully assimilated vocabulary V/n/F are usually realised as ṼF sequences, e.g. *b[ɛ̃z]yna* (petrol, nom. sg.), although there is a tendency, especially among the younger generation, to realise them as V/n/F, e.g. *b[ɛnz]yna* (e.g. Zagórska-Brooks 1968, Wierzchowska 1980: 128-129, Doroszewski 1980, Sawicka 1995, Madelska & Witaszek-Samborska 1998) Thus, theoretically, when a palatalising suffix is attached to a borrowing containing a V/n/F sequences, a fully palatal NF cluster could be produced, e.g. *se[ɲɕ]+e.* (sense, loc. sg.)[8]. This is precisely what is reported to happen in /n/ + plosive clusters, e.g. *ka/nt/ ⟶ ka/ɲtɕ/+e* (corner, nom. sg./ loc. sg.). As Sawicka (1995: 122) points out, phonological or even phonetic descriptions regarding the behaviour of nasals in clusters are to a large extent arbitrary and are often based on the author's subjective opinion. I will look at V/n/F sequences in more detail in the experimental part of the chapter.

2.2. Labials

2.2.1. Words without morpheme boundaries

Secondary palatalised labials occur only before a vowel:

18.	[p^j]es	*dog, nom. sg.*
	[b^j]ały	*white, mas. sg.*
	[v^j]eś	*village, nom. sg.*
	[m^j]asto	*town, nom. sg.*

---

[7] This dissertation does not discuss stem-final clusters consisting of more than two members. In such clusters, spreading of palatalisation is optional, e.g. *ku[ksɲ]+e* or *ku[kɕɲ]+e* (s/he will nudge).

[8] According to previous studies (e.g. Zagórska-Brooks 1968, Wierzchowska 1980: 128-129, Doroszewski 1980, Sawicka 1995, Madelska & Witaszek-Samborska 1998), V/ɲ/F sequences tend to be realised as V[j̃]F with a nasalized palatal glide, e.g. *p[ãj̃s]two* (state, nom. sg.).

They are not permitted before a consonant or at the end of a word. Thus, sequences like *C^{j}CV and *VC^j# are disallowed[9].

In present-day Polish, we find a relic of an earlier word-final contrast: palatalised and non-palatalised labials alternate in the stem of certain nouns, i.e. a palatalised consonant occurs before a V-initial suffix and a plain one at the end of the word. Inflectional paradigms reveal which nouns ended historically in a palatalised labial. It is possible to find minimal pairs of nouns ending in the same consonant, where the addition of the same V-initial suffixes always allows stem-final palatalisation in one noun but not in the other:

19.	*Nom*	chle[b]	*bread*	gołą[b]	*pigeon*
	Acc	chle***[b]+a***		gołę***[b^j]+a***	
	Gen	chle[p]		gołę[b^j]+a	
	Dat	chle***[b]+owi***		gołę***[b^j]+owi***	
	Instr	chle***[b]+em***		gołę***[b^j]+em***	

What is of interest to us are the accusative, dative and instrumental cases, where we can observe that exactly the same suffixes allow palatalisation to surface in *gołąb* but not in *chleb*[10].

There are also minimal pairs constituted by plain vs. palatalised labials in onsets:

20.	[p^j]asek	*sand, nom. sg.*	[p]asek	*belt, nom. sg.*
	[b^j]ały	*white, mas. sg.*	[b]ały (się)	*they (fem) were afraid*

Palatalised labials can freely combine as C_2 of an onset cluster with other consonants, both plain (21a) and palatal (21b):

21. (a)	[tf^j]erdza	*castle, nom. sg.*
	[dv^j]e	*two, fem.*
	[kf^j]at	*flower, nom. sg.*
	[gv^j]azda	*star, nom. sg.*
	[zb^j]erzność	*overlap, nom. sg.*
	[sp^j]erać się	*argue, inf.*
	[zm^j]ana	*change, nom. sg.*

---

[9] Before the 15th century they could occur at the end of the word. The 15th c. may already have witnessed the hardening of palatalised L(abials) or their decomposition into L + /j/. In certain dialects L was even lost and replaced by /j/, e.g. *z[v^j]astowanie* → *z[j]astowanie* (annunciation).The gradual process of depalatalisation of word-final labials was completed by the end of the 19th century (Stieber 1973, Stone 1987).

[10] I disregard palatalisation in locative and vocative of *chleb* which is triggered by the suffix *-^{pal}e* and is not conditioned by the quality of the stem-final consonant:

Loc	chle[b^j]+e	gołę[b^j]+u
Voc	chle[b^j]+e	gołę[b^j]+u

(b)	[ɕpʲ]ew	*singing, nom. Sg.*
	[ɕfʲ]adek	*witness, nom. Sg.*
	[dʑvʲ]ęk	*sound, nom. Sg.*
	[ɕmʲ]ech	*laughter, nom. Sg.*

/mʲ/ has the same distribution restrictions as /ɲ/, i.e. there is a correlation between the voicing and the place of articulation of the fricative preceding /mʲ/. When the fricative is non-palatal, it is always voiced. When it is palatal, it is voiceless. Thus, clusters like */smʲ/ or */ʑmʲ/ are not permitted word-initially.

2.2.2. Words with morpheme boundaries

Palatalised labials (obstruents as well as nasals) do not trigger palatalisation of the prefixal consonant:

22.	[br]ać	[z+bʲ]erać	*[ʑ + bʲ]erać	*take, inf. Imper./perf.*
	[mʲ]erzyć	[z+mʲ]erzyć	*[ʑ + mʲ]erzyć	*measure, inf. Imper./perf.*

In suffixation, if the stem ends in coronal + labial cluster, two options are allowed:

23.	romanty[zm]	romanty[zmʲ]e	~ romanty[ʑmʲ]+e	*romanticism, nom. sg./ loc. sg.*
	i[zb]+a	i[zbʲ]+e	~ i[ʑbʲ]+e	*room, nom. sg./ loc. sg*

Again, the assimilated pronunciation is considered to be more widespread (Karaś & Madejowa 1977).

3. Previous analyses of place assimilation across morpheme boundary in Polish

As already mentioned above, according to *The Dictionary of Polish Pronunciation* (Karaś & Madejowa 1977), forms with fully assimilated consonant clusters across morpheme boundaries (both prefixed and suffixed) should be more widespread than the unassimilated ones and they should constitute the recommended norm in terms of pronunciation. The dictionary does not specify whether there are any frequency/statistical differences between the occurrence and non-occurrence of place assimilation in prefixed and suffixed words. Wierzchowska (1980) notes that place assimilation can take place across morpheme or word boundaries without specifying which type of pronunciation (assimilated or unassimilated) is more common: the assimilated forms are said to be characteristic of fast speech. Similarly, Klebanowska (1990) claims that place assimilation across morpheme boundaries (with the exception of palatalisation before the nasal /ɲ/) can be frequently observed in present-day Polish.

Sawicka (1995: 151) also writes that the prefix *z-* optionally assimilates to the following alveolar and alveolo-palatal consonants. She points out that the voiceless /s/ is more prone to assimilation than the voiced /z/. By the same token, prefixes ending in the plosive /d/, e.g. *nad-*, *pod-*, *od-* undergo the process of affrication (the assimilation of place and manner) before stems beginning with alveolar and alveolo-palatal fricatives (and affricates). According to the author, unassimilated prefixes can be found only in slow and careful speech. She does not mention place assimilation in suffixed forms.

Madejowa (1990) discusses the realisation of Polish consonant clusters. She concentrates mostly on monomorphemic words but also briefly mentions prefixed forms and sporadically suffixed forms. The study is based on author's own data, however, again, the data analysis is more impressionistic than experimental: the author listened to the subjects' production of the tested forms and on this basis she decided whether a given item was assimilated or not. Madejowa looked at the assimilation of the alveolar fricatives /s z/ and the plosives /t d/. The plosives assimilate from 53% to 68% of the time both in prefixed (e.g. *na[dʑ+ʑ]ziemny,* overground, adj. nom. sg. masc.) and suffixed words, e.g. *boga[tɕ+ɕ]i* (richer, adj. nom. pl. masc.). Unfortunately, no separate statistics are provided for prefixed and suffixed words. In general, assimilation is lower for voiced than for voiceless plosives. Assimilation of /s z/ patterns similarly: it ranges from 50% to 62%. Here, however, the differences between the voiced and voiceless fricative are more striking. The lack of assimilation of /z/ is definitely prevalent. No data for the fricative assimilation in suffixed words was provided. Madajowa also notes that unassimilated forms are more frequent among younger speakers, while the assimilated ones among older ones.

In general, the literature suggests that assimilated forms are more frequent. Unassimilated forms are characteristic of slow speech and are used mostly by younger speakers. There is also a correlation between voicing and place assimilation in that voiceless fricatives are more prone to palatalisation than the voiced ones.

4. Summary and predictions

4.1. Summary

The tables below represent the distribution of palatalisation in CC clusters in four different environments: stem-initially, in prefixed words, word-medially and stem-finally in suffixed words.

Table 24 represents CC clusters that occur stem-initially, where the beginning of the stem coincides with the beginning of a phonological word (and syllable onset). C_1's are represented vertically and C_2's horizontally. The table does not represent all the possible initial CC combinations. The selection was limited to /n ɲ m mʲ s z ɕ ʑ ʃ ʒ p b pʲ bʲ/ as these consonants are tested in the experiments described below. A detailed table outlining all the possible combinations of these consonants can be found in APPENDIX 1. Shaded rows represent cases where the consonant in question can never appear in the initial position in a cluster. Blank cells are unattested combinations.

24. *CC stem-initial clusters*

C_1 C_2	A-P	A	D	Lab	Lab^j
A-P					√
A				√	√
D			√	√	√
Lab	√	√	√		
Lab^j	▨	▨	▨	▨	▨

A-P - alveolo-palatal obstruents
A – alveolar obstruents
D – dental obstruents
Lab – labials
Lab^j – palatalised labials

Table 25 represents the attested C+C word-initial clusters. The vertical column represents six possible realisations of the monoconsonantal prefix *z-*: /s z ɕ ʑ ʃ ʒ/. As mentioned earlier, the assimilation affects other prefixes, e.g. *pod-* or *nad-*, ending in a dental obstruent, but these are not tested in the experiments below. Attaching *z-* to a stem beginning with a single C will not affect the syllable structure of the word and the resulting word-initial C+C cluster can be easily compared to stem-initial CC cluster represented in table 24 above. The only variable involved here is the presence/ absence of a morpheme boundary.

The horizontal row represents stem-initial consonants. The following consonants were considered: /n ɲ m mʲ s z ɕ ʑ ʃ ʒ p b pʲ bʲ/. Blank cells represent combinations non-attested in [*z*C] word-initial clusters (table 24). Cells with √/- represent optional place assimilation. Place assimilation is optional if the stem begins with one of the following consonants: /ɕ ʑ ʃ ʒ tɕ dʑ tʃ dʒ/. Note that only stem-initial fricatives and affricates can trigger palatalisation of the prefix. Palatal(ised) nasals and stops do not have any palatalising effect on the prefix. Note that in case of stem-initial A-P and A, neither the assimilated nor the unassimilated C+C clusters occur stem initial in monomorphemic words. All the remaining attested C+C clusters (the ones marked with √ only) are found stem-initially as well (cf. table 24 above), i.e. they can be found both morpheme internally and across the morpheme boundaries. A more detailed summary can be found in APPENDIX 2. Note also that most 'new' clusters resulting from prefixation are geminates (shaded cells), as long as the stem begins with a fricative.

25. *Prefix /z/- + C-initial stem*

C_1 C_2	ɲ	n	A-P	A	D[11]	Lab	Labʲ
A-P ɕ/ʑ			√/-				
A ʃ/ʒ				√/-			
D s/z	√	√	√/-	√/-	√	√	√

A-P - alveolo-palatal obstruents
A – alveolar obstruents
D – dental obstruents
Lab – labials
Labʲ – palatalised labials

To summarise, prefixed *z*- + fricative clusters either stay unassimilated, producing a consonant cluster that does not agree in palatality, or assimilate to produce a geminate. Both options make new cluster types non-attested in monomorphemic words.

Table 26 represents the possible CC combinations in monomorphemic word-medial position or in stem-final position not followed by a palatalising suffix. C_1's are represented vertically and C_2's horizontally. The table does not represent all the possible medial CC combinations. The selection was limited to /n ɲ m mʲ s z ɕ tɕ ʑ dʑ t d p b pʲ bʲ/ as these consonants are tested in the experiments described below.

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[11] There are very few words that begin with /ss/ or /zz/ and are considered to be monomorphemic, e.g. *ssać* (suck, inf.) or *zza* (from behind). However, historically they can be traced back to polymorphemic words.

Only those plain consonants were selected that undergo palatalisation when followed by a palatalising suffix, i.e. /n m t d s z p b/. They palatalise to /ɲ m^j tɕ dʑ ɕ ʑ p^j b^j/, respectively. Once palatalised, these consonants can also trigger palatalisation of preceding consonants.

Shaded rows and columns represent cases where the consonant in question can never appear in that position in a cluster, e.g. there are no /p^jC/ stem-final or word-medial clusters at all. A detailed summary can be found in APPENDIX 3.

26. *CC word-medial/ stem-final clusters*

C_1 \ C_2	A-P	D	Lab	Lab^j
A-P	√	√	√	
D		√	√	
Lab	√	√	√	
Lab^j				

A-P - alveolo-palatal obstruents
D – dental obstruents
Lab – labials
Lab^j – palatalised labials

Table 27 represents a different word-medial contrast: stem-final CC clusters when followed by a vowel-initial palatalising suffix. C_2 is obligatorily palatalised in this context, while this is not always the case for C_1. Non-palatal(ised) consonants in C_2 position are excluded from the table. Cells with √/- represent optional place assimilation. There is only one environment where palatalisation is optional, i.e. before palatalised labials. All the remaining attested stem-final CC + palatalising suffix clusters (the ones marked with √ only) are found stem-finally when not followed by a palatalising suffix (cf. table 26 above). A detailed summary can be found in APPENDIX 4.

27. *CC-final stems + palatalising suffix*

C_1 \ C_2	ɲ	A-P	Lab^j
A-P	√	√	√/-
D			√/-
Lab	√	√	
Lab^j			

A-P - alveolo-palatals
D – dentals
Lab - labials
Lab^j – palatalised labials

4.2. Predictions

As you can see from the above tables, consonant clusters resulting from prefixation and suffixation do not always comply with monomorphemic phonotactic restrictions. In particular, they may allow clusters that do not agree in palatality. This is particularly the case with stem-final clusters. The first observation is that morphological boundaries can have a blocking effect on palatal assimilation in prefixed words. Underapplication of palatal assimilation can also be found in stem-final clusters in suffixed words. Thus, based on the above generalisations from the existing literature, we can predict the following pattern of application of palatalisation in our experiments:

28. *Palatal assimilation in prefixed words -/z/- + C-initial stem*

Stem-initial C	*No palatalisation*	*Palatalisation*	*Status of palatalisation*
(i) ɕ	s+ɕ	ɕ+ɕ	optional
ʑ	z+ʑ	ʑ+ʑ	optional
ʃ	s+ʃ	ʃ+ʃ	optional
ʒ	z+ʒ	ʒ+ʒ	optional
(ii) ɲ	z+ɲ	*ʑ+ɲ	impossible
(iii) mʲ	z+mʲ	*ʑ+mʲ	impossible
pʲ	s+pʲ	*ɕ+pʲ	impossible
bʲ	z+bʲ	*ʑ+bʲ	impossible

The following generalisations can be made regarding palatal assimilation in prefixed words:

i. alveolo-palatal /ɕ ʑ/ and alveolar /ʃ ʒ/ obstruents trigger place assimilation
ii. nasals fail to pass back palatalisation
iii. labials fail to pass back palatalisation

29. *Palatal assimilation in suffixed words – CC stems + palatalising suffix*

Stem-final CC cluster	*No palatalisation*	*Palatalisation*	*Status of palatalisation*
(ii) zn	*zɲ	ʑɲ	obligatory
sn	*sɲ	ɕɲ	obligatory
nn	*nɲ	ɲɲ	obligatory
st	*st͡ɕ	ɕt͡ɕ	obligatory
zd	*zd͡ʑ	ʑd͡ʑ	obligatory
(iii) zmʲ	zmʲ	ʑmʲ	optional
smʲ	smʲ	ɕmʲ	optional
spʲ	spʲ	ɕpʲ	optional
zbʲ	zbʲ	ʑbʲ	optional
(iv) ns/z	?nɕ/ʑ	?ɲɕ/ʑ	? (possibly obligatory)

The following generalisations can be made regarding palatal assimilation in suffixed words:

i. palatalisation is more widespread in stem-final clusters than in prefixed words
ii. coronal clusters obligatorily agree in the place of articulation in stem-final position (optional or impossible assimilation in prefixed words)
iii. coronal + palatalised labial clusters may or may not agree in their palatal specification (coronal + palatalised labial clusters never agree in their palatal specification in prefixed words)
iv. it is not clear whether /n/ palatalises before alveolo-palatal fricatives; palatalisation is obligatory before alveolo-palatal affricates, therefore we may expect the same effect before alveolo-palatal fricatives

All the above generalisations are, however, based on traditional (often prescriptive) descriptions of Polish prefixation/suffixation. The question is to what extent are phonotactic restrictions really violated in morphologically complex words. It is the aim of the experiments outlined below to provide an answer to this question. Specifically, the experiments will verify the status of palatalisation across morpheme boundaries by using nonce words and loanwords to elicit production of prefixed and suffixed words.

5. Experiments

Four experiments were designed to test the productivity of palatal assimilation across morpheme boundaries: two of the experiments involved nonce words (one for prefixation and one for suffixation) and two involved loanwords (similarly, one for prefixation and one for suffixation). The aim of the prefixation experiments was to analyse the influence of nasality and place of articulation on palatal assimilation of the prefix, while the aim of the suffixation experiments was to analyse the influence of nasality and place of articulation on palatal assimilation of C_1 in stem-final CC cluster after the addition of a palatalising V-initial suffix.

I decided to include the English borrowings in the test for the following reason. All the participants spoke fluent English. I assumed that even if asked to treat the borrowings as Polish verbs/nouns, due to their high competence in English, they might still fail to apply some of the Polish phonological processes. Effectively, the processes found in the English borrowings should be the most 'pervasive' ones that the native speakers of Polish find difficult to control.

5.1. Participants

Twenty-three second-year students of the *Academy of Humanities and Economics* in Łódź who were native speakers of Polish took part in the experiments. Seventeen students (4 males and 13 females) were aged between 19 and 21. Six participants were mature students in their late 30-ies (2 male and 4 female). All the participants spoke the standard dialect of Polish. There were no significant pronunciation differences between the two groups of students. All the students majored in English and had a fluent command of the language. The data comprises six hours of recordings.

5.2. Experiment 1 (nonce verb prefixation)

5.2.1. Materials

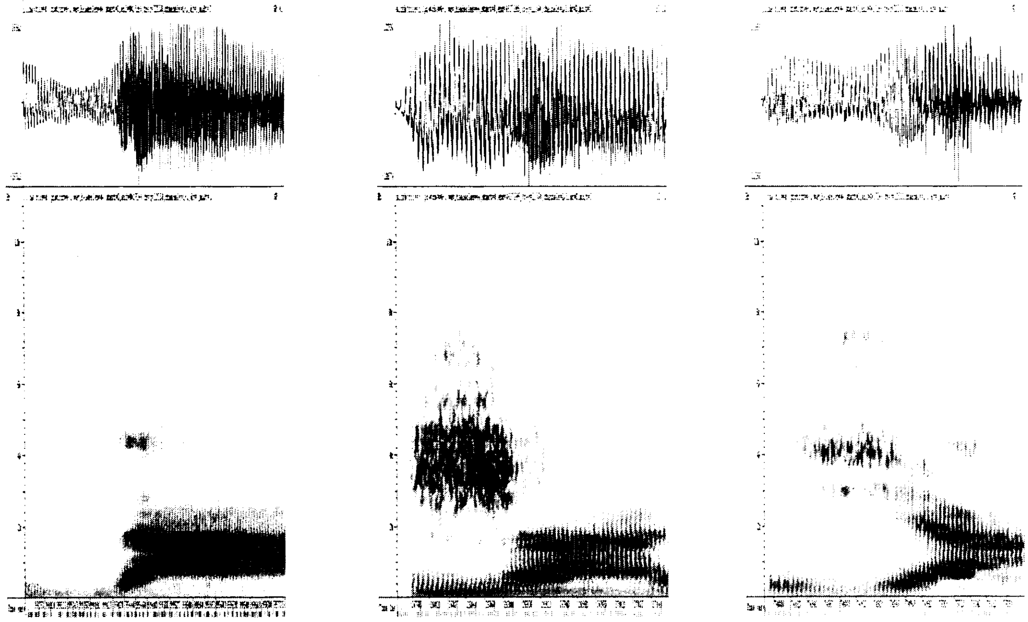
The materials consisted of 70 (APPENDIX 5) imperfective nonce verbs (5 verbs beginning with each of the 14 tested stem-initial consonants) in the infinitive, to which subjects were asked to attach the native Polish prefix *z-*. The verbs did not contain any prefixes or infixes. They all had the same morphological structure, i.e. root + the infinitival suffix *–ić/-ać*. All the stems were disyllabic. The length of the verb has been dictated by the Polish stress pattern. Polish has penultimate stress, which means that a typical Polish foot is a syllabic trochee (see chapter 2 for the discussion of Polish stress). In disyllabic verbs, therefore, the stress will always be initial and the prefix will always be added to a stressed syllable. In longer verbs, the suffix would be attached to an unstressed syllable or a syllable bearing a secondary stress, which might affect the degree of assimilation. Further, all the verb stems began with a single consonant to avoid any coarticulatory effects of C_2 on C_1. Every effort was made to select disyllabic verbs where the stressed vowel is an /a/, which, in terms of phonetics is the most neutral vowel with the least co-articulatory effects on the preceding consonant. The initial consonant was controlled for place and manner of articulation and, in case of obstruents, for voicing. The test material contained an equal number of verbs beginning with each type of consonant. Four types of nasals were included: /n ɲ m m^j/. This choice of nasals allowed a four-way contrast: labial vs. coronal and plain vs. palatal. The selection of obstruents was much larger due to the additional voicing contrast involved: /s z ɕ ʑ ʃ ʒ p b pʲ bʲ/. The test material did not include affricates or secondary palatalised dental obstruents. As mentioned above, to each of the verbs, the prefix *z-* was attached. This is a very frequent prefix in Polish used to form perfective verbs. *z-* is a mono-consonantal non-syllabic prefix and as such it will have no effect on the foot structure of the verb. The prefix will simply be incorporated into the onset of the stem-initial syllable. Typically, complex onsets beginning with /z/ are common, both with and without a morpheme boundary. Secondly, being a mono-consonantal prefix, /z/ might be more susceptible to assimilation than a syllabic prefix such as *pod-,* since it forms a tautosyllabic cluster.

5.2.2. Procedure

In the training phase, participants were presented with a list of real Polish verbs with the prefix *z-* on flash cards, one verb at a time (APPENDIX 6). First an unprefixed verb was shown, e.g. *robić* (do, inf.) and then its prefixed equivalent followed, e.g. *zrobić*. The verbs were presented in a random order as far as the quality of the initial consonant is concerned. Next, the participants were presented with a list of real Polish verbs and asked to add the prefix *z-* to them (APPENDIX 7). The unprefixed verbs were presented to the subjects on flash cards, one verb at a time. The participants were asked to read out the unprefixed verb, e.g. *czernieć* (become black, inf.) and then the verb with the attached prefix, e.g. *zczernieć*. The subjects were asked to read the verbs as quickly and as casually as possible in order to avoid artificial or hyper-articulated speech. The aim of this presentation was to acquaint the subjects with the morphological process involved in the experiment. Any subjects who could not perform this task were not included in the final analysis.

Next, the participants were presented with a series of nonce words where the procedure described above was repeated. The subjects were presented with an unprefixed nonce verb, e.g. *szakać*, and asked to add the prefix *z-* to it, e.g. *zszakać*. The nonce verbs were randomised as far as the quality of the initial consonant is concerned and presented in Polish orthography (APPENDIX 8). Mispronounced words were excluded from the final statistics. All the responses were recorded on a Marantz tape recorder and analysed acoustically. A spectrogram of each verb was produced using the SFS programme (*Speech Filing System*[12]). In the spectrograms, I looked for full palatal assimilation of the prefix *z-* to /ʑ/, /ɕ/, /ʒ/ or /ʃ/, depending on the voicing and place of articulation of the stem-initial consonant. The alveolo-palatal fricatives /ʑ/ and /ɕ/ have the major concentration of energy in the region of 2500 – 3000Hz[13], while the aleveolar fricatives /ʒ/ and /ʃ/ have energy concentration in both the 1500 – 1700Hz and especially the 4000 – 6000Hz regions. By comparison, the dental fricatives /z/ and /s/ have the major concentration of energy in both the 1700Hz and 5000 – 10,000Hz regions.

30. Sample spectrograms of /z ʒ ʑ s ʃ ɕ/.



30a. z a

30b. ʒ a

30c. ʑ a

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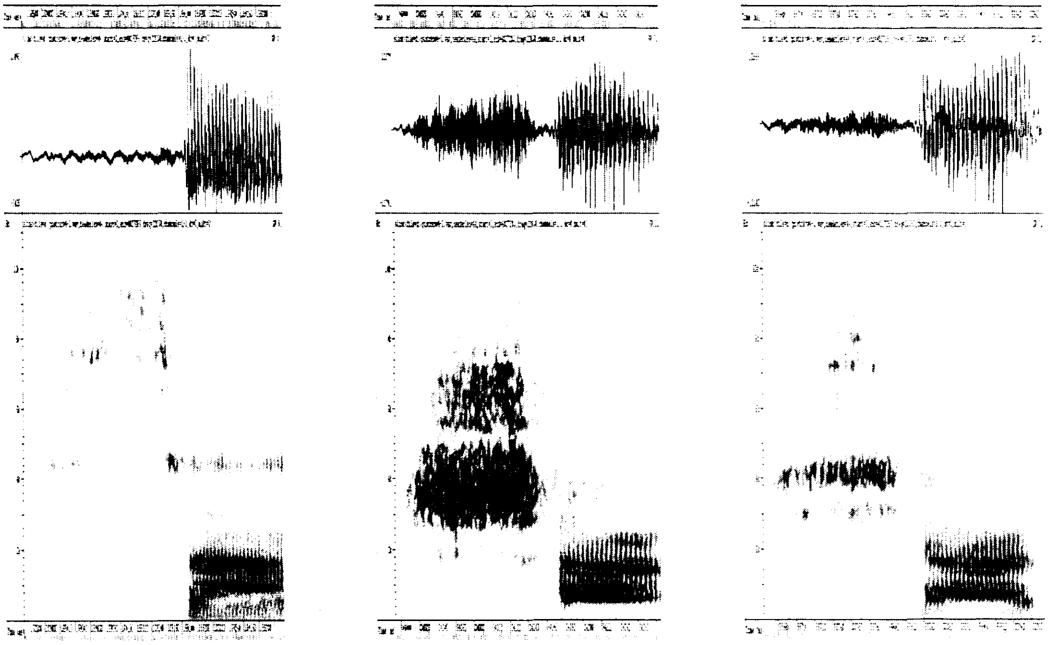
[12] The programme is freely downloadable from http//:www.phon.ucl.ac.uk

[13] All the acoustic measurements are based on Wierzchowska (1980).



30d. s a 30e. ʃ a 30f. ç a

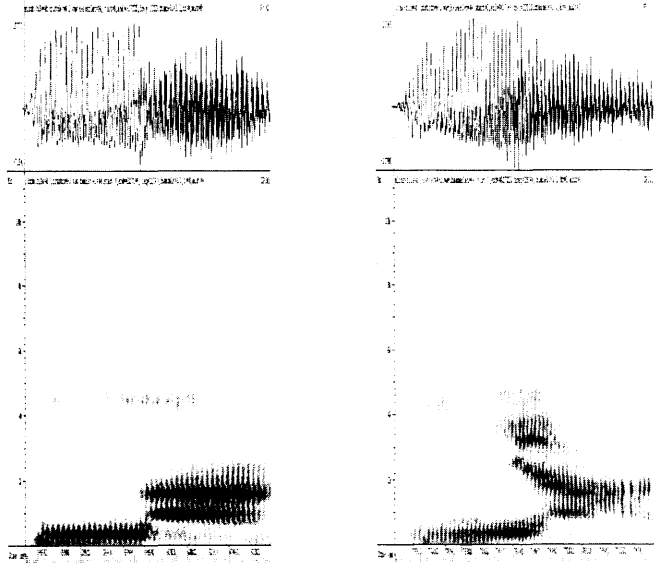
The prefix was considered fully palatalised if its spectrogram contained concentration of energy within the same region as the following stem-initial fricative, i.e. if the word-initial cluster resulting from prefixation was a geminate.

The remaining stem-initial consonants included in the experiment have major concentrations of energy in the following regions:

/n/: 200 – 300Hz, 900 – 1000Hz, 1100 - 1200Hz;

/ɲ/: 200 – 400Hz, 800Hz, 1800 – 2500Hz;

31. Sample spectrograms of /n ɲ/

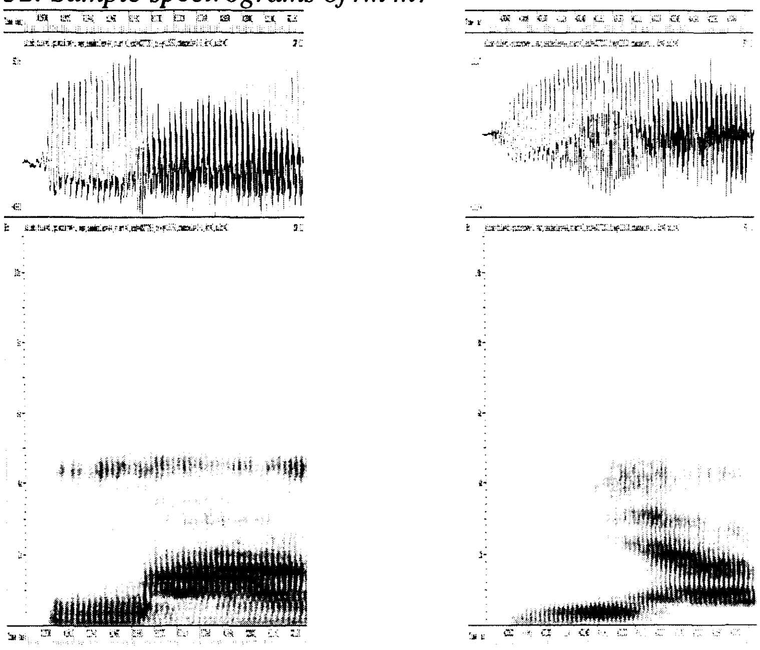


31a. n a 31b. ɲ a

/m/: 250 – 300 Hz and 900 Hz;

/m^j/: 200 – 400 Hz, 800 – 1000 Hz, 2500 Hz;

32. Sample spectrograms of /m m^j/

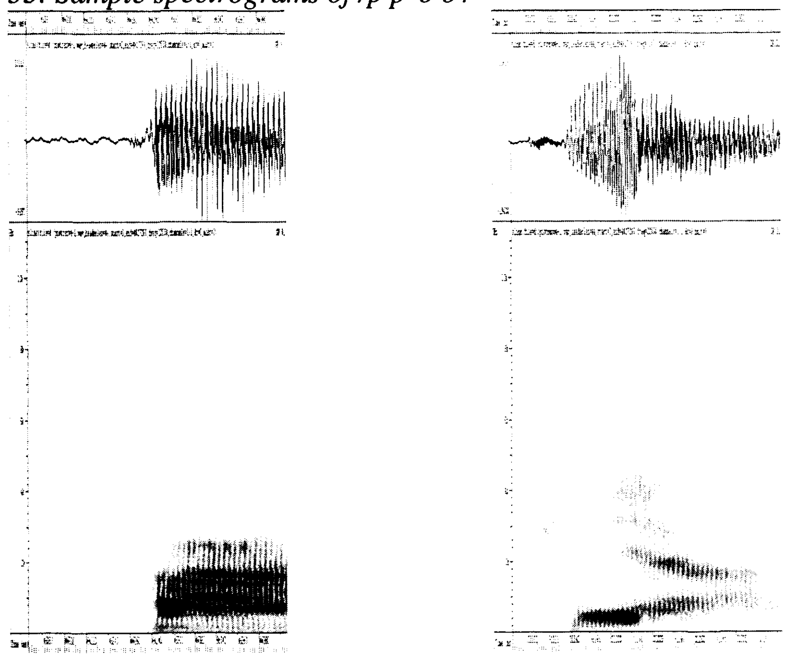


32a. m a 32b. m j a

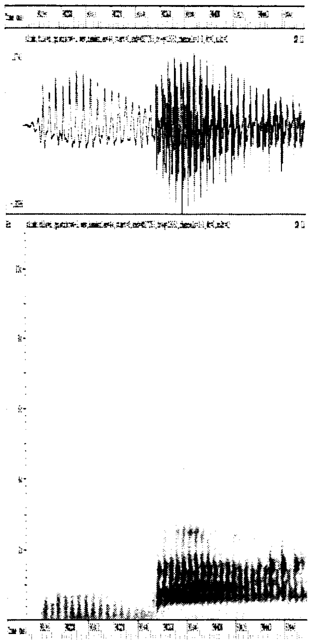
/p b/: 0 – 400 Hz and 1000 – 1400 Hz;

/p^j b^j/: 2500 – 3000 Hz.

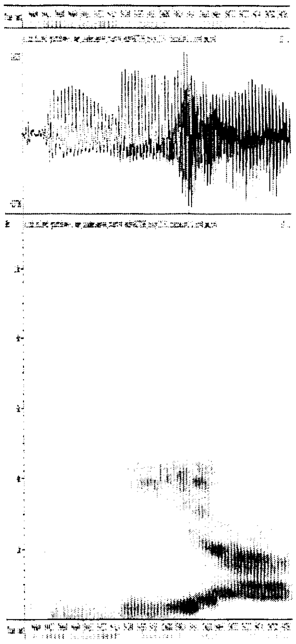
33. Sample spectrograms of /p p^j b b^j/



33a. p a 33b p j a



33c. b a



33d. b j a

As the spectrograms 31b, 32b, 33b and 33d show, in /ɲ m^j p^j b^j/ palatalisation is realised as a glide-like element following the consonants.

According to previous research (see the generalisation in table 25 above), the prefix *z-* may change into its alveolar or alveolo-palatal equivalent before obstruents but not before the alveolo-palatal nasal /ɲ/. The prefix does, however, assimilate in terms of voicing.

I looked at palatal assimilation of the prefix in the above context to check whether my results would corroborate the outcome of previous research in this area.

5.3. Experiment 2 (prefixation of loanwords)

5.3.1. Materials

The materials consisted of 70 English verbs in the infinitive (APPENDIX 9), to which subjects were asked to attach the native prefix *z-* and an infinitival ending in order to make the verb resemble a real Polish word. I looked for relatively recent borrowings that have not been incorporated into the Polish morphological system. The verbs did not contain any prefixes, suffixes or infixes. They were all monosyllabic so that after the attachment of one of the Polish infinitival suffix, such as *–ić, -ać, -ować*, they would all be disyllabic or trisyllabic, e.g. *shift* → *shift+ować* → *z+shift+ować*. Due to the fact that Polish infinitival suffixes differ in length, it was impossible to design the experiment in such a way that all the resultant new verbs would be disyllabic. Each of the infinitival ending indicates a different conjugational class and it is difficult to predict which conjugational class the subjects will assign a given borrowing to. I attempted to suggest the use of a monosyllabic infinitival ending during the training session. Thus, when a given subject, started attaching a disyllabic infinitival ending, I provided more examples of loanwords and suggested an alternative way of forming Polish infinitives. However, some of the subjects felt uncomfortable and confused about attaching a monosyllabic infinitival suffix to the English verbs and they constantly added a disyllabic one.

All the verb stems began with a single consonant to avoid any coarticulatory effects of C_2 on C_1. Every effort was made to select monosyllabic verbs where the stressed vowel after the addition of a monosyllabic inflectional suffix would be most likely to be pronounced as /a/ by the subjects, although sometimes verbs containing a different vowel had to be included. The initial consonant was controlled for place and manner of articulation and, in case of obstruents, for voicing. The test material did not contain an equal number of words beginning with each consonant due to their limited distribution in English, e.g. verbs beginning with the consonant /z/ are rare in English. Words with contexts for the production of four types of nasals were included: /n ɲ m mʲ/: *[n]ab, [ɲ][14]eed, [m]elt, [mʲ]ute*. This choice of nasals allowed a four-way contrast: labial vs. coronal and plain vs. palatal. The selection of obstruents was much larger due to the additional voicing contrast involved: /s z ʃ ʒ p b pʲ bʲ/. Additionally, I included five verbs beginning with the palatalised /sʲ/, e.g. *sift* to check whether any of them would contain /ç/ when borrowed into Polish. As already mentioned, not all consonants mentioned above can be easily found in English, e.g. /ɲ/ or /ç/, but the stimuli contained the closest equivalents of the Polish consonants tested here. I assumed that once the borrowed English verbs are incorporated into the Polish morphological system, they would also undergo phoneme substitution and the English consonants would be replaced with their Polish equivalents. This assumption was confirmed by the experimental data. Further, the subjects were also instructed to make the English verbs sound 'as

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[14] Polish speakers of English, even the very advanced ones, usually have great difficulty producing a non-palatal coronal nasal directly in front of /i/. English [ni] tends to be realised as [ɲi].

Polish as possible' in order to encourage both phonological and morphological adaptation. To each of the verbs the prefix *z-* was attached. After a brief training session, the subjects had no difficulties adopting the English verbs into the Polish phonological and morphological systems.

5.3.2. Procedure

Participants were presented with a list of English verbs on flashcards, one verb at a time, and asked to treat them as real Polish verbs (APPENDIX 10). First, the English infinitive was shown, e.g. *log*, and then the subjects were asked to form a Polish infinitive, e.g. *log+ować*. Once they did it, they were asked to add the prefix *z-* to the Polish infinitive, e.g. *z+log+ować*. The aim of this presentation was to acquaint the subjects with the morphological process involved in the experiment. Any subjects who could not perform this task were not included in the final analysis.

After the training session, the subjects were presented with the list of English verbs tested in the experiment. The English verbs were randomised as far as the quality of the initial consonant is concerned and presented in English orthography (APPENDIX 11). The verbs were presented on flashcards, one verb at a time, e.g. *nip*. The participants were asked to read out the verb with the attached Polish infinitival suffix, e.g. *nip+ić* or *nip+ować*, and then again with the prefix *z-*, e.g. *z+nip+ić* or *z+nip+ować*. The subjects were asked to read the verbs as quickly and as casually as possible in order to avoid artificial hyper-articulated speech. The subjects were instructed to make the verbs sound as 'Polish as possible', which would include both their pronunciation as well as morphological make-up. All the responses were recorded and analysed acoustically. Spectrograms of each verb were produced. I looked for full assimilation of the prefix *z-* to /ʃ/, /ʑ/ or /ɕ/, depending on the voicing of the stem-initial consonant (for the acoustic description of the above sounds see Experiment 1).

5.4. Experiment 3 (nonce noun suffixation)

5.4.1. Materials

The materials consisted of 90 nonce nouns in the nominative: 18 types of cluster, 5 tokens of each (APPENDIX 12), to which the subjects were asked to add the native Polish suffix $-^{pal}e$. (see section 2.1.3.2 above) This is a very frequent suffix in

Polish used in many inflectional cases and paradigms. The suffix induces palatalisation of the stem-final consonant(s). The nouns contained either no overt inflectional/gender ending *-ø* or a non-palatalising inflectional/gender suffix such as *–a* or *–o*. They all had the same morphological structure, i.e. root + the nominative inflectional/gender suffixes *—a, -o, -ø*. All the stems were disyllabic (the ones containing an overt inflectional/gender marker in the nominative) or monosyllabic (the ones with a zero inflectional/gender marker in the nominative). The suffix $-^{pal}e$ replaces the nominative markers *—a, -o, -ø*. Thus, in nouns with overt markers the number of syllables in the word will not be affected after the attachment of $-^{pal}e$. The nouns will remain disyllabic and the suffix will be part of an unstressed syllable, while the immediately preceding syllable will be stressed. The whole structure will have the form of a syllabic trochee. However, in nouns with no overt nominative marker, the suffix will add an additional syllable. Therefore, it is important that such nouns are monosyllabic in the nominative. If they are disyllabic, then after the attachment of the suffix, the new word will be trisyllabic, which will introduce another variable into the analysis, i.e. not all the inflected nouns will not have a uniform prosodic shape. Further, all the noun stems ended with a cluster of two consonants. Every effort was made to select disyllabic nouns where the vowel /a/ is preceding the stem-final cluster. The final consonant cluster was controlled for place and manner of articulation and, in case of obstruents, for voicing. The clusters consisted of the following combinations of consonants:

34. D + D D – dental obstruent (voiced and voiceless)
D + P P – labial obstruent (voiced and voiceless)
D + N N – dental nasal
D + M M – labial nasal
N + D

The same consonants were involved as in the above prefix experiments with a few exceptions. No stems ending in an alveolo-palatal consonant were included. That is due to the fact that the aim of the experiment was to test the influence of C_2 on C_1 in a context where C_2 was palatalised as a result of a morphophonological operation. Secondly, plosives were also included in C_1 position, while in the previous two experiments the consonant in the C_1 position was always a fricative (the prefix *z-*). Thirdly, Polish does not have stem-final CC clusters consisting solely of dental or/and alveolar fricatives, e.g. /sʃ/, /sɕ/ or /ss/, which would match the word-initial clusters studied in the previous two experiments. The closest matches were stem-final clusters consisting of a fricative followed by a plosive, e.g. /st/. After the addition of the suffix $-^{pal}e$, the dental plosive will palatalise to the alveolo-palatal affricate /tɕ/. Mispronounced words were excluded from the final statistics.

5.4.2. Procedure

In the training phase, participants were presented with a list of real Polish nouns with the prefix $-^{pal}e$ on flashcards, one noun at a time (APPENDIX 13). First a noun without the suffix was shown, and then its suffixed equivalent followed. The nouns were presented in a random order as far as the quality of the final consonant cluster was concerned. Next, the participants were presented with a list of real Polish nouns, e.g. *miast+o* (town), and asked to add the suffix $-^{pal}e$ to them, e.g. *mieści+e* (APPENDIX 14). The unsuffixed nouns were presented on flashcards, one noun at a time, and the participants were asked to read out the unsuffixed noun and then the noun with the attached suffix. The subjects were asked to read the nouns as quickly and as casually as possible in order to avoid artificial or hyper-articulated speech. The aim of this presentation was to acquaint the subjects with the morphological process involved in the experiment. Any subjects who could not perform this task were not included in the final analysis. The participants were then presented with a series of nonce words where the procedure described above was repeated, e.g. *mant* → *manci+e*. The nonce nouns were randomised as far as the quality of the final consonant cluster is concerned and presented in Polish orthography (APPENDIX 15). All the responses were recorded and analysed acoustically.

A spectrogram of each noun was produced and the spectra of the stem-final clusters were analysed. I looked for full palatal assimilation of C_1 in the stem-final cluster. The suffix $-^{pal}e$ will always induce palatalisation of the stem-final consonant. The aim of the experiment was to check to what extent the palatalised stem-final consonant will cause assimilation of the preceding consonant. I looked at the spectra of all C_1's and searched for energy concentration in the following region:
/ʑ/ and /ɕ/: 2500 – 3000Hz (as compared to non-palatal /z/ and /s/ which have the major energy concentration in both the regions of 1700Hz and 5000 – 10000Hz regions.);

/ɲ/: 200-400, 800 and 1800-2500Hz (as compared to /n/ which has the major energy concentration in the regions of 200-300, 900-1000 and 1100-1200Hz);
/tɕ/ and /dʑ/: 2500 – 3500Hz, i.e. energy concentration similar to /ɕ/ and /ʑ/ (as compared to /t/ and /d/ which have energy concentration in the regions of both 0 - 600Hz and 1000 – 1500Hz).

5.5. Experiment 4 (loanword suffixation)

5.5.1. Materials

The materials consisted of 30 English nouns (APPENDIX 16) in the form that might be adopted as the Polish nominative case, to which the subjects were asked to add the native Polish suffix $-^{pal}e$. The nouns were monosyllabic and ended in a cluster of consonants, which means that when borrowed into Polish, they were reanalysed as containing no overt inflectional ending. They all had the same morphological structure, i.e. root + the nominative inflectional/gender suffix *-ø*. All the noun stems ended in a cluster of two consonants. Every effort was made to select monosyllabic nouns where the vowel /a/ precedes the stem-final cluster, however, failing that, nouns with other vowels had to be included. The final consonant cluster was controlled for place and manner of articulation and, in case of obstruents, for voicing. The selection of stem-final consonant clusters was much smaller than in Experiment 3 due to English phonotactic constraints. The following clusters were included: /-st/, /-sp/, /-nt/, /-nd/ and /-ns/.

5.5.2. Procedure

In the training session, participants were presented with a list of English nouns on flashcards, one noun at a time (APPENDIX 17), e.g. *lisp*. The subjects were asked to treat the English nouns as if they were Polish ones and add the palatalising suffix $-^{pal}e$ to them, e.g. *lispi+e*. The aim of this presentation was to acquaint the subjects with the morphological process involved in the experiment. Any subjects who could not perform this task were not included in the final analysis.

Next, the participants were presented with a series of English nouns tested in the experiment and the above procedure was repeated. The nouns were randomised as far as the quality of the final consonant cluster is concerned and presented in English orthography (APPENDIX 18). An English noun was shown on a flashcard, one noun at a time, e.g. *dust,* and the participants were asked to read out the unsuffixed noun and then the same noun with the attached suffix, e.g. *duści+e*. The subjects were asked to read the nouns as quickly and as casually as possible in order to avoid artificial or hyper-articulated speech. All the responses were recorded and analysed acoustically. I looked at the same parameters as in experiment 3 above.

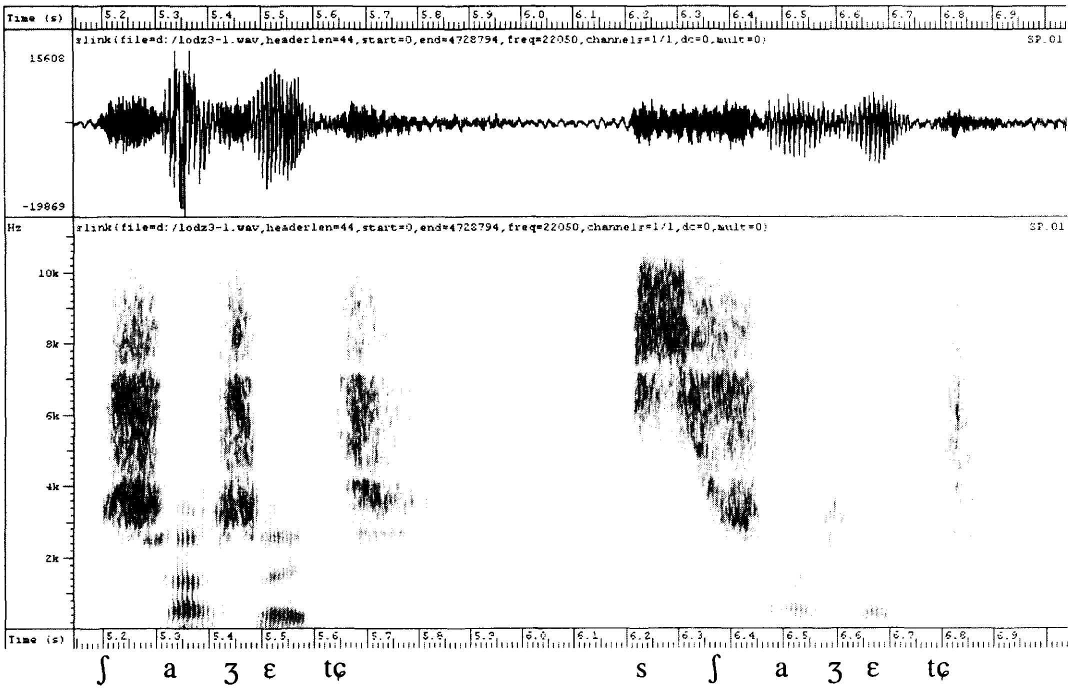
6. Results

6.1. Prefixation

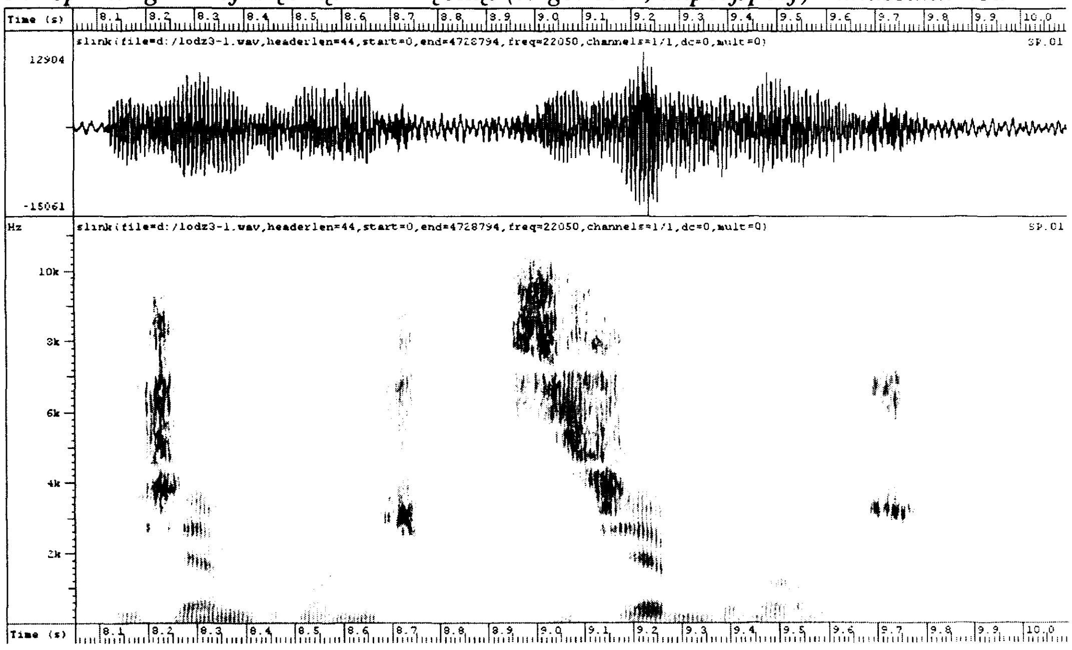
6.1.1. Native Polish words

The spectrograms below exemplify the production of prefixed verbs in native Polish words.

35. Spectrogram of szarzeć – z+szarzeć *(to become grey, imperf/perf) - unassimilated*

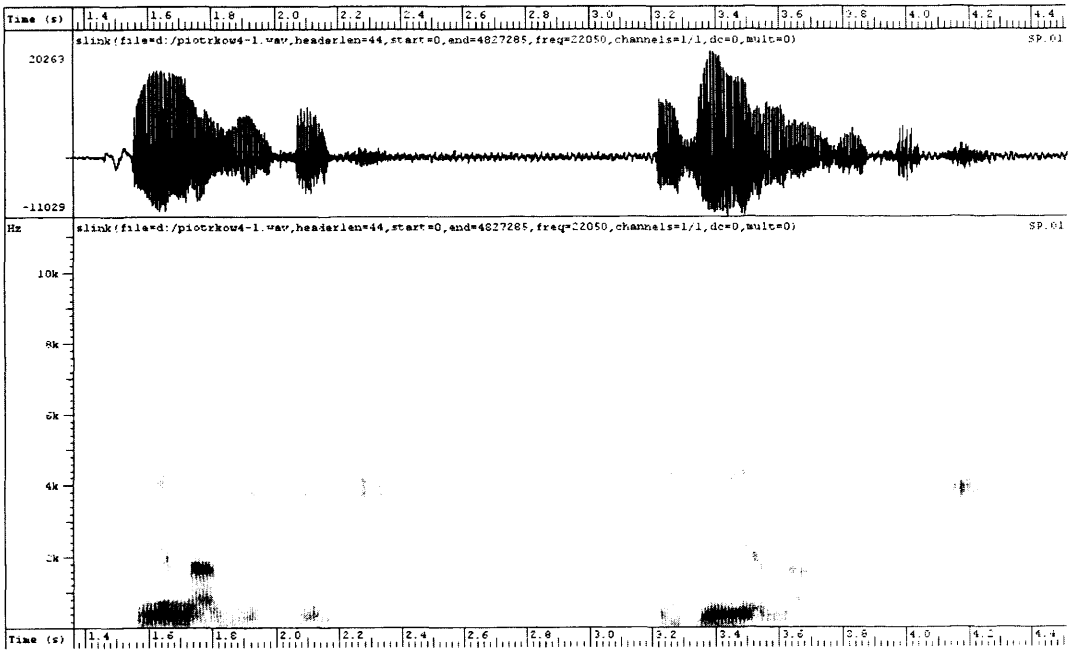


36. Spectrogram of ziębnąć – z+ziębnąć *(to get cold, imperf/perf) - unassimilated*



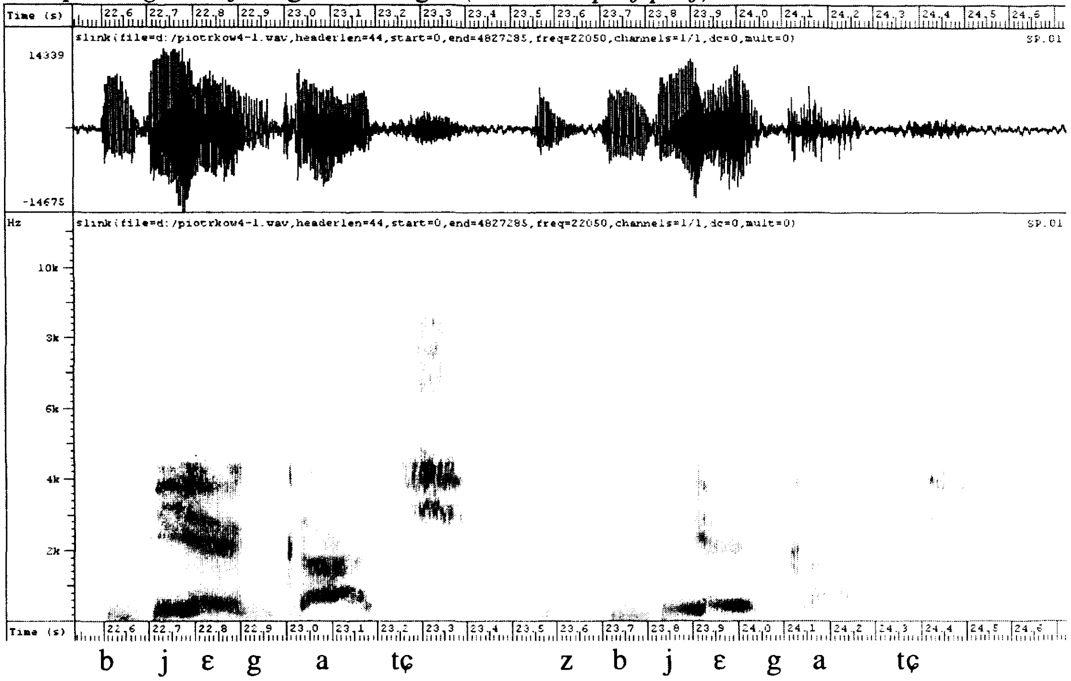
ʑ ɛ m b n ɔ n tɕ z ʑ ɛ m b n ɔ n tɕ

37. Spectrogram of nienawidzieć – z+nienawidzieć *(to hate, imperf/perf) - unassimilated*

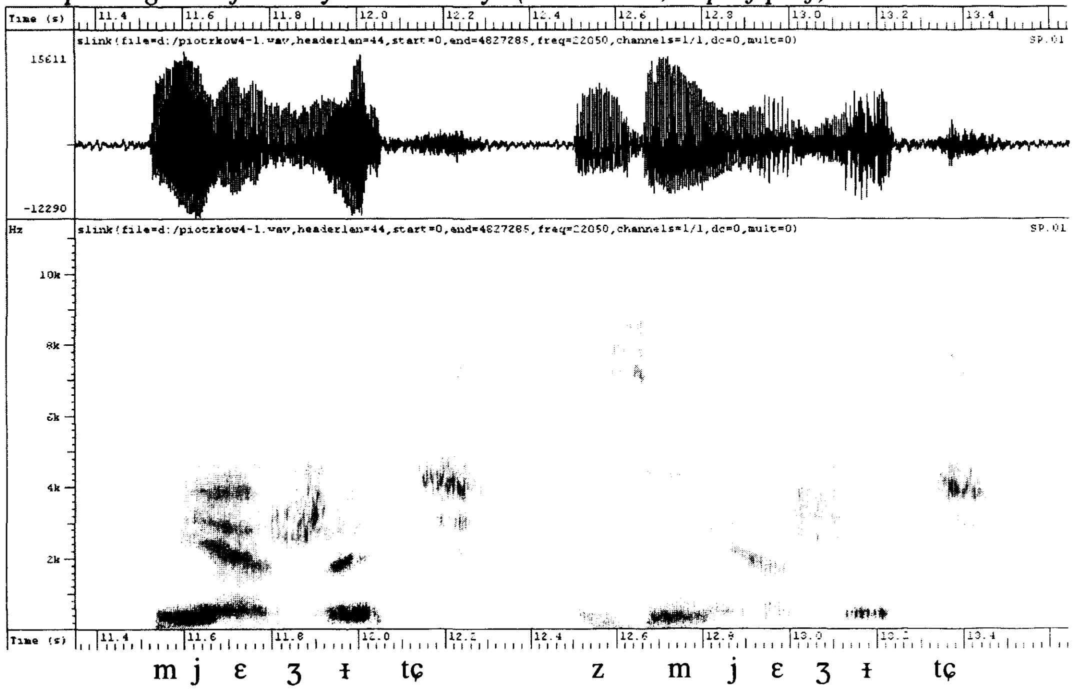


ɲɛn a v i dʑ ɛ tɕ z ɲ ɛ n a v i dʑ ɛ tɕ

38. Spectrogram of biegć – z+biegać *(to run, imperf/perf) - unassimilated*

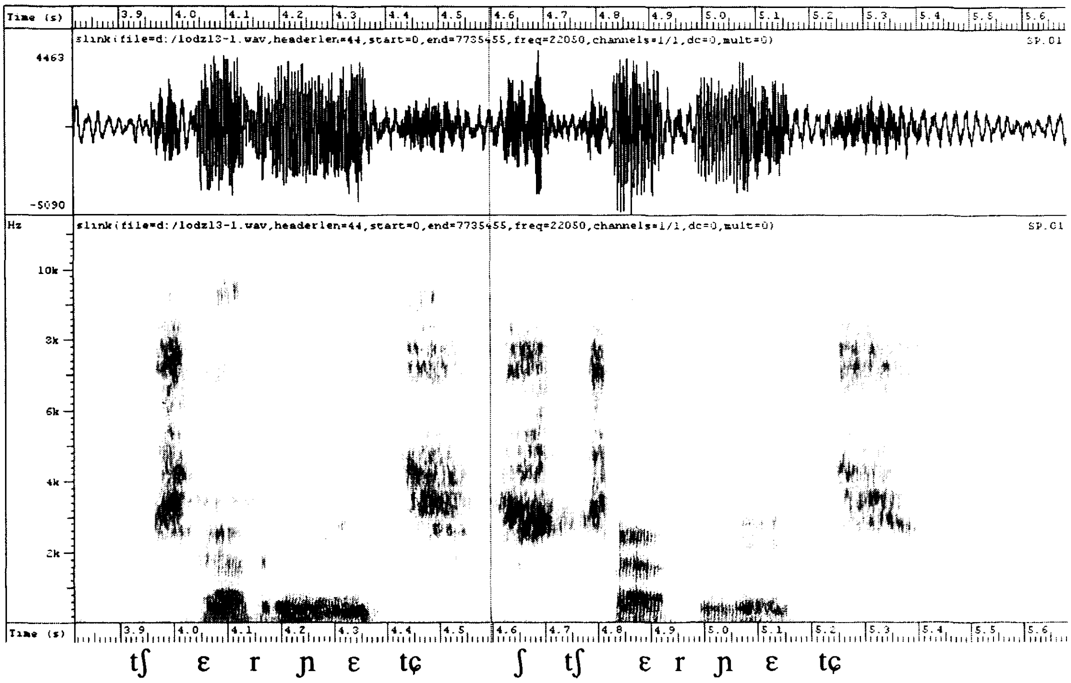


39. Spectrogram of mierzyć – z+mierzyć *(to measure, imperf/perf) - unassimilated*



As the spectrograms show, the prefix does not assimilate to the place of articulation of the stem-initial consonant. There were only a few isolated cases (3) of prefixed verbs with a high degree of coarticulation of the prefix to the place of articulation of the stem-initial consonant:

40. Spectrogram of czernieć – z+czernieć *(to become black, imperf/perf)) - assimilated*



There were also a few isolated cases, where the prefix failed to take on the voicing of the stem consonant and remained voiced although the stem was beginning with a voiceless consonant. This may have been due to either hyper-articulation or to the fact that the subjects tried to preserve a clear boundary between the prefix and the stem. There was one case where the prefix and the stem were isolated by an intrusive vowel. Again, this is a typical case of hyper-articulation. In general, the prefix *z-* in real Polish verbs takes on the voicing of the stem-initial consonant but it fails to assimilate to its place of articulation.

6.1.2. Nonce Verb Formation

The results of Experiment 1 are given in APPENDIX 19. Unless otherwise stated, all statistical tests in this chapter are based on a chi-squared test.

6.1.2.1. Place assimilation

The table below summaries the results of place assimilation of *z-* in Experiment 1:

41: *Place assimilation of /z-/ in experiment 1 - summary*

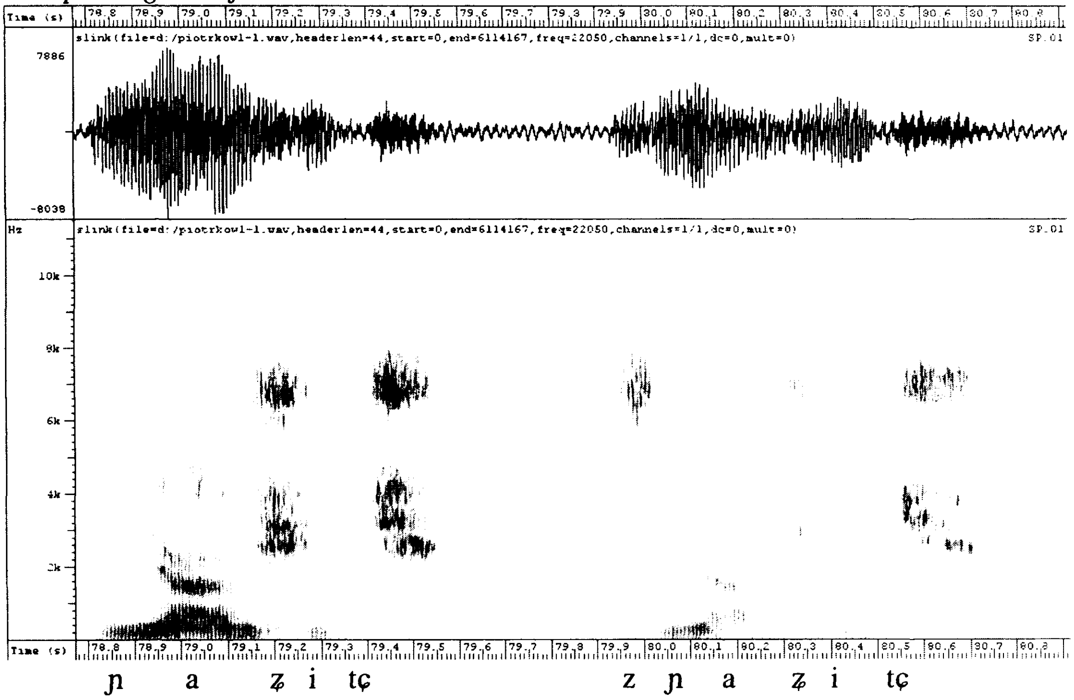
C_1 C_2	N	Lab/Lab^j	ʃ / ʒ	ɕ/ʑ
assimilated *z-*	0%	0%	2%	4%
non-assimilated *z-*	100%	100%	98%	96%

N – nasal consonants
Lab – labial obstruents

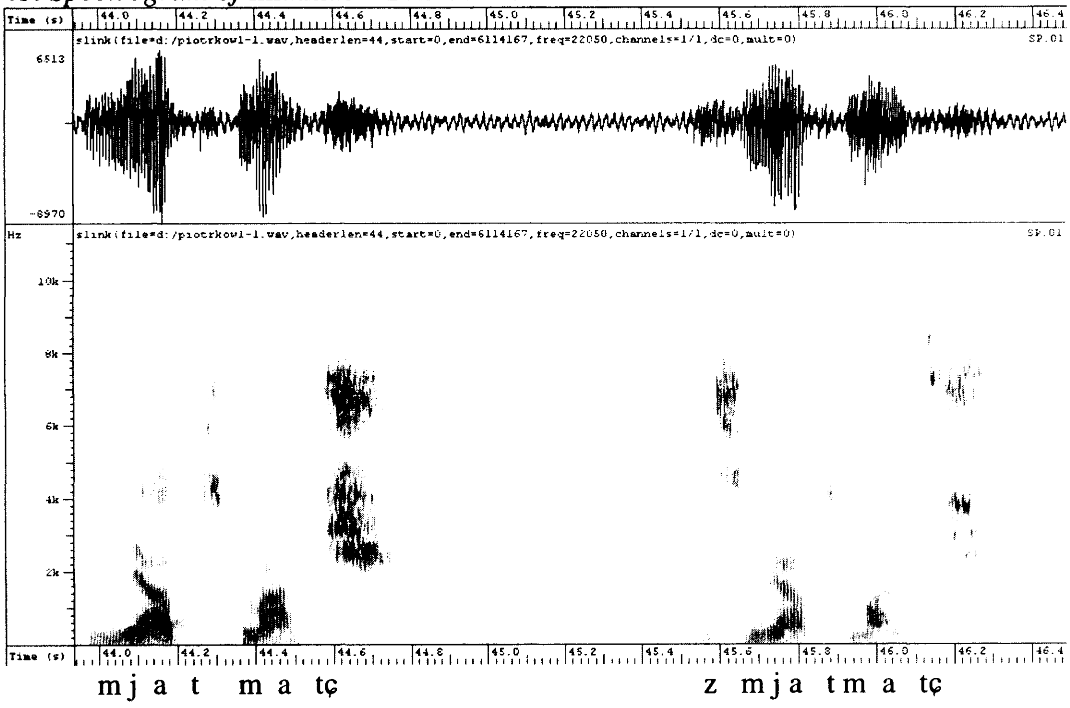
The following generalisations can be drawn as far as place assimilation is concerned:

- there is no assimilation before nasals (neither palatal nor labial), i.e. the prefix retains its dental place of articulation:

42. Spectrogram of niazić – z+niazić - *unassimilated*

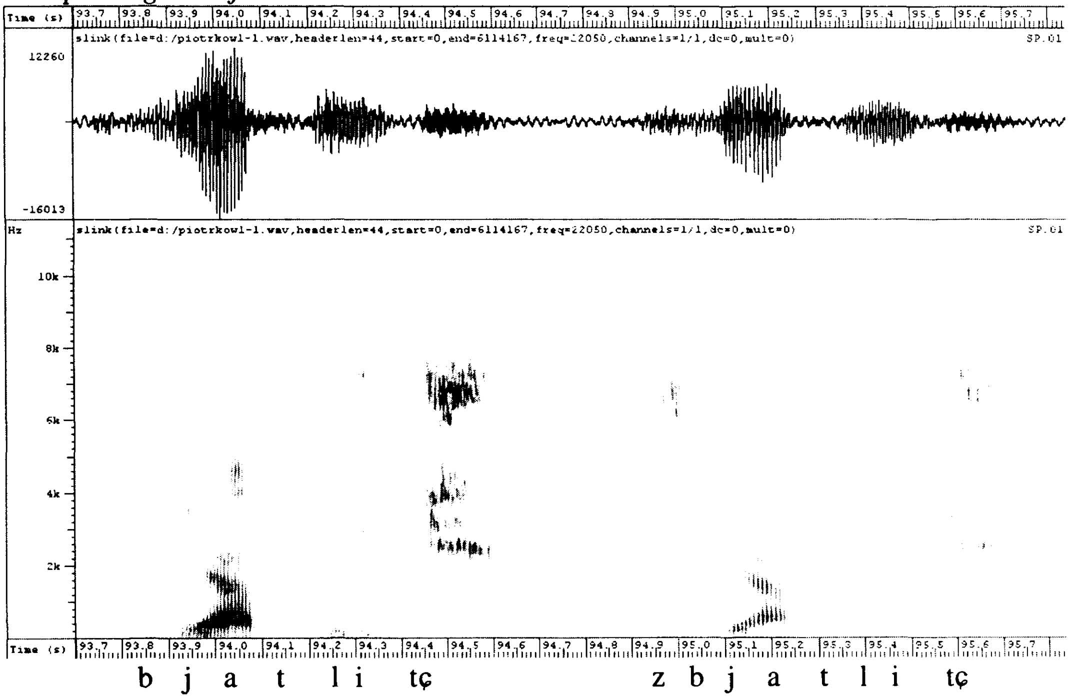


43. Spectrogram of miatmać – z+miatmać - *unassimilated*



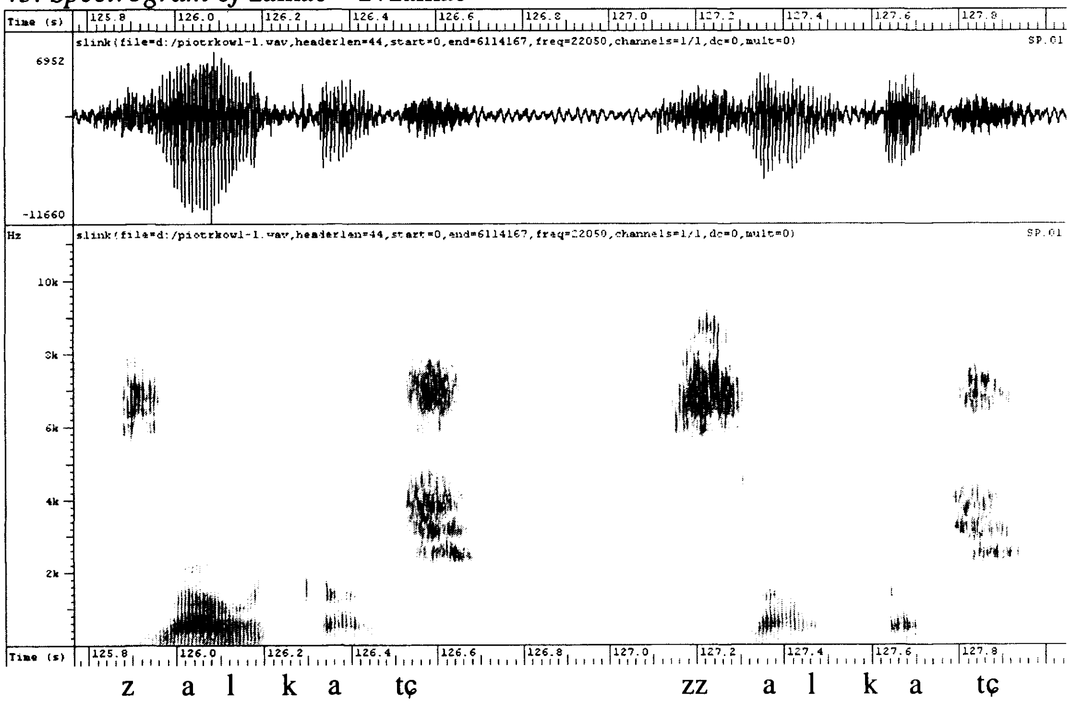
- similarly, there were no cases of the prefix taking on the alveolo-palatal place of articulation before labial plosives:

44. Spectrogram of biatlić – z+biatlić - *unassimilated*



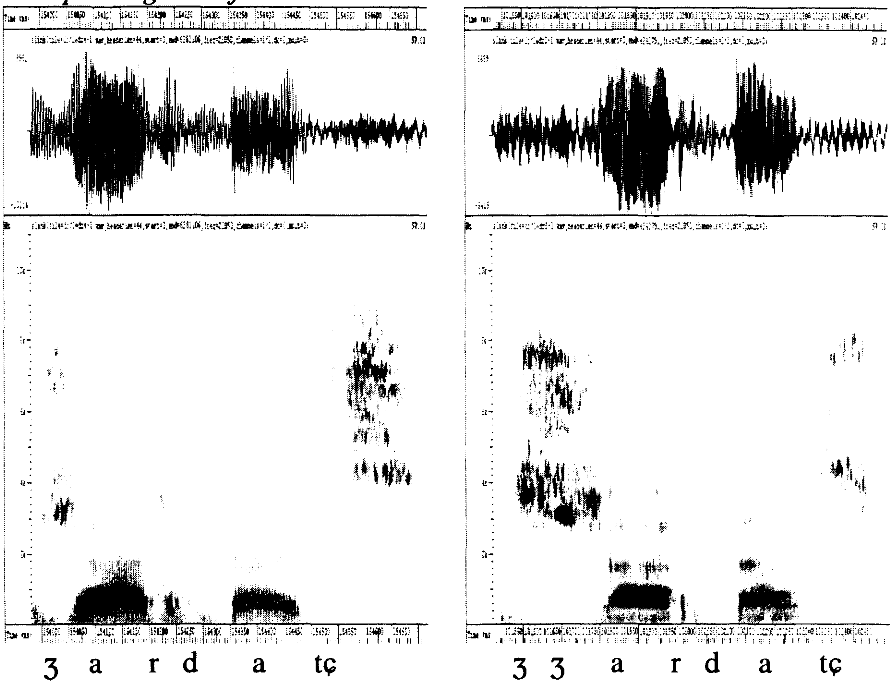
- the prefix remains unchanged before the dental fricatives /s z/. Effectively, the resultant initial segment is a geminate:

45. Spectrogram of zalkać – z+zalkać



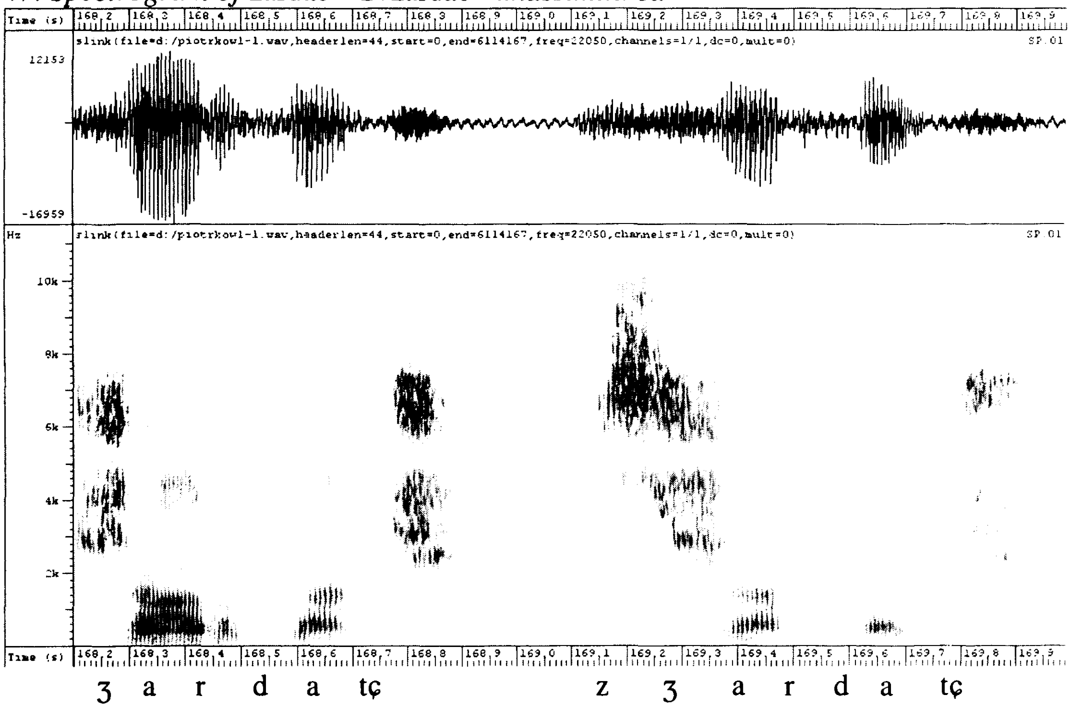
- sporadic assimilation of the prefix can be observed before the <u>alveolar fricatives</u> /ʃ/ and /ʒ/. The two consonants do not differ in the extent to which they trigger place assimilation of the prefix [p = 0.3078].

46. Spectrogram of żardać – z+żardać - *assimilated*



In all the remaining verbs, the prefix stays clearly unassimilated:

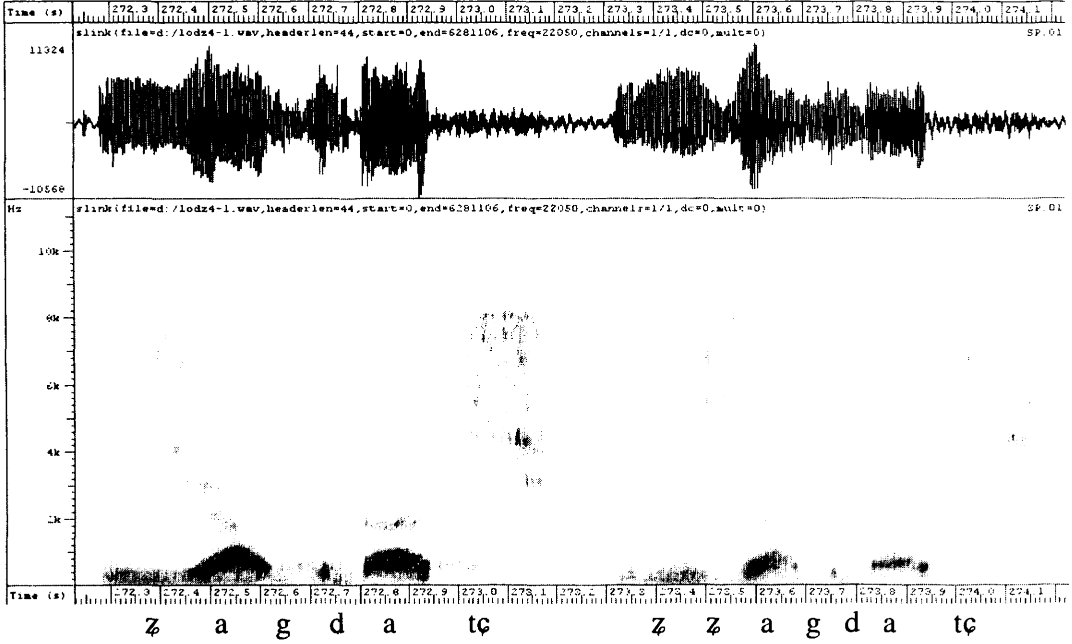
47. Spectrogram of żardać – z+żardać - *unassimilated*



Sometimes it is even separated from the stem by a vowel-like segment. Such realisations, however, were very infrequent.

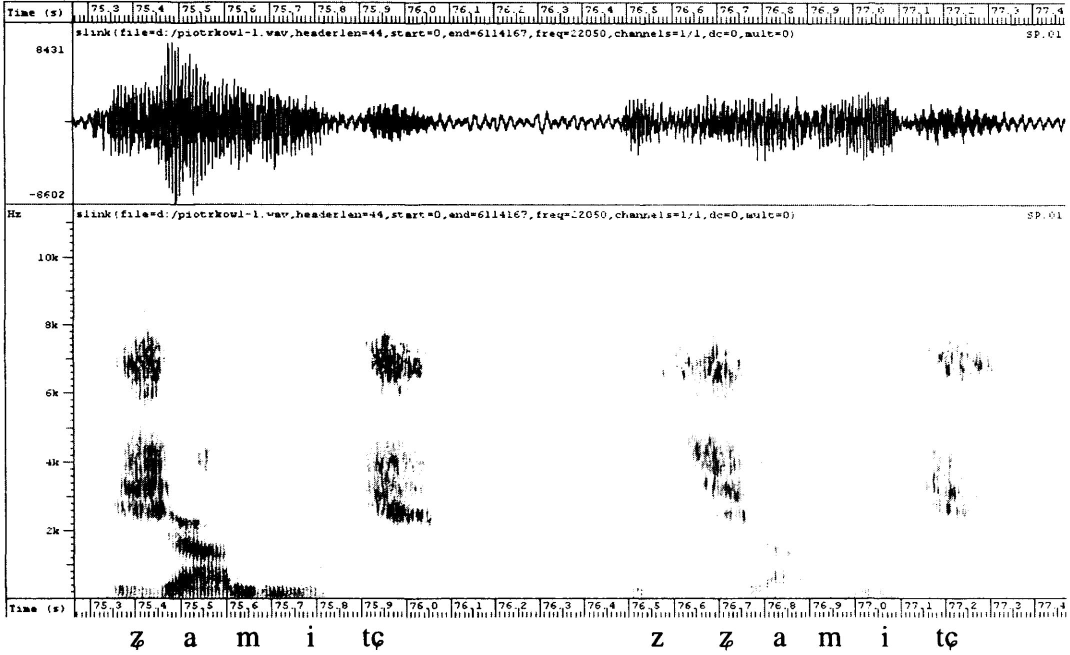
- the same generalisations apply to prefixed verbs where the stem begins with an alveolo-palatal fricative (/ɕ/ and /ʑ/). Here, the assimilation of the prefix is sporadic and accounts for only 4% of the cases. The two consonants do not differ in the extent to which they trigger place assimilation of the prefix [p = 0.8231]:

48. Spectrogram of ziagdać – z+ziagdać – *assimilated.*



In most cases the prefix remained clearly unassimilated:

49. Spectrogram of ziamić – z+ziamić – *unassimilated.*



Alveolars and alveolo-palatals do not differ in the extent to which they trigger place assimilation of the prefix [p=0.1302]. There is, however, a significant difference between nasals vs. alveolars and nasals vs. alveolo-palatals as well as between labials vs. alveolars and labials vs. alveolo-palatals [p<0.0001 in each case].

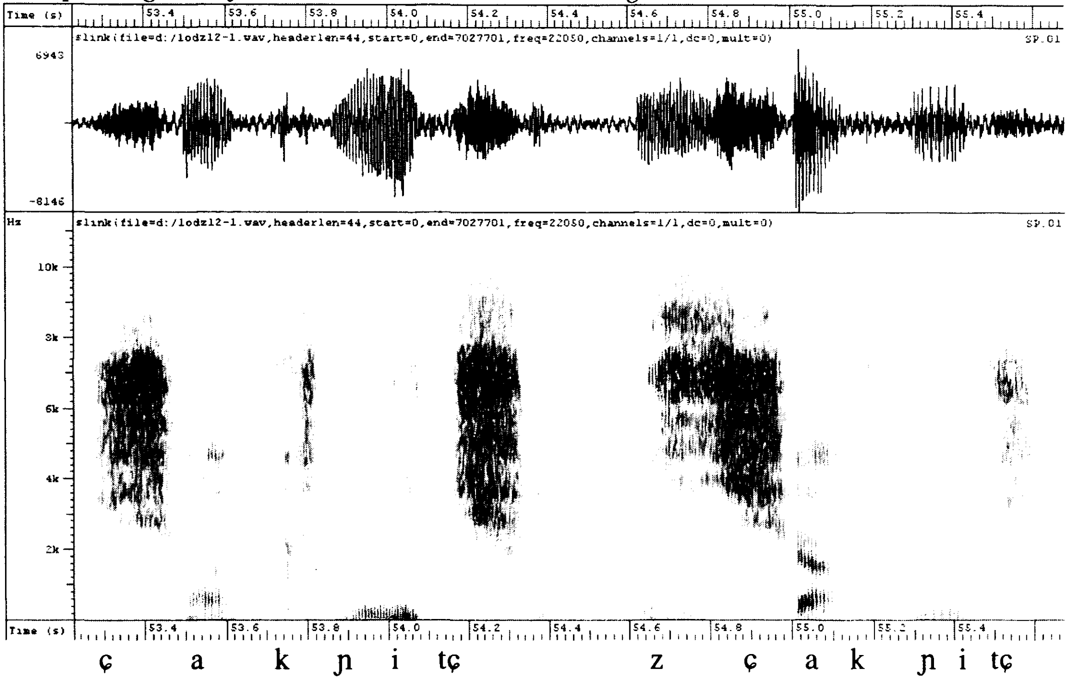
6.1.2.2. Voicing assimilation

Although my central interest is palatalisation, I also looked at voicing. The prefix *z-* is underlyingly voiced. By voicing assimilation I mean cases where the prefix becomes voiceless before a voiceless stem-initial obstruent. The voicing assimilation occurs in 69% to 95% of cases and it is less frequent before fricatives than before stops. The difference between stops and fricatives is statistically significant [p<0.0001]. Plain and palatalised labials do not differ in the extent to which they trigger voicing assimilation of the prefix [p = 0.2655]. Similarly, there is no significant difference between the three fricatives [p = 0.1072], although the difference between /s/ and /ʃ/ almost reaches the level of significance with p = 0.0509.

50: *Voice assimilation of the prefix /z-/ in experiment 1 - summary*

C1 \ C2	p	pʲ	s	ʃ	ɕ
assimilated *z-*	90%	95%	69%	80%	75%
non-assimilated *z-*	10%	5%	31%	20%	25%

51. Spectrogram of siaknić – z+siaknić – *no voicing assimilation*

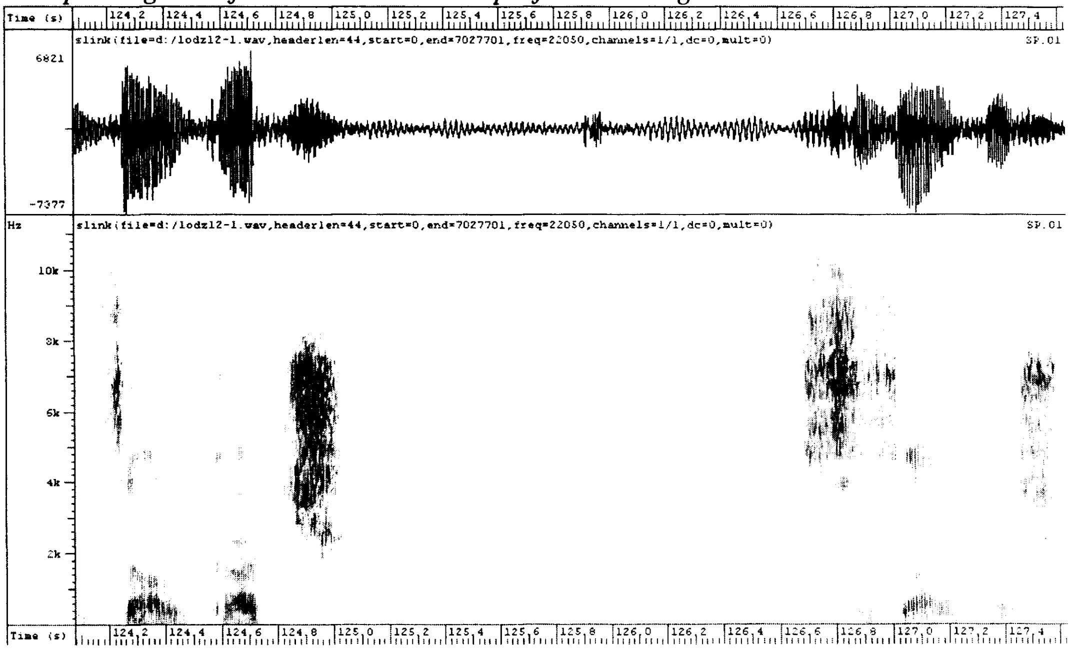


These results should not be surprising. /z/ differs from /p, pʲ/ in place, manner and voicing. Even if the prefix assimilates in voicing to the following plosive, the two consonants can still be easily distinguished by their place and manner of articulation. In case of stem initial fricatives /ʃ/ and /ɕ/, they can be distinguished from the prefixal /z/ by means of place of articulation and voicing. Once the prefix devoices, the place of articulation is the only factor differentiating /s/ from /ʃ/ and /ɕ/ and, in any case, the place of articulation differences between theses three fricatives are very fine. This explains why voicing assimilation of /z/ is less frequent before the fricatives than before the plosives. As the table below shows, /z/ is least likely to devoice before stem initial /s/, where voicing assimilation leads to the formation of a word-initial geminate and the difference between prefixed and unprefixed words lies solely in the length of the verb initial segment.

It is also worth noting that there are no cases where the prefix before a voiceless consonant stem remains voiced while changing its place of articulation, i.e. cases like */ʑɕ/ or */ʒʃ/ are unattested. If the prefix retains its voicing, it also retains its manner of articulation.

Another phenomenon that can be observed in the data is voicing dissimilation, where an underlying voiced prefix becomes voiceless before nasals and voiced obstruents: /n ɲ m mʲ z ʒ ʑ b bʲ/:

52. Spectrogram of zalkać – s+zalkać – *prefix devoicing*



No change in the voicing of the prefix should be expected in these contexts. In the data, the prefix voicing dissimilation ranges from 1 - 10% and it is significantly more widespread before labial consonants, both oral and nasal, than before coronals [p = 0.0001]. There was no significant difference between nasal or oral labials [p = 0.7518], or between plain or palatalised labials [p = 0.9203]. In the coronal region, the voicing dissimilation is more frequent before nasals than obstruents, but the difference is not significant [p = 0.0081]:

53: *Voice dissimilation of the prefix /z-/ before voiced consonants in experiment 1- summary*

C_1 \ C_2	CorN	CorO	Lab/Labʲ
voiceless *z-*	5%	1%	10%
voiced *z-*	95%	99%	90%

CorN – coronal nasals
CorO – coronal voiced obstruents
Lab – labial consonants (excluding voiceless plosives)
Labʲ – palatalised labial consonants (excluding voiceless plosives)

The subjects may have employed this technique as a means to mark a boundary between the prefix and the stem. Obstruent cluster with non-uniform voicing specification are not allowed in Polish monomorphemic words. Therefore, allowing such clusters in prefixed words would be one way of distinguishing between morphologically simple and morphologically complex words. Alternatively, we might claim that *z-* is unspecified for voice and what we observe is a polarity rule for voice: *z-* takes the voicing specification opposite to the voicing specification of the following stem-initial sound. However, this analysis would predic that the prefix should be voiceless before vowel-initial stems. Vowel-initial stems were not included in my experiments and so it is impossible falsify the hypothesis that the prefix z- is unspecified for voicing and is governed by the polarity rule for voice. This phenomenon, however, needs further investigation.

6.1.3. Loanword prefixation

The results of loanword prefixation are similar to the results of nonce verb prefixation. Some segments were not included in the experiment due to their limited occurrence in English, e.g. /ʒ/. Thus, the following potential stem-initial consonants were not included in the test material: /ʑ ʒ b^j/. Some of the English segments or sequences of segments were rarely borrowed by the subjects in the predicted way, e.g. palatalised labials were usually adopted as plain labials and the /sj/ was usually adopted as plain /s/ rather than the alveolo-palatal /ɕ/. /ɕ/ and /p^j/ occurred only 7 times in the tested material (as compared to over 200 occurrences of the remaining consonants) and so were excluded from the final statistics. The results of experiment 2 are given in APPENDIX 20.

6.1.3.1. Place assimilation

The table below summaries the results of place assimilation of the prefix *z-* in Experiment 2:

54: *Place assimilation of /z-/ in experiment 2 - summary*

C_1 C_2	N	Lab	ʃ
assimilated *z-*	0%	0%	8%
non-assimilated *z-*	100%	100%	92%

N – nasal consonants
Lab – labial plosives

As mentioned above, the results of this experiment corroborate the results of the nonce verb prefixation experiment. There is no assimilation before nasals and labials. Sporadic assimilation of the prefix can be observed before the alveolar fricative /ʃ/.

It should also be pointed out that the place assimilation of the prefix before /ʃ/ is higher in loanwords than in nonce forms. The difference almost reached the level of significance with p = 0.0534.

6.1.3.2. Voicing assimilation

The voicing assimilation ranges from 100% to 82% and it is significantly higher before /ʃ/ than before /p/ and /s/ [p = 0.0001]. There was no significant difference in voicing assimilation before /p/ and /s/ [p = 0.2506]. Recall that in the nonce form prefixation experiment, /ʃ/ also triggered voicing assimilation more frequently than /s/. As in the previous experiment, there were no cases where the prefix before a voiceless consonant stem remains voiced while changing its place of articulation, i.e. cases like */ʑɕ/ or */ʒʃ/ are unattested. If the prefix retains its voicing, it also retains its manner of articulation.

55: *Voice assimilation of the prefix /z-/ in experiment 2 - summary*

C_1 C_2	p	s	ʃ
assimilated *z*-	82%	85%	95%
non-assimilated *z*-	18%	15%	5%

Another phenomenon that can be observed in the data is voicing dissimilation. In the data the prefix voicing dissimilation ranges from 0 - 7%. Different types of nasals do not differ in the extent to which they trigger voice dissimilation of the prefix [p = 0.3135]. Similarly, there was no significant difference between the nasals and the labial plosive /b/ [p = 0.1221]. Voicing dissimilation is significantly lower before the dental /z/ than before the nasals and the labials [p = 0.017]. A similar result was obtained in the nonce formation experiment.

56: *Voice dissimilation of the prefix /z-/ before voiced consonants in experiment 2- summary*

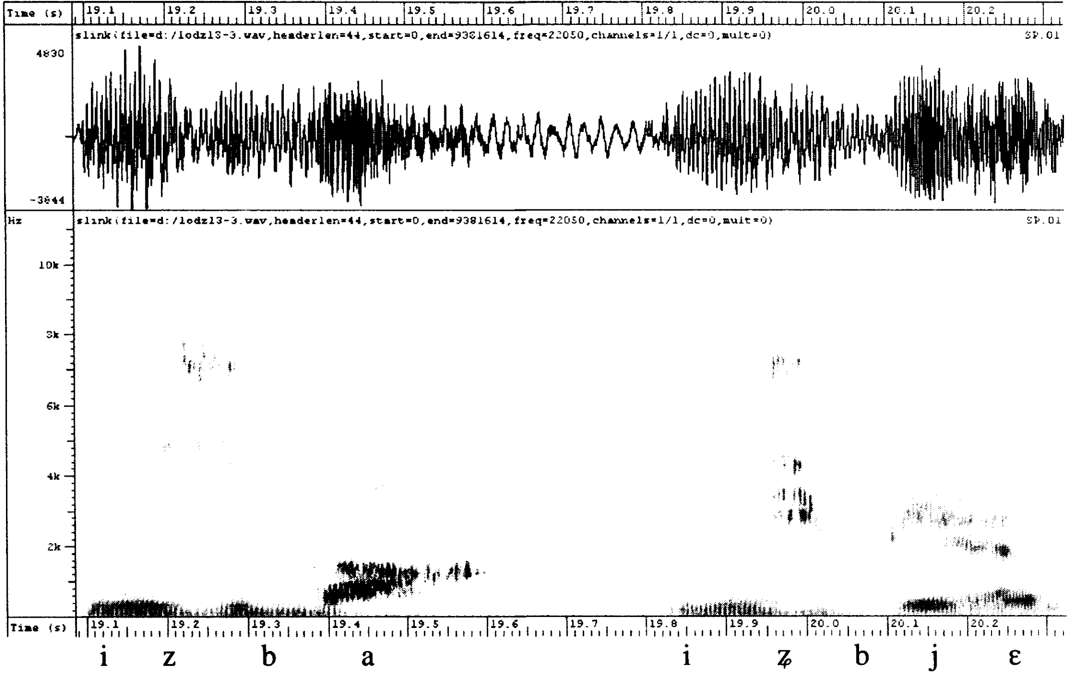
C_1 C_2	N	z	b
voiceless *z*-	7%	0%	7%
voiced *z*-	93%	100%	93%

6.2. Suffixation

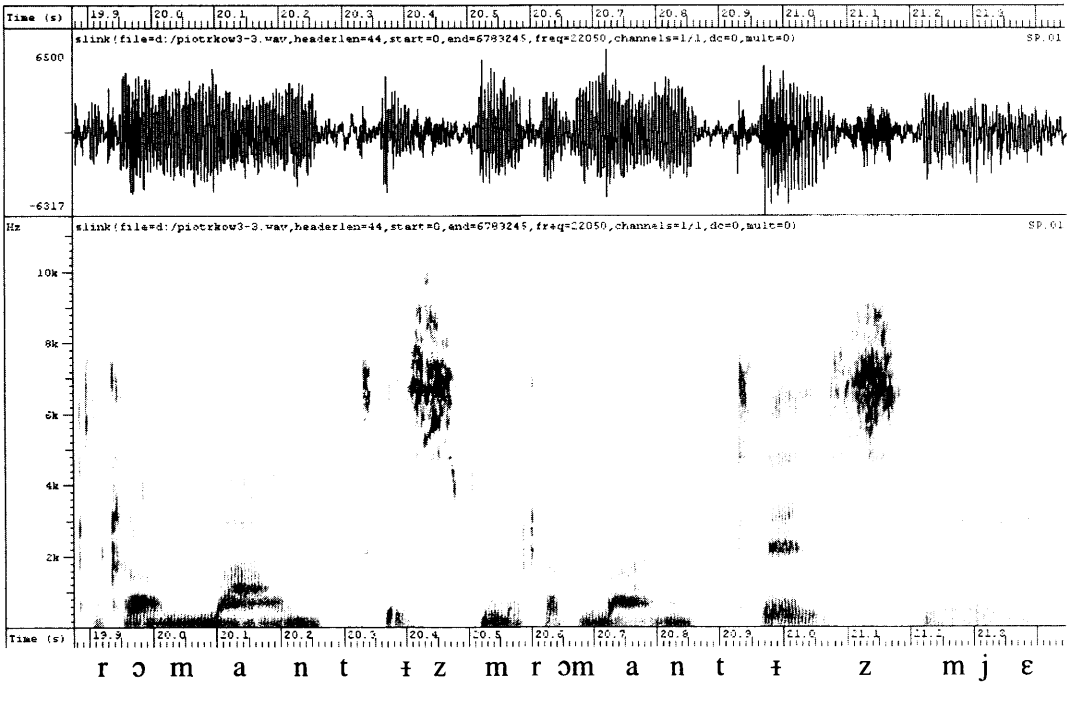
6.2.1. Native Polish words

The spectrograms below represent real inflected Polish words. In general, the stem-final cluster must agree in the palatal specification if both consonants are coronal with the exception of cases where C_1 is a nasal. The nasal does not take on the

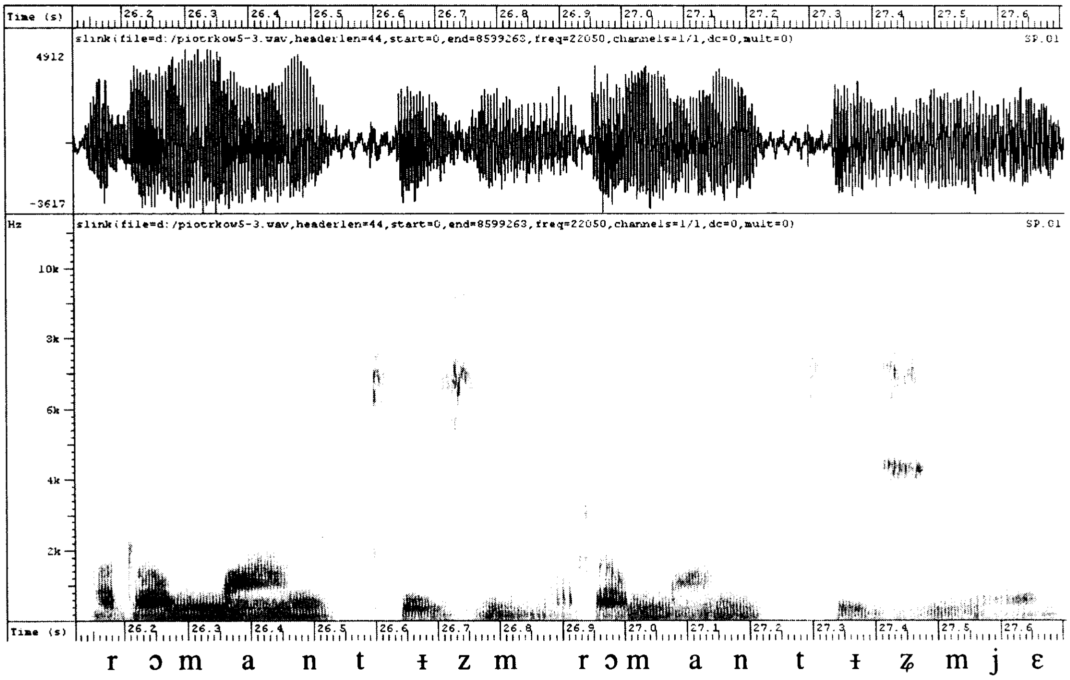
61. Spectrogram of izba – izbi+e *(room, nom./loc.) –assimilated /z/*



62. Spectrogram of romantyzm – romantyzmi+e *(romanticism, nom./loc.) – unassimilated /z/*



63. Spectrogram of romantyzm – romantyzmi+e *(romanticism, nom./loc.) – assimilated /z/*



6.2.2. Nonce noun suffixation

The results of experiment 3 are given in APPENDIX 21.

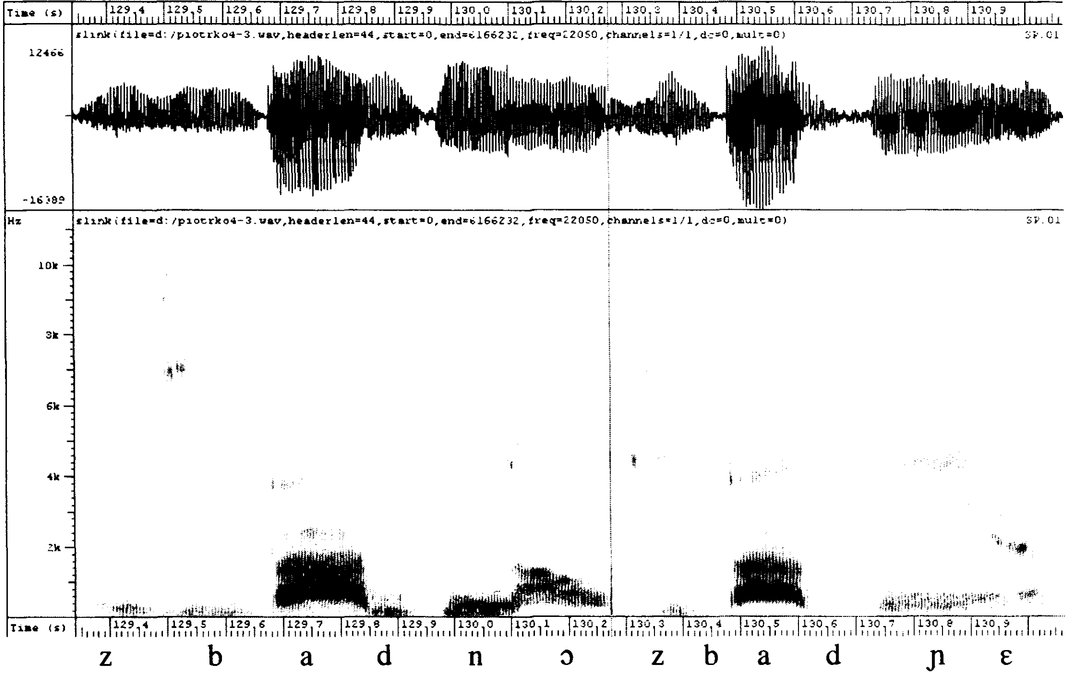
The following generalisations can be drawn regarding the assimilation of C_1:

- /t d/ in C_1 position do not palatalise before any consonant. There were only a few isolated cases where /t d/ would become alveolo-palatal affricates. Even the alveolo-palatal nasal /ɲ/ failed to trigger palatalisation of the preceding plosive. Labials and nasals do not differ in the extent to which they trigger palatalisation of the preceding plosive [p = 0.1168].

64: *Palatalisation of /t d/ in C_1 position stem-finally - summary*

C_1 \ C_2	pʲ/bʲ	N
t/d	98%	99%
tɕ/dʑ	2%	1%

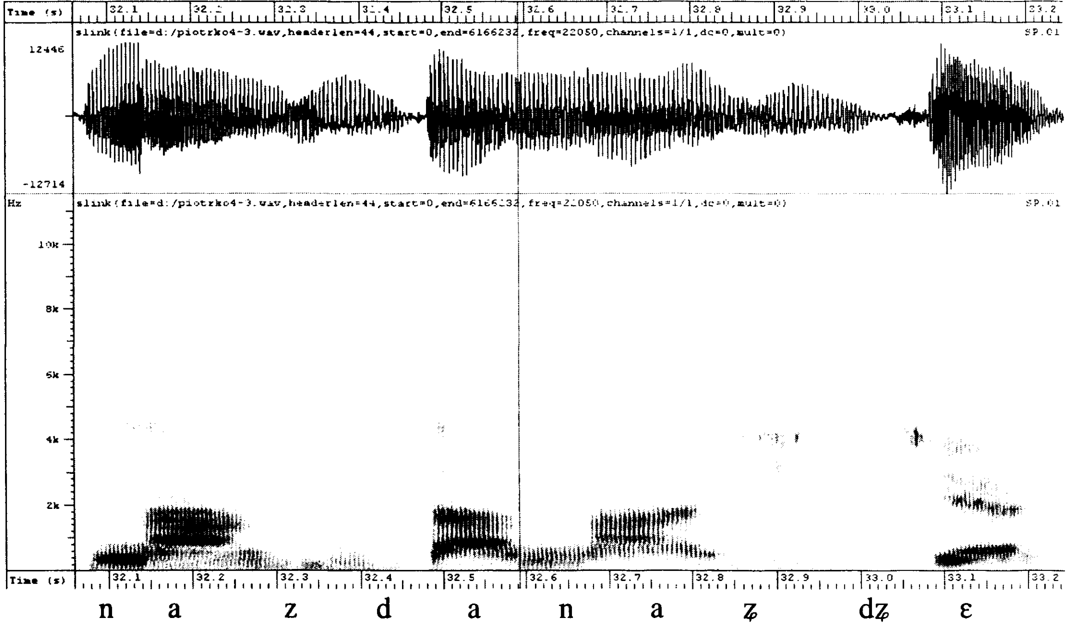
65. *Spectrogram of* zbadno – zbadni+e *–unassimilated /d/*



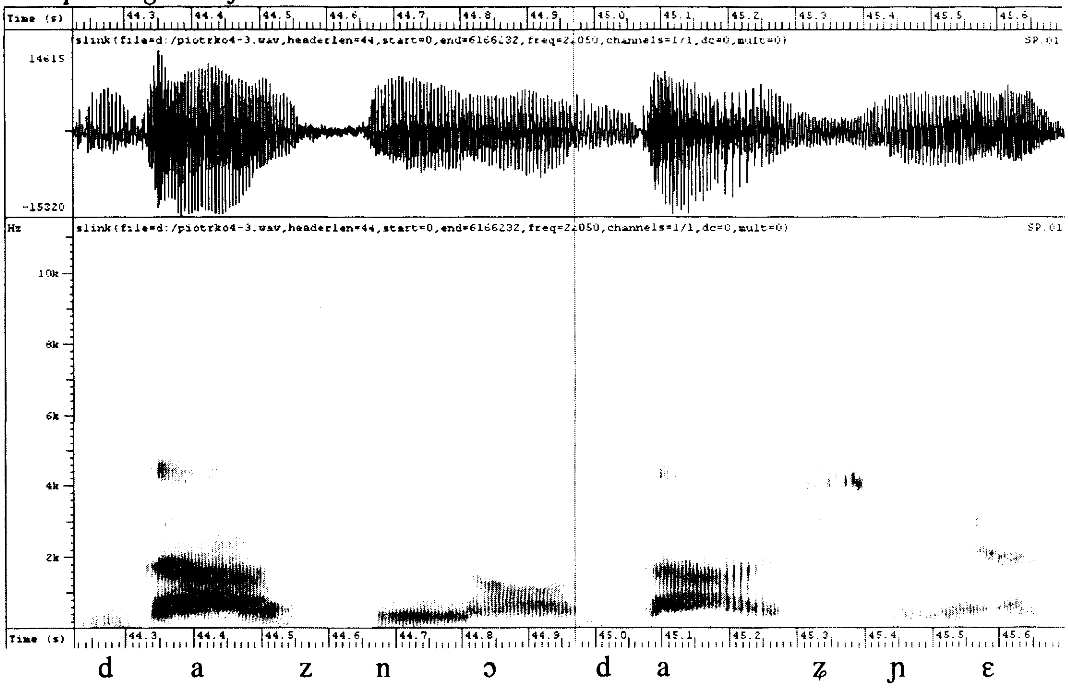
It would be interesting to see what happens in clusters like /ts/ or /dz/, however, such clusters would be analysed as single units, i.e. affricates.

- /s z/ are most likely to palatalise before alveolo-palatal consonants, especially if the following consonant is an obstruent, less likely if it is a nasal. Oral coronals are significantly more likely to trigger palatalisation of /s z/ than coronal nasals [$p < 0.0001$]. The voicing of the obstruents has no effect on place assimilation [$p = 0.3929$].

66. Spectrogram of nazda – nazdzi+e – *assimilated /z/*

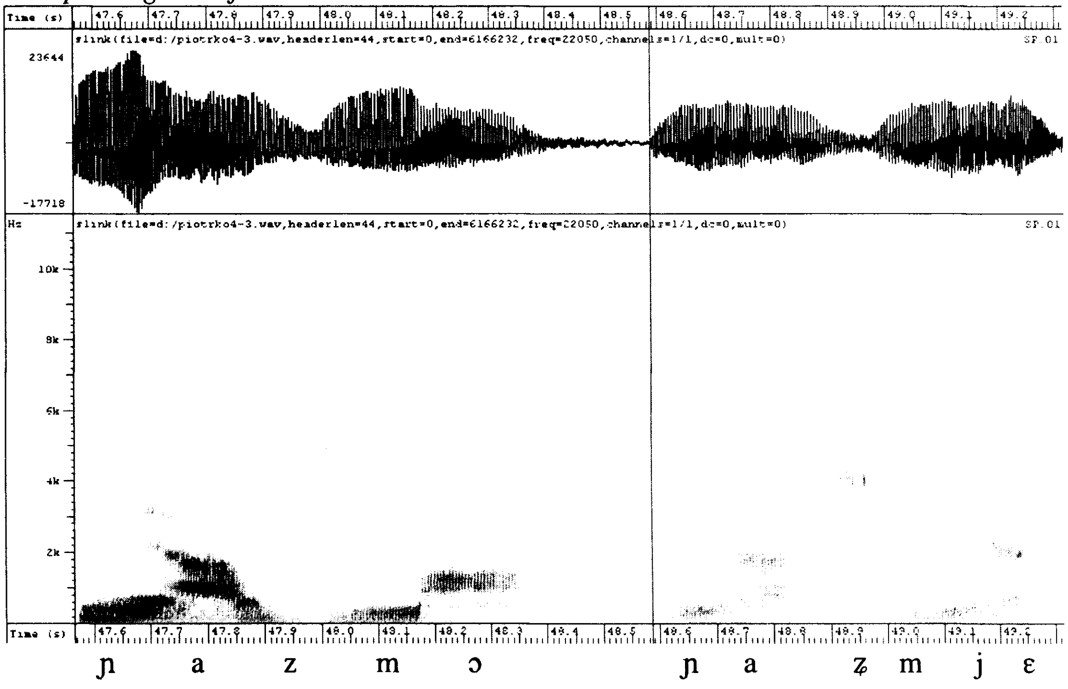


67. Spectrogram of dazno – dazni+e – *assimilated /z/*

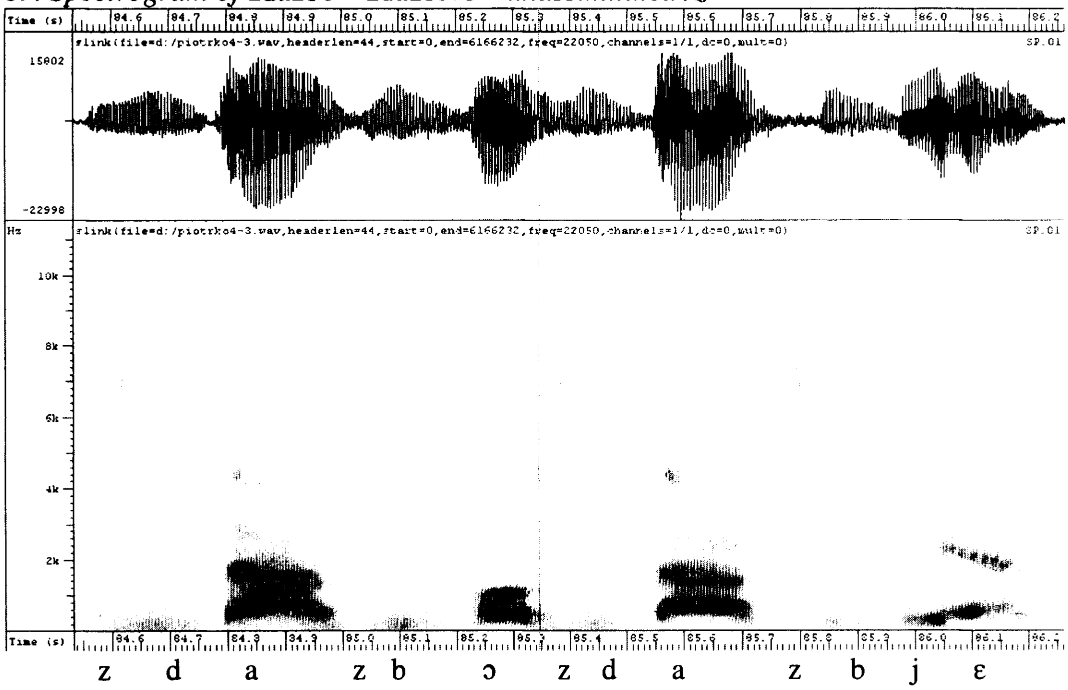


/s z/ are less likely to assimilate before palatalised labials than before palatal coronals. The difference between coronals and labials is significant [p<0.0001]. In the case of labials, the situation is reversed as compared to coronals: palatalisation is more popular before labial nasals than labial plosives and the difference reaches the level of significance [p = 0.0021]. Voicing has no effect on place assimilation [p = 0.1277].

68. Spectrogram of niazmo – niazmi+e – *assimilated /z/*

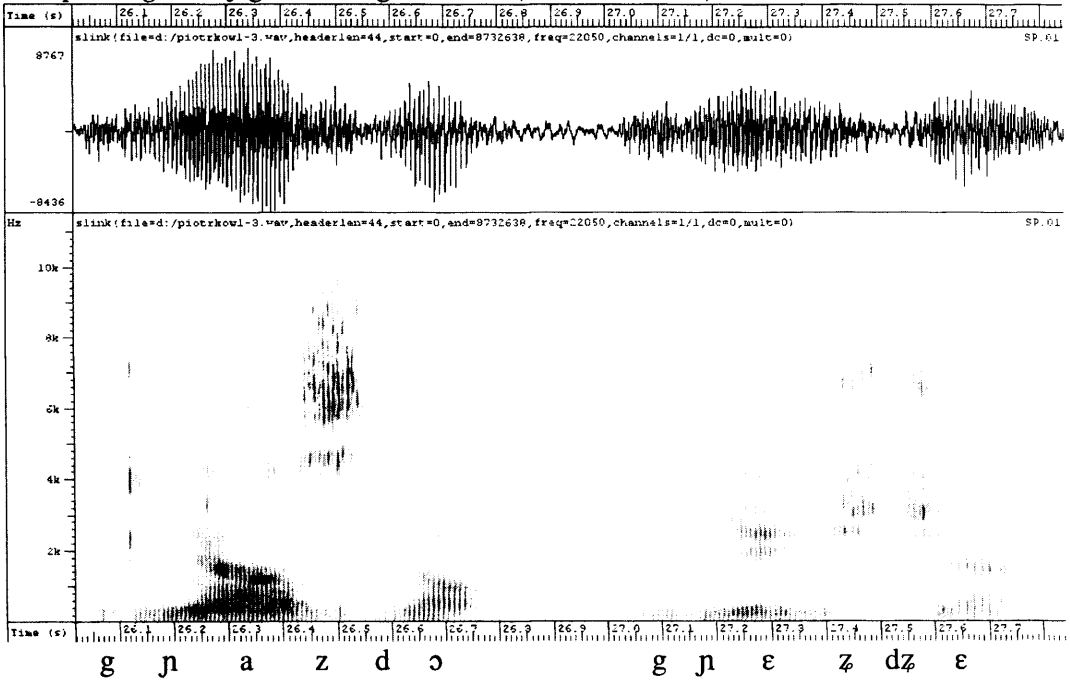


69. Spectrogram of zdazbo – zdazbi+e – *unassimilated /z/*

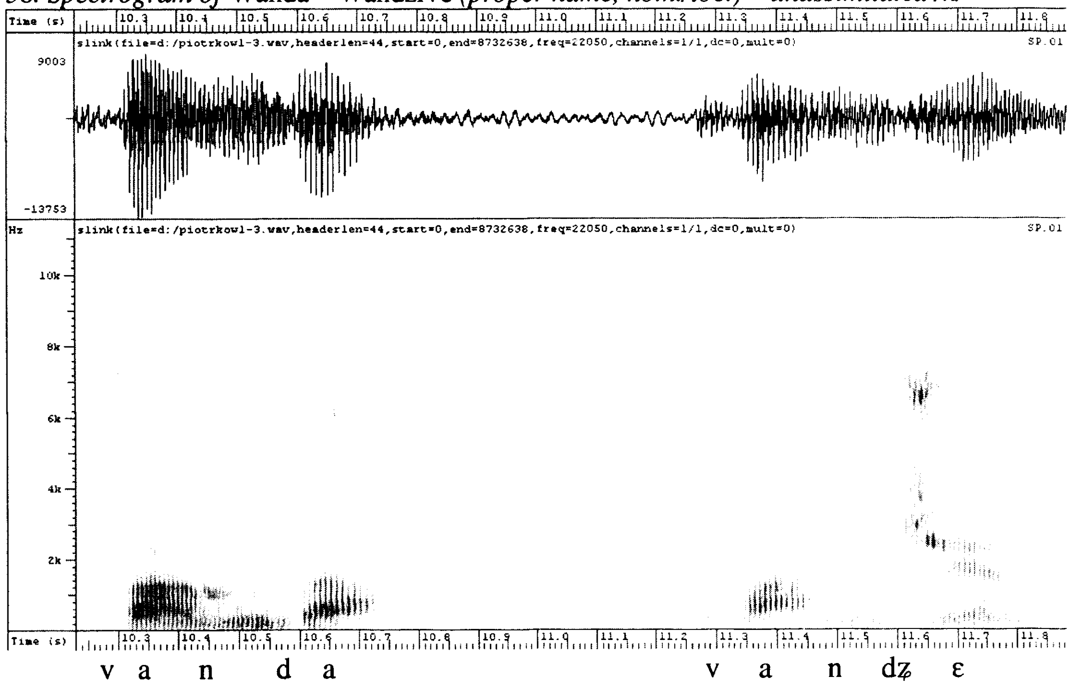


It should also be pointed out that there is a lot of intraspeaker variation in case of palatalisation of /s z/ before labials. One and the same speaker would sometimes palatality of the following palatal(ised) obstruent. However, /ɲ/ in C$_2$ position causes palatalisation of the preceding coronal obstruent.

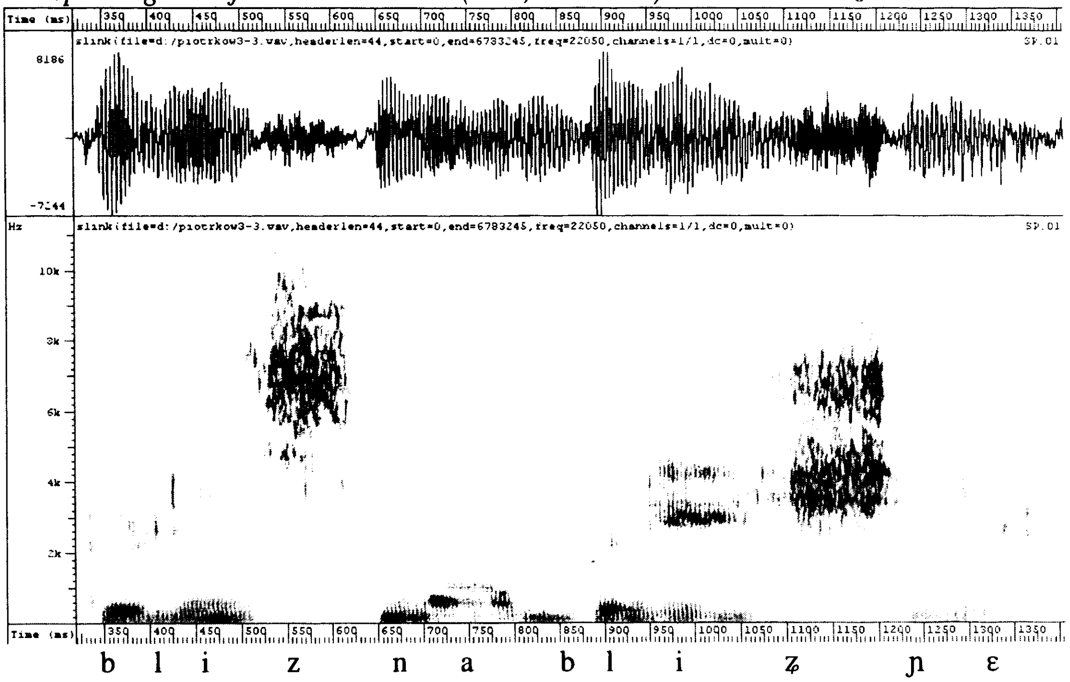
57. Spectrogram of gniazdo – gnieździ+e *(nest, nom./loc.) – assimilated /z/*



58. Spectrogram of Wanda – Wandzi+e *(proper name, nom./loc.) – unassimilated /n/*

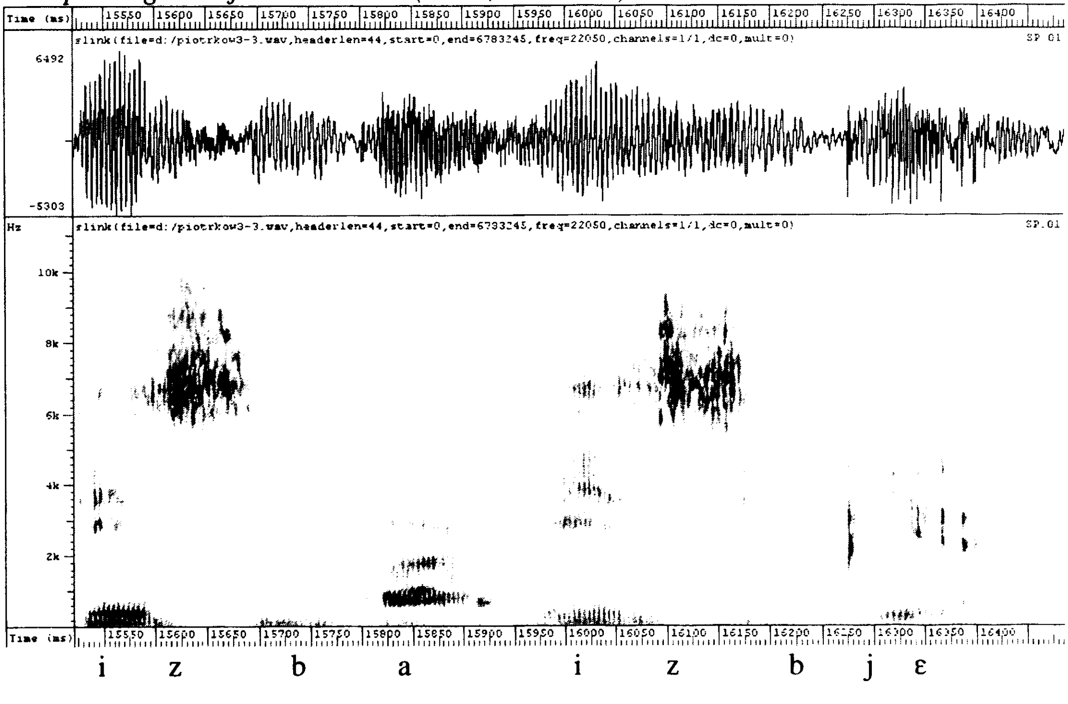


59. Spectrogram of blizna – bliźni+e *(scar, nom./loc.) – assimilated /z/*



There is a lot of variation in palatal assimilation of an obstruent in C_1 position if the following C_2 is a palatalised labial, especially a palatalised labial nasal. Coronal obstruents can stay either plain or become palatalised before palatalised labials.

60. Spectrogram of izba – izbi+e *(room, nom./loc.) – unassimilated /z/*



apply the process and sometimes they would not. There is no clear-cut pattern and the application of palatalisation before palatal(ised) labials seems to be random. Certain subjects even gave two options: one with and one without palatalisation. In case of palatalisation before coronals, there is more interspeaker variation, i.e. some subjects assimilate while others do not.

70: *Palatalisation of /s z/ in C_1 position stem-finally - summary*

C_1 \ C_2	tɕ/dʑ	tj/dj[15]	ɲ	mʲ	pʲ/bʲ
s/z	16.5%	22.5%	50%	68%	81%
ɕ/ʑ	61%	0%	50%	32%	19%

- /n/ generally only sporadically palatalises, even before alveolo-palatal consonants. In this respect, the nasal differs from coronal obstruents. Alveolo-palatal fricatives and affricates do not significantly differ in the extent to which they trigger palatalisation of the preceding /n/ [p = 0.2713]. The voicing of the obstruent has no significant effect on the spreading of palatalisation [p = 0.8231]. What is significantly more common than palatalisation is a complete loss of the nasal consonant and realisation of the nasality on the preceding vowel [p = 0.0208]. This happens only before fricatives.

71: *Realisation of /n/ in C_1 position stem-finally position - summary*

C_1 \ C_2	tɕ/dʑ	tj/dj	ɕ/ʑ	sj/zj
n	67%	30%	71%	12%
ɲ	3%	0%	5%	0%
Ṽ	0%	0%	12%	0%

As the table above indicates, not all the subjects palatalised the stem-final consonant and instead the floating feature associated with the suffix was realised as the palatal glide /j/. This realisation was significantly higher after stops than after fricatives [p = 0.0002]. The voicing of the obstruent played in role in this process [p = 0.1253].

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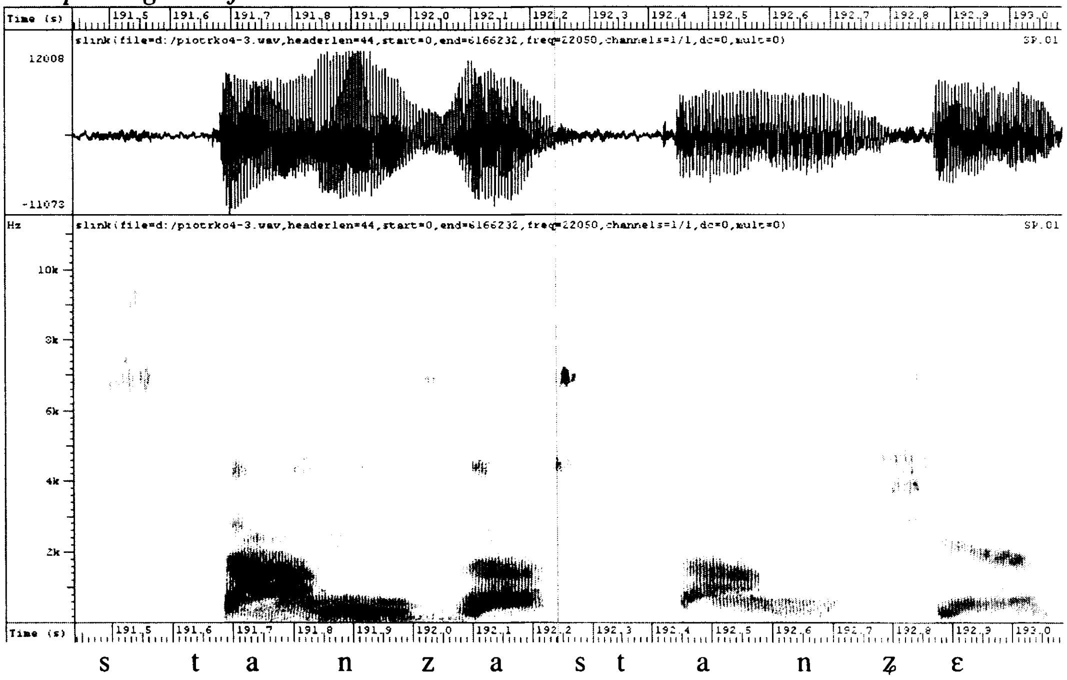
[15] The column represents cases where the stem-final consonant did not take the alveolo-palatal place of articulation. The final cluster retained its original place of articulation but a glide-like element was inserted in between the stem and the suffix, e.g. *kla/zd/-a* → *kla/zdj/-e*.

72. Spectrogram of stanza – stanza+e – *unassimilated /n/*



- There were no instances of voicing dissimilation or lack of voicing assimilation, which could be observed in prefixed verbs.

6.2.3. Loanword suffixation

The results of experiment 4 are given in APPENDIX 22. The selection of stem-final clusters in this experiment was much smaller than in the previous one due to the phonotactic limitations of English. The following generalisations can be drawn regarding the assimilation of C_1:

- /s/ is significantly more likely to palatalise before the alveolo-palatal /tɕ/ than before the palatalised labial /p^j/ [$p < 0.0001$]. The same generalisation was observed in the previous experiment. No */s/+nasal* clusters were included in the experiment so it is impossible to draw any generalisations regarding the influence of nasality of C_2 on the palatal assimilation of C_1.

73: *Palatalisation of /s/ in C_1 position stem-finally - summary*

C_1 C_2	tɕ	tj[16]	ø	pʲ	ø[17]
s	10%	5%	11%	70%	10%
ɕ	74%	0%	0%	20%	0%

- /n/ only sporadically palatalises, even before alveolo-palatal consonants. In this respect, the nasal differs from /s/, i.e. /s/ palatalises significantly more frequently than /n/ [p < 0.0001]. The voicing of the obstruent does not influence the spreading of palatalisation from the obstruent to the preceding nasal [p = 0.8231]. As in the previous experiment, what is significantly more common than the palatalisation is a complete loss of the nasal consonant and realisation of the nasality on the preceding vowel [p < 0.0001], This process is significantly higher before fricatives than before affricates [p < 0.0001].

74: *Realisation of /n/ in C_1 position stem-finally - summary*

C_1 C_2	tɕ/dʑ	tj/dj	ø	ɕ	sj	ø
n	77%	7%	12%	35%	7%	15%
ɲ	3%	0%	0%	0%	0%	0%
Ṽ	1%	0%	0%	43%	0%	0%

- There were no instances of voicing dissimilation or lack of voicing assimilation, which could be observed in prefixed verbs.

6.3. Summary

6.3.1. General

- Assimilation of place of articulation is significantly more widespread in stem-final position than in the prefix [p < 0.0001]. Voicing, it is obligatory in clusters in stem-initial position. Cases of the lack of voice assimilation or even voice dissimilation can be observed only in prefixed words.
- Place assimilation is most frequently triggered by coronal obstruents. In prefixed words, coronal obstruents are the only consonants that can trigger palatalisation of the prefix. In suffixed words, palatalisation spreads

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[16] The column represents cases where the stem-final consonant did not take the alveolo-palatal place of articulation. The final cluster retained its original place of articulation but a glide-like element was inserted in between the stem and the suffix, e.g. *kla/zd/-a → kla/zdj/-e.*

[17] The column represents cases where only the plain suffix *-e* was attached without any modification of the stem-final consonant(s).

significantly more often from stem-final coronal obstruents than from coronal nasals [p < 0.0001] or from the labials [p < 0.0001].

- Labials have a different effect on assimilation in prefixed words and in stem-final position. In prefixed words, palatalised labials totally fail to propagate palatalisation (both oral and nasal palatalised labials). In stem-final position, palatalised labials do trigger palatalisation of the preceding consonant but significantly less frequently than alveolo-palatal obstruents [p < 0.0001].
- There is a clear effect of nasality on assimilation. In prefixed words, palatal(ised) nasals fail to propagate palatalisation to the preceding prefix. In stem-final position, obstruent place assimilation is significantly less frequent before /ɲ/ than before a palatal(ised) obstruent [p < 0.0001]. The dental nasal /n/ is quite resistant to palatalisation and takes the place of articulation of the preceding palatal(ised) obstruent significantly less frequently than dental fricatives [p < 0.0001].
- Plosives are significantly more resistant to assimilation than fricatives [p < 0.0001]. In the experimental data, plosives underwent palatalisation only sporadically in any context, i.e. before alveolo-palatal obstruents, the alveolo-palatal nasal and palatalised labials (oral and nasal).
- There were no observable differences in the treatment of nonce forms and borrowings, with one exception. In experiment 4 (loanword suffixation), some subjects added the suffix *–e* without causing any change in the stem-final cluster or adding the palatal glide /j/. No palatalisation effects could be observed whatsoever. No such cases were found in experiment 3 (nonce noun suffixation).

6.3.2. Polish and the experimental data

Both in the real Polish verbs and the experimental data, place assimilation of the prefix is rare and it occurs only before alveolar and alveolo-palatal obstruents. No palatalisation of the prefix can be observed before palatalised labials (both oral and nasal) and the alveolo-palatal nasal /ɲ/.

One of the characteristics of the prefixed verbs in experiments 1 and 2 is the lack of voice assimilation or/and voice dissimilation of the prefix. This phenomenon is almost unattested in the real Polish verbs. It must stressed, however, that voice dissimilation does occur in Polish. Łobacz (1996), for example, reports the occurrence of the so-called 'voiceless speech' in the pronunciation of pre-school children: underlyingly voiced segments, including sonorants, become voiceless even in contexts where no devoicing should be expected.

In suffixed words, the stem-final cluster agrees in the palatal specification if both consonants are coronal obstruents. This is obligatory in the real Polish nouns and applies to a significant majority of the experimental data. If, however, C_1 is /n/, it does not take on the palatality of the following palatal(ised) obstruent. This generalisation applies both to real Polish nouns and to the tested material.

/ɲ/ in C_2 position usually causes palatalisation of the preceding coronal obstruent in real Polish nouns. This is less frequent in the experimental data, where /s z/ failed to palatalise before /ɲ/ in about 50% of cases, while /t d/ palatalised only sporadically.

There is a lot of variation in palatal assimilation of an obstruent in C_1 position if the following C_2 is a palatalised labial, especially a palatalised labial nasal. Coronal obstruents can stay either plain or palatalise before palatalised labials. There is a difference in the behaviour of plosives and fricatives: /t d/ hardly ever become /tɕ dʑ/, while /s z/ become /ɕ ʑ/ in up to 32% of cases.

/s z/ palatalised mostly before /m^j/ and less so before /p^j b^j/. At first glance it looks as if in the case of labials, the nasal propagates palatalisation to a greater extent than the plosives. Again, this generalisation applies to both the experimental data and the real Polish nouns. This is a reverse situation when compared to alveolo-palatals, where the obstruents usually cause palatalisation of the preceding consonant, while /ɲ/ only causes palatalisation in about 50% of nouns. The fact that the subjects palatalised more before /m^j/ than before /p^j b^j/ may be due to prescriptivism. The pronunciation of words ending in *–zm* (and their inflected forms) is discussed not only in pronunciation dictionaries but also in secondary school hand-books. It is stressed that inflected nouns ending in *–zm* can be realised in two ways, i.e. with and without palatalisation of /z/. Effectively, for some of the speakers the presence of palatalisation in this class of words may result from the process of lexicalisation rather than spontaneous (non-)application of place assimilation. The issue of obstruent palatalisation before /ɲ/ does not attract so much attention in the literature and so the speakers might be more prone to apply or not apply certain assimilatory processes in this context more spontaneously.

Another point worth mentioning is a relatively low realisation of VN sequences as Ṽ before fricatives, which should be the norm (see section 1.).

The following predictions were made regarding prefix assimilation (cf. 4.2. above):

75: *Palatal assimilation in prefixed words -/z/- + C-initial stem*

Stem-initial C	*No palatalisation*	*Palatalisation*	*Predicted status of palatalisation*	*Actual status of palatalisation*
(i) ɕ	s+ɕ	ɕ+ɕ	optional	very rare
ʑ	z+ʑ	ʑ+ʑ	optional	very rare
ʃ	s+ʃ	ʃ+ʃ	optional	very rare
ʒ	z+ʒ	ʒ+ʒ	optional	very rare
(ii) ɲ	z+ɲ	*ʑ+ɲ	impossible	impossible
(iii) mʲ	z+mʲ	*ʑ+mʲ	impossible	impossible
pʲ	s+pʲ	*ɕ+pʲ	impossible	impossible
bʲ	z+bʲ	*ʑ+bʲ	impossible	impossible

i. alveolo-palatal and alveolar obstruents trigger place assimilation
ii. nasals fail to propagate palatalisation
iii. labials fail to propagate palatalisation

The first prediction was not born out. *z*- assimilation occurred before /ɕ ʑ ʃ ʒ/ but only sporadically. In fact, it was so rare that it cannot even be considered optional. Recall that according to previous studies, the assimilated pronunciation is the recommended and more widespread norm. The results of the experiments are surprising because historically the trend towards non-assimilation in obstruent clusters in Polish is quite unusual and the history of Polish abounds in examples of consonant cluster assimilations and simplifications (Rospond 2000). Consequently, one would expect the same tendency to be observed in present-day Polish as well. The last two predictions were born out by the experimental results. There were no cases of *z*- palatalisation before /ɲ mʲ pʲ bʲ/, i.e. palatalisation in this context is impossible.

The following generalisations were made regarding palatal assimilation in suffixed words:

76: *Palatal assimilation in suffixed words – CC stems + palatalising suffix*

Stem-final CC cluster	*No palatalisation*	*Palatalisation*	*Predicted status of palatalisation*	*Actual Status of palatalisation*
(ii) zn	*zɲ	ʑɲ	obligatory	optional
sn	*sɲ	ɕɲ	obligatory	optional
nn	*nɲ	ɲɲ	obligatory	not tested
st	*st͡ɕ	ɕt͡ɕ	obligatory	obligatory
zd	*zd͡ʑ	ʑd͡ʑ	obligatory	obligatory
(iii) zmʲ	zmʲ	ʑmʲ	optional	optional
smʲ	smʲ	ɕmʲ	optional	optional
spʲ	spʲ	ɕpʲ	optional	optional
zbʲ	zbʲ	ʑbʲ	optional	optional
(iv) ns/z	?nɕ/ʑ	?ɲɕ/ʑ	? (possibly obligatory)	rare

i. palatalisation more widespread in stem-final clusters than in prefixed words

ii. coronal clusters obligatorily agree in the place of articulation in stem-final position (optional or impossible assimilation in prefixed words)

iii. coronal + palatalised labial clusters may or may not agree in their palatal specification (coronal + palatalised labial clusters never agree in their palatal specification in prefixed words)

iv. it is not clear whether the /n/ palatalises before alveolo-palatal fricatives; palatalisation is obligatory before alveolo-palatal affricates, therefore we may expect the same effect before alveolo-palatal fricatives

(i): Percentage-wise, palatal assimilation is significantly more widely attested in suffixed than prefixed words, e.g. in stem-final clusters the highest degree of assimilation is 74%, while in verbs, the prefix assimilates to the place of articulation of the stem-initial consonant in 8%. Palatal assimilation takes place in more contexts in suffixed words than in the prefixed ones. In the suffixed nouns, C_1 palatalises before /ɲ mʲ pʲ bʲ/, while this is never the case in prefixed verbs. There was a slight difference between voiced and voiceless fricatives in that voiceless fricatives assimilate more frequently than voiced ones. The difference, however, was marginal and did not reach the level of significance in any of the experiments.

(ii): This prediction was not born out by the experimental data. Obstruent coronal clusters agree in their palatal specification in a significant majority of cases (although there are exceptions) but coronal clusters consisting of an obstruent and a nasal agree in their palatal specification to a significantly smaller degree. Thus, the spreading of palatalisation is affected by nasality, i.e. nasality has a blocking effect on the spreading of palatalisation.

(iii): Palatal assimilation is optional before palatalised labials, although the norm is not to palatalise the consonant preceding the palatalised labial (on average 70% of cases). Note that Karaś & Madejowa (1977) recommend the pronunciation with palatal assimilation before palatalised labials, i.e. [-ʑm^{j}e] rather than [-zm^{j}e].

(iv): The dental nasal /n/ only sporadically assimilates to the place of articulation of the following alveolo-palatal fricative (or affricate). Note that previous studies (e.g. Zagórska-Brooks 1968, Wierzchowska 1980) report that palatalisation of the nasal before alveolo-palatal obstruents should be obligatory.

The experimental results discussed above differ substantially from previous findings discussed in section 3 above. One of the reasons why frequency of assimilation was so low might be the fact that the subjects had to tackle nonce words and borrowings. Since they were not familiar with these forms, they tried to pronounce them as clearly as possible (see the discussion below for more details). Further, the age of the subjects might have played a role as well. As Madejowa (1990) points out, younger speakers were more reluctant to apply assimilation to affixed forms. Most of the subjects taking part in the experiments described above were undergraduate students aged around 20, i.e. they were representatives of the generation where one might expect a lower occurrence of assimilatory processes.

In the experiments described above, speakers are fully aware of the presence of the juncture in affixed words. The experimental data suggests that they attempt to keep the morpheme boundary as transparent as possible even though this may result in 'non-native' like consonant clusters. Recall that in Polish morpheme internal consonant clusters tend to agree in voice and palatal specification.

The experiments clearly show that there is a difference in the frequency of assimilation between prefixed and suffixed words. Suffixed words obey morpheme internal phonotactics to a greater degree than the prefixed ones. This point will be discussed in more detail below.

7. Discussion

7.1. Psycholinguistics

In chapter 1, we mentioned 6 factors affecting the asymmetry in assimilation between prefixed and suffixed words. In this section, I will look at each of these factors separately and discuss its relevance with respect to the Polish data analysed in this chapter.

7.1.1. Phonological transparency

Cutler (1980, 1981) observes that the acceptability of neologisms relies on the degree to which they are phonologically transparent. It would seem that in choosing neologisms, speakers should prefer the base word to remain intact in the derived form. In my experiments, the subjects were tested on nonce-words and borrowings. Cutler's observations could help to explain why assimilation in the experimental data is much less frequent than generally reported in the literature for real Polish words. The subjects were aware of the fact that the words that they were asked to decline/conjugate were very rare or non-existent and so they tried to keep the base intact in the derived form. Further, some of the subjects did not alter the stem-final consonant at all when adding the suffix $-^{pal}e$, e.g. *ma[nt]+a* → *ma[nt]+e*, while some added the suffix preceded by the glide /j/, again without changing anything in the stem, e.g. *ma[nt]+a* → *ma[ntj]+e*. The performance of these subjects can be accounted for within Cutler's theory of processing neologism. Phonological transparency may be overridden by other factors, such as frequency or phonotoctics (see the discussion below). This approach, however, only bears on suffixation and it does not address the issue of phonological changes in prefixes.

7.1.2. Temporality

Speech is processed temporally. Hay (2003) claims that the whole word route should be favoured for prefixed words. This bias should be reduced in suffixed words. Again, it is very difficult to verify this hypothesis for nonce-words that the subjects hear for the first time. It is true, however, that subjects were more hesitant when adding prefixes than suffixes. Sometimes they would even put an epenthetic vowel between the prefix and the stem. This was never observed in case of suffixes. This leads to the conclusion that prefixes are 'freer' than suffixes. Suffixes are added after the whole stem has been processed and so subjects are less concerned if the stem-final consonant(s) is/are disturbed. In the case of prefixation, subjects do not know what the coming up stem is (or what it looks like), so they are more hesitant. This may also be the reason why the prefix does not assimilate to the stem-initial consonant. The subjects are too 'busy' trying to process an item they have never heard or seen before and they are bound to treat the prefix and the stem as separate entities. Thus, prefix assimilation is blocked.

7.1.3. Phonotactics

Hay (2003) claims that phonotactics plays a crucial role in the decomposition of morphologically complex words. Subjects tend to posit boundaries inside phoneme transitions that are unlikely to occur word-internally.

In the experimental data, there was only sporadic assimilation of the prefix *z-* to the stem-initial consonant place of articulation. Voicing assimilation was much more common (from 70% to 100%). In general, obstruent clusters with mixed palatal and mixed voicing specification are not allowed in Polish monomorphemic words. Thus, if language users want to preserve clear morpheme boundaries, then they should not assimilate. This tendency should be even stronger if the word is very infrequent, if it is a borrowing or a nonce formation, and/or the prefix is similar to an existing word or can function as an independent word. As mentioned above, Polish prefixes function as separate words (prepositions) and even as prepositions they assimilate to the onset of the following word. It is thus surprising that they do not assimilate in the prefix position, where they should be more bound to the following noun than prepositions in prepositional phrases. Note, however, that in case of *z-*, the cluster resultant from assimilation is often a geminate. Thus, the only difference between a prefixed and a non-prefixed verb would be the length of the initial consonant. Geminates in word-initial position are not easily perceived and so speakers may prefer not to assimilate the prefix. The situation may be different for prepositions: the morphological, syntactic and semantic contexts give a vast amount of cues indicating the presence of the preposition. The same cues may not always be sufficient for speakers to decide whether a given verb is prefixed or not.

Further, verbs with the *z-* prefix often violate phonotactic principles of Polish word-onsets whether the prefix assimilates or not. Language users will always have a 'prompt' that a given word is morphologically complex. The only difference is that in unassimilated forms the perception of the verb might be easier than in the assimilated ones (where the resultant cluster is a geminate).

In CC clusters in stem-final position in suffixed words, there is total assimilation of voicing in obstruent clusters. In this respect, stem-final clusters fully obey the phonotactic restrictions of Polish. In prefixed words, on the other hand, the prefix does not always take the voicing of the stem-initial consonant, thus creating obstruent clusters with mixed voicing. The same generalisation applies to place assimilation. Place assimilation is much more common in suffixed words (up to 70%) than in the prefixed ones, where it is hardly attested (up to 8%). These discrepancies in the spreading of assimilation in prefixed and suffixed words are due to left-to-right processing, whereby the beginnings of words should remain unchanged.

7.1.4. Frequency

It is generally assumed in most of the linguistic literature that the more frequent a word is, the less decomposable it is (e.g. Modor 1992, Baayen 1992, 1993, 1994, Bybee 1988, 1995). Frequency, however, played no role in my experiments as the subjects were tested on nonce-words. The frequency effect can, however, explain the discrepancy between my results (with hardly any assimilation of the prefix) and the general literature reporting a high degree of assimilation of the prefix. In my experiments subjects were faced with forms that they saw for the first time: the frequency of the stem was thus 0. The literature on the prefix assimilation in Polish is based on real words. In fact, a lot of verbs cited there are fairly frequent, which would definitely enhance the process of assimilation.

7.1.5. Metrical structure

The metrical structure of speech can be another source of information for speech segmentation. In Polish, stress is penultimate (with certain exceptions, but see chapter 2 on stress in Polish) and it is insensitive to morpheme boundaries, so is highly unlikely that stress can provide the speakers with any cue to the morphological complexity of the word. In any case, the data was controlled for stress. All the forms were bisyllabic with initial stress to conform to the shape of a typical Polish word.

Some of the subjects, however, did use the stress for emphasis or contrast. In Polish, stress can shift from the penultimate to the initial position (see chapter 2 for more details), irrespective of the morphological complexity of the word. In experiment 3, which involved adding a Polish infinitival suffix to English borrowings, some of the subjects chose to attach a bisyllabic suffix, thus creating a trisyllabic verb. After adding the suffix, they were expected to attach the prefix *z-* to the newly created verb. Three of the subjects read the pair consisting of an unprefixed verb with penultimate stress and a prefixed verb with initial stress, e.g. *shift+ówać* vs. *z+shíft+ować.*

7.1.6. Possible Word Constraint

The Possible Word Constraint (Norris et al. 1997) is operative in the segmentation of speech and requires that wherever possible the input should be segmented so as to produce a string of feasible words.

This constraint is important for my data. In general, Polish prefixes are derived from prepositions and can still function as separate words, which will highly influence the degree to which prefixes can assimilate. Speakers will be less likely to assimilate a prefix that sounds exactly like an existing, commonly used preposition (even though they do not need to be semantically related). Suffixes are not syntactically/morphologically/semantically or in any other way related to existing Polish words, however, that do look like possible words in Polish. My experiments involved attaching the suffix *–e*. Although, there is no such word in Polish, there are other monosyllabic words consisting only of a vowel, e.g. *i* (and) or *a* (but), so theoretically *e* could be an existing word in Polish as well. Thus, both prefixes and suffixes fulfil the *Possible Word Constraint.* The only difference between the two types of affixes is that prefixes coincide with existing Polish words, i.e. prepositions, while suffixes only resemble existing Polish words. This fact might disadvantage processing prefixed words as single items. On the other hand, it does not necessarily mean that that would prevent prefixes from assimilating. Prepositions fully assimilate to the place of articulation of the initial consonant of the following NP in spite of the fact that they function as separate words, e.g. *[ʑ ʑ]ielonym kapeluszem* (with a green hat). It is highly unlikely that prepositional phrases are stored as whole items.

7.1.7. Psycholinguistics - general discussion

The factors discussed above explain the following two points regarding the place assimilation in prefixed and suffixed words:

- the discrepancy between the degree of assimilation in the experimental data discussed here and real Polish words as discussed in the existing literature.
- high percentage of assimilation in suffixed words as compared to very low percentage of assimilation in prefixed words

With reference to the first point, a lot of examples in the literature on assimilation in morphologically complex words in Polish are fairly frequent. These forms may be already lexicalised: the affixed word is stored in the memory as a single item and accessed via a whole word route. Assimilation is highly likely to occur in frequent words even if it destroys phonological/morphological transparency. Speakers/hearers are well acquainted with frequent words and they can retrieve the meaning even if the surface phonological form is distorted. In nonce words, on the other hand, phonological/morphological transparency is more important: language users are completely unfamiliar with the new word and so they try to preserve it in as much an unchanged form as possible.

With reference to the second point, left-to-right processing and the fact that subjects prefer to process stems before affixes explain why assimilation is more frequent in stem-final position after suffixation than in the prefix. An additional reason may be the fact that the prefix *z-* is also an independent word (preposition), not just a morpheme, which may have influenced the performance of some (most) of the subjects. They were familiar with *z-* in an assimilated version and they made a conscious effort to preserve it in this form in the prefixed words. Unassimilated pronunciation of the prefix may have been further enhanced by the fact that the subjects tried to keep the nonce-stem unchanged and effectively produced the affixed form as clearly as possible.

7.2. The details of assimilation

When analysing assimilation in affixed words in Polish, the following points need to be accounted for:

- the asymmetry between prefixed and suffixed words (this point was extensively discussed in the above sections and will not be dealt with here)

- the direction of assimilation (always regressive)
- smaller percentage of assimilation of consonants when followed by labials and nasals as compared to a much higher percentage of assimilation of consonants (excluding nasals) before coronal obstruents
- very low percentage of the palatal assimilation of nasals.

7.2.1. Directionality of assimilation

Place and voicing assimilations in Polish are regressive[18]. There have been many attempts to account for voicing/place assimilation in Polish (e.g. Bethin 1992, Gussmann 1992a, Musan 1994, Nair 1999). Most of them have been syllable based, i.e. the voicing/place specification spread from the syllable onset to the syllable coda. However, due to the existence of very complex consonant clusters/ syllable types in Polish, such accounts usually left voice/place spreading in many syllable types unaccounted for. Further, there is no general agreement among native speakers about the syllabification of word-medial consonant clusters, e.g. some speakers syllabify the same CCC cluster as C.CC, while others as CC.C (Rubach & Booij 1990a,b). This variation in syllable division of medial clusters makes it difficult to apply an approach whereby the voicing/ place specification spreads from the onset to the coda. Further, a syllable-based approach would not account for the spreading of voicing from C_2 to C_1 if both consonants are in the onset position. This is exactly the situation we are dealing with in the case of prefixed words.

A non-syllable based approach to voice/place assimilation was proposed by Steriade (1997, 1999, 2000). The direction of assimilation does not depend on the position that the triggering consonant occupies in a syllable but rather on its relative perceptibility, i.e. there are positions in a string of sounds where certain featural contrasts are less perceptible and thus more susceptible to neutralisation. Steriade refers to this perception based assimilation as *Licensing by Cue*. It is possible to classify segmental contrasts based on asymmetries in the distribution of their transitional cues. An example of a transitional cue is the Voice Onset Time (VOT). The vowel following a voiceless plosive is contextually devoiced by it and provides information about the plosive's laryngeal featurs. The vowel preceding a plosive does not provide this information. In pre-aspirated plosives, on the other hand, the

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[18] I will not discuss cases of progressive voicing assimilation in /Cv/ clusters. See, e.g. (Rubach 1996) for a detailed analysis.

main cue to pre-aspiration precedes the onset of the oral closure and the main cues are present in the vowel preceding the plosive. The voicing contrast is typically lost in the absence of a following sonorant (S), while in case of pre-aspirated plosives the contrast is lost in the absence of a preceding S. In terms of feature spreading, we might expect spreading from C_2 to C_1 in a C_1C_2V or C_1C_2S string. This is the most frequent direction for voicing assimilation in many languages, including Polish.

The *Licensing by Cue* analysis can be applied to the neutralisation of place distinctions as well. For many place features, the main cues lie in the post-release interval (burst – in case of stops – and CV transitions). These features include those ensuring the distinction between labials, coronals and velars; the anteriority contrast between laminals and the apical-laminal contrast[19]. The discussion so far was mainly about the importance of CV transitions for the recognition of plosives. Nowak (2003) shows, however, that in case of Polish vowel transitions are also vital for the recognition of fricatives (see the discussion below).

Kochetov (2002) is a detailed study of palatal assimilation in Russian using the presence of cues found in vocalic transitions. As his analysis is of great relevance to Polish palatalisation, I will give a detailed summary of Kochetov (2002) here. The author examines the distribution of /p/, /pʲ/, /t/, /tʲ/ in a number of languages from different language families and discovers certain asymmetries with respect to position, place and palatalisation. The onset[20] environment before a vowel is the least restricted, while the context before a palatalised consonant is the most restrictive. The palatalised coronal /tʲ/ occurs in more environments than the palatalised labial /pʲ/. The final and preconsonantal coda _C positions show a preference for a plain consonant, while the environment before a palatalised segment may accept either palatalised (preferred) or plain consonants. Further, historically, the palatalised labials are the first to undergo the process of

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[19] Left-anchored place features, where the feature spreads C_1 to C_2 in a SC_1C_2S string, exist as well though they are much less common than the right-anchored ones, where the feature spreads from C_2 to C_1 in a SC_1C_2S string. Retroflexion is a feature whose primary cues lie in the interval preceding the onset of the closure, i.e. in the VC transitions. I will not discuss VC place transitions in detail as the place features studied in this section have cues in the CV transitions. See also e.g. Malecot 1958, Wang 1959, Fujimara et al 1978, Ohala 1990, Redford & Diehl 1999, Winters 2001.

[20] The terms 'onset' and 'coda' are used as a shorthand for C_V position and V_C position, respectively.

depalatalisation, while the palatalised coronals are more resistant to the change (the same tendency can be observed in Polish both synchronically and diachronically).

In a final C^jC environment, C^j tends to depalatalise before a plain C. The palatalised labial is the primary target. /t^j/ is more susceptible to depalatalisation before heteroorganic consonants than before homorganic ones. On the other hand, changes in consonants before palatalised segments, i.e. CC^j show less consistency: they can be either palatalised in agreement with the following C^j or depalatalised. The former process seems to prevail. Thus, the environment before palatalised consonants is more restrictive than before plain segments, with the palatalised option being more likely for coronals than labials.

Kochetov seeks to explain these asymmetries by studying the production and perception of the four plosives. In terms of production, palatalised labials are characterised by raising and fronting of the tongue body. The peaks of these movements are not always simultaneous, suggesting their partial independence. Lips and tongue body are articulatorily independent. /p/ shows no raising of the tongue. Thus, /p/ and /p^j/ differ from each other with respect to the tongue body movement. The difference is most substantial at point CV, that is at the stop release. /t^j/ is also characterised by raising of tongue body, however, the overall articulatory difference between /t/ and /t^j/ is small. The primary gesture for both of these consonants is the forward movement of the tongue tip or blade towards the upper teeth. Being coupled with tongue tip, tongue body is dragged forward during the primary constriction regardless of whether the consonant is plain or palatalised. This explains the lack of substantial timing differences between the two gestures that were characteristic of /p^j/. The tongue body configuration of the palatalised coronal stop does not differ very much from environment to environment. The effect of environment on the palatalised labial is much stronger than on the palatalised coronal, i.e. gestures are significantly reduced in palatalised labials in word-final position. This is related to the fact that glides are particularly susceptible to syllable-final reduction (Gick 1999). The reduction of the palatal gesture in /p^j/ in coda is a related process since the properties of this constriction are similar to those of a palatal glide /j/. In addition, the tongue body gesture in /p^j/ is independent from the primary articulator, the lips. The smaller degree of reduction in /t^j/ follows from its tight coupling with tongue tip: the tight coordination of the two gestures prevents the reduction of the secondary constriction. This explains the presence of palatal coronals in word-final position in Polish as opposed to palatalised labials.

Palatalisation is more easily lost in C^jC clusters. Preconsonantal stops do not have the CV transitions. The main source of acoustic information about the tongue body trajectories is the VC transition if the consonant happens to be preceded by a vowel. The tongue body gesture is generally higher in the environment before a palatalised consonant. The acoustic information provided by the VC transitions, however, is not as high as the one provided by the CV transitions. No transitions are available if the C^jC cluster is at the beginning of a word. In a _C context a plain consonant is higher when followed by a palatalised segment than when it is followed by a plain consonant. The effect of the following consonant in a C_1C_2 context differs depending on the place of C_1. Coronals are more sensitive to the plain/palatalised quality of the following segment than labials. Although the place of articulation of the following consonant did not play a significant role, it did show some influence when combined with the secondary articulation of C_2. A following palatalised coronal /t^j/ tends to induce fronting or raising of tongue body to a greater extent than a following /p^j/. In general, labials are more likely to lose palatalisation when followed by another consonant than coronals. Palatal coronals are more likely to induce palatalisation of preceding consonants than palatal labials. This is exactly what we observe in the Polish data.

Acoustically, the bursts of palatalised stops are more salient than those of the corresponding plain stops, being characterised by longer duration and higher energy at high frequencies. This is due to the tongue body raising and fronting which raises F_2 and creates an additional source of noise. At the same time, the coronal plain and palatalised stops have more salient (longer duration and higher intensity) bursts than the corresponding labials. The presence of the burst prior to the following vowel makes the right edge of the stop crucially important for perception. The burst plays a crucial role in distinguishing plain and palatalised stops. The perception of the place of articulation of stops is reduced for C_1 in a C_1C_2 cluster. The likelihood of there being a burst for C_1 depends on the place of articulation of the following consonant. Kochetov shows experimentally that stops are audibly released significantly more often before hetero-organic /k/ than before homorganic /n/ and /s/. The same hetero-organic versus homorganic distinction holds true for stop clusters (Zsiga 2000). The first consonant in homorganic clusters is rarely released. A homorganic cluster is manifested articulatorily in one steady constriction for the two consonants and by the absence of burst in the acoustic signal. A release of C_1 would involve an additional movement away from the constriction and back. This property of homorganic clusters has important consequences for the first consonant in the cluster. In the absence of burst, all the information about its secondary articulation and place is very limited.

The following generalisations can be drawn from Kochetov's study:

i. labials are less likely to become palatalised when followed by a palatal(ised) consonant than coronals
ii. palatal(ised) coronal in C_2 position is more likely to cause palatalisation of the preceding consonant than a palatalised labial
iii. clusters consisting of consonants with different places of articulation, e.g. coronal + labial are more likely to remain unassimilated than, e.g. clusters consisting of two coronals.

The same generalisations hold for the Polish experimental data discussed in this chapter. Labials never palatalise when followed by a palatal(ised) consonant. The only types of consonants affected by palatalisation in a C_1 position in a C_1C_2 cluster are coronals.

In suffixed words the dental stops /t d/ do not palatalise before /p^j b^j m^j ɲ/, i.e. in clusters where coronal plosive is followed by a labial. Previous experimental studies (e.g. Łobacz 1982, Wierzchowska 1980, Pompino-Marschall & Zygis 2003) show that palatalisation in labials is asynchronous: it is a separate glide-like element following the consonant. The onsets of plain and palatalised labials barely differ from each other. The same can be observed in my data. One might expect a higher degree of assimilation before the palatal nasal /ɲ/ since both the dental plosive and the palatal nasal include a tongue body movement. However, in Polish, palatalisation of dental plosives does not consist only of the modification of the tongue body movement, i.e. shifting it towards the hard palate (the plosive changes from dental to alveolo-palatal). Additionally, the sound is affricated. Effectively, palatalisation of dental plosives includes changes in both place and manner of articulation. Such a substantial alteration might be 'too much' for the speakers in terms of production and perception and so they decide to leave the consonant unchanged.

One might also expect a similar pattern for clusters consisting of fricatives or a fricative and a stop. Here, however, the percentage of assimilation of fricatives in C_1 position is much higher than the percentage of assimilation of stops. Again, assimilation is less frequent before palatalised labials than before palatal coronals. This pattern follows Zsiga's observation that clusters consisting of consonants with mixed places of articulation are less likely to undergo assimilation. The question is why fricatives should assimilate at all, while stops hardly ever do. As mentioned above, assimilation of plosives entails changes in both place and manner of articulation. In the case of fricatives, it is only the place of articulation that is affected. Further, in a cluster consisting of a dental and an alveolo-palatal fricatives, the same articulator is involved in the production, i.e. tongue body. Preserving both places of articulation would mean making tiny adjustment in the tongue body shape during the articulation of a single consonant cluster, which in turn, means more articulatory effort. Recent (preliminary) studies (Nowak 2003) also show that the vocalic context plays an important role in the perception of Polish sibilants. The results indicate that the information included in the vocalic environment of the Polish sibilants may be a robust cue that is capable of overshadowing the properties of the fricative noise itself. Since fricatives in C_1 position have no CV transitions available, their perception is at a disadvantage and they are more likely to assimilate.

Kochetov does not discuss nasals. In Polish, however, the remaining puzzle is the behaviour of nasal consonants. Recall that nasals propagate assimilation to a much smaller degree than obstruents and they are much more resistant to assimilation themselves. According to Ladefoged & Maddieson (1996:116-118), nasal consonants are perceptually quite distinct from other speech sounds. The steady state portion of a voiced nasal consonant is characterised acoustically by a low frequency first resonance with greater intensity than the other resonances. The higher resonances have low amplitude. Nasal consonants with different places of articulation are poorly discriminable one from another on the basis of the voiced steady state portion isolated from the transitions which might precede or follow it. This explains frequent assimilations in nasals like [np] → [mp] or [nf] → [ɱf]. The same tendency can be observed in Polish with the exception of the palatalisation of /n/ before alveolo-palatal fricatives/affricates. The reason for this might be the fact that in Polish /ɲ/ tends to be realised in an asynchronous manner, with palatalisation as a separate glide-like element (e.g. Rocławski 1976, Łobacz 1982). Thus, /n/ fails to palatalise for the same reason as labials do not assimilate before palatal(ised) consonants: palatalisation in this context produces a CjC sequence, where the glide is very unstable and easily susceptible to loss (Gick 1999).

The asynchronous palatalisation of /ɲ/ is also the reason why this nasal does not induce place assimilation of the preceding obstruent. If /ɲ/ is realised asynchronously as [nj], then the onset of the phonological /ɲ/ is the same as the onset of the plain nasal /n/, which hinders the application of palatal assimilation. Historically, palatalisation in /ɲ/ used to be realised synchronously and the sound would trigger palatalisation of preceding consonants more regularly (Stieber 1973). That is why in present-day Polish ON clusters tend to agree in their palatal specification morpheme internally. The same generalisation applies to palatalised labials (oral and nasal) /pʲ bʲ mʲ/, which have exactly the same onset as plain labials and thus fail to trigger palatalisation of the preceding consonant.

7.2.2. Assimilation - summary

To summarise, the presence of cues in CV transitions and their absence in CC transitions explain the right-to-left direction of assimilation in Polish. There also other factors that influence the frequency of assimilation of C_1 in a C_1C_2 clusters:

- homorganic clusters[21] are more likely to undergo assimilation than hetero-organic clusters; hence dentals followed by palatalised labial plosives do not palatalise;
- assimilation is more likely if it involves changes only in the place of articulation than if the changes include both place and manner of

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[21] The experiments presented in this chapter concentrate in more detail only on homorganic clusters consiting of coronals. However, Kochetov (2002) found that C_1 in other types of homorganic clusters is less likely to be released (and thus more likely to undergo assimilation) if it has the same place of articulation as C_2.

articulation; hence fricatives palatalise more often than plosives because palatalised plosives are additionally affricated;

- asynchronous palatalisation may result in CjC clusters, where the glide is disadvantaged in terms of production and perception, hence lack of palatalisation of /n/ to /ɲ/ (realised phonetically as [nj]) before palatal(ised) consonants;
- palatal consonants where palatalisation is realised asynchronously as a glide-like element act as poor triggers of palatalisation because the onsets of such consonants do not differ from the onsets of plain non-palatal(ised) consonants.

8. OT Analysis

This section provides an OT analysis of Polish consonant clusters within and across morpheme boundaries, with a particular focus on place assimilation. A great deal of this chapter has been devoted to the discussion of various functionally-based explanations regarding the prefix-suffix asymmetry in Polish. The section is an attempt to show how this asymmetry (and the functionally-based explanations) can be captured by a formal grammar.

8.1. Polish consonant clusters

An OT analysis of Polish consonant clusters was provided by Rochoń (2000). She starts off with Pulleyblank's (1997: 64) observation that consonant clusters should require identity along the following featural dimensions (Identity Cluster Constraints):

77. AGREEPLACE: A sequence of consonants must be identical in place of articulation
AGREECONTINUANCY: A sequence of consonants must be identical in continuancy
AGREENASALITY: A sequence of consonants must be identical in nasality
AGREEVOICING: A sequence of consonants must be identical in voicing

Rochoń concludes that AGREEPLACE, AGREECONTINUANCY and AGREENASALITY are not obeyed in Polish. Thus, for example, Polish allows clusters consisting of a velar followed by a plosive, e.g. *[gb]urowaty* (churlish, masc. nom. sg.). This indicates that the faihfulness constraint requiring a faithful parse of place of articulation, IDENT$_{\text{PLACE}}$, is ranked higher than a constraint demanding identical place of articulation of consonants belonging to the same cluster: IDENT$_{PLACE}$ >> AGREEPLACE. The same generalisation applies to AGREECONTINUANCY and AGREENASALITY. Consonants do not change these features when they occur in clusters. Sequences consisting of plosive + fricative and vice-versa occur extensively in Polish (see examples in section 2. above). Similarly, consonants with mixed nasality are widely attested in Polish, e.g. *[gɲ]ieść* (knead, inf.), *[ml]eko* (milk, nom. sg.), *[tɲ]ie* (s/he cuts), *[mr]óz* (frost, nom. sg.). Thus, the constraints AGREEPLACE, AGREECONTINUANCY and AGREENASALITY are lower ranked than the IDENTITY constraints requiring a faithful parse between features: IDENT >> markedness (AGREEPLACE, AGREECONTINUANCY, AGREENASALITY).

The only case where a syntagmatic constraint is ranked above the IDENTITY constraint is constituted by voicing agreement. It is, however, satisfied in Polish only with respect to obstruent clusters. The specific implementation of the constraint VOICING looks as follows (Rochoń 2000: 122):

78.

AGREEVOICING$_{OBSTRUENT}$: A sequence of obstruents must be identical in voicing.

The ranking for voicing assimilation will look as follows:

79.

AGREEVOICING$_{OBSTRUENT}$ >> IDENT$_{VOICING}$ >> AGREEVOICING

This ranking ensures that voicing assimilation takes place in obstruent clusters, while in sequences consisting of obstruent(s) and sonorant(s) or only sonorants the underlying voicing is preserved on the surface[22].

The above constraint itself does not account for the directionality of the voicing assimilation, i.e. from the rightmost consonant in an obstruent cluster. As already mentioned in section 7 above, the spreading of voicing/place from right to left is due to the presence of cues in the CV and VC transitions. Steriade (1997: 35) proposes the following perceptibility scale in obstruent voicing according to context:

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[22] I will not provide a detailed analysis of the devoicing of sonorants in clusters violating the Sonority Sequencing Principle, e.g. *pie[ɕɲ̊]* (song, nom. sg.). See Rubach (1996) for an analysis of cases where sonorants in consonant clusters are devoiced.

80. V_ [long son] >> V_ [son] >> V_ [short son] >> V_ # >> V_ [-son] >>
{[-son] _ [-son], [-son] _ #, # _ [-son]}

Notation: [long son] = long sonorous stretch (V, RV or syllabic R)
[son] = shorter sonorous stretch (R#)
[short son] = shortest sonorous stretch (_RO)

Corresponding to this scale, we have a set of *[α voice] constraints. The constraints are universally ranked in the order of inverse perceptibility: the lower the context is on the perceptibility scale, the higher ranked the corresponding *[α voice]/X_Y constraint.

81. (i) *αvoice / [-son] _ [-son], [-son] _ #, #_ [-son]
(ii) *αvoice/ V _ [-son]
(iii) *αvoice/ V _ #
(iv) *αvoice/ V _ [short son]
(v) *αvoice/ V _ [son]
(vi) *αvoice/ V _ [long son]

The exact ranking for Polish voicing pattern(s) looks as follows:

82. *αvoice / [-son] _ [-son], [-son] _ #, #_ [-son]
*αvoice/ V _ [-son]
*αvoice/ V _#
*αvoice/ V _ [short son]
*αvoice/ V _ [son]
PRESERVE VOICE
*αvoice/ V _ [long son]

The ranking proposed by Steriade can easily replace the two rankings in 78. and 79. Steriade's constraint ranking has the advantages that (i) it accounts for the directionality of voicing assimilation, (ii) it covers cases of the voice neutralisation of extrasyllabic sonorants (not just voicing neutralisation in obstruent clusters), e.g *pie[ɕɲ̊]* (song, nom. sg.). The fact that the voicing specification of R in VOR# sequences is neutralised may be related to the degree of temporal reduction of the final R (see Steriade 1997: 30-38 for a full discussion and analysis).

The tableau below illustrates the working of voicing assimilation in obstruent clusters:

83. *αvoice/ _ [-son] >> PRESERVE VOICE >> *αvoice/ _ [long son][23]

/zsV/	*αvoice/ _ [-son]	PRESERVE VOICE	*αvoice/ _ [long son]
zsV	*!		
zzV		*	*!
☞ ssV		*	

The above tableau exemplifies voicing assimilation in monomorphemic clusters. *αvoice/ _ [-son] is violated only by the candidate [zsV] because here C_1 has a different voicing specification from C_2. In the remaining two candidates, C_1 takes on the voicing specification of the preceding C_2. Finally, *αvoice/ _ [long son] selects as the winner the last candidate, where the whole consonant cluster has the voicing specification of the consonant directly followed by a vowel. However, exactly the same candidate would win if there was a morpheme or word boundary between the two consonants: /z # s/. That is because none of the constraints in 82 makes a reference to morpheme or word edges. This is correct: the voicing assimilation facts are the same whether or not a morpheme or word boundary intervenes.

Moving on to place assimilation, as before I begin with the ranking proposed by Rochoń, i.e. IDENT >> markedness (AGREEPLACE, AGREECONTINUANCY, AGREENASALITY), although eventually I will propose a cue-based account of place assimilation as well. Rochoń's ranking accounts only for clusters found in monomorphemic words. The tableau below exemplifies the ranking IDENT$_{\text{PLACE}}$ >> AGREEPLACE for monomorphemic clusters:

84. IDENT$_{\text{PLACE}}$ >> AGREEPLACE

sk	IDENT$_{\text{PLACE}}$	AGREEPLACE
☞ sk		*
xk	*!	

Rochoń's ranking IDENT$_{\text{PLACE}}$ >> AGREEPLACE, however, misses one important generalisation about monomorphemic consonant clusters. There are no monomorphemic clusters of the type */zʒ/ or */zʐ/, i.e. clusters of coronal fricatives with different place specifications. It is true that Polish does not have clusters like

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[23] This example does not provide an argument for the PRESERVE VOICE >> *αvoice/ _ [long son]. The evidence comes from cases like /zV/ vs. /sV/. If there was no ranking between the two constraints, the contrast between /zV/ and /sV/ would be neutralised in Polish and /sV/ would always be the winner.

/ʒʒ/ or /ʑʑ/ either but this may simply be an accidental gap. There are clusters in monomorphemic words consisting of a coronal fricative + affricate. Such clusters always agree in their place of articulation:

85.	[ʃtʃ]otka	*brush (nom. sg.)*
	sze[ɕtɕ]	*six*

Fricative + affricate coronal clusters with different place specifications are not permitted, e.g. */ʃts/ or */stɕ/.

It seems then that the ranking IDENT$_{\text{PLACE}}$ >> AGREEPLACE is too general, because, given the Richness of the Base principle, clusters like */stɕ/ would be allowed to surface. In order to prevent this from happening, I propose to restrict the constraint AGREEPLACE to consonant clusters with the feature specification [+continuant][24], [+coronal]:

86. AGREEPLACE$_{\text{CONTIN,CORONAL}}$: A sequence of consonants with the feature specification [+continuant], [+coronal] must be identical in the place of articulation.[25]

The above constraint is articulatorily based. In articulatory terms, place assimilation in consonant clusters with the specifications [+continuant] [+coronal] results from gesture overlap (Browman & Goldstein 1992) due to the fact that the same articulators take part in the production of coronals. Additionally, assimilation is more likely to occur in coronal continuant clusters than in coronal clusters where one of the segments is a plosive. The production of plosives involves a complete closure and, in case of Polish, a complete release, which may prevent the gestures of the neighbouring sounds from overlapping. In continuants, there is no closure but a smooth transition from one segment to the other, which facilitates gesture overlap. In a cluster consisting of sounds involving an incomplete closure of articulators, it is easier to keep the closure constant throughout the whole cluster rather than change

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[24] I assume that affricates have double specification [-continuant] and [+continuant], with no phonological ordering of the two features. Since either value is visible from either side of the segment, fricatives assimilate in the place of articulation before affricates but not before plosives that have only [-continuant] specification (Lombardi 1995). See also Rubach (1994) for an analysis of Polish affricates as stops.

[25] I assume that the above constraint is a conjunction of two constraints: AGREEPLACE$_{\text{CONTIN}}$ (militating against continuant consonant clusters with non-identical place) and AGREEPLACE$_{\text{CORONAL}}$ (militating against coronal clusters with non-identical place of articulation).

minimally for each sound (cf. e.g. Kirchner 1998). The ranking AGREEPLACE$_{\text{CONTIN, CORONAL}}$ >> IDENT$_{\text{PLACE}}$ >> AGREEPLACE [26] will correctly produce monomorphemic coronal fricative/affricate clusters that agree in the place specification, while having all other specifications unchanged.

87. AGREEPLACE$_{\text{CONTIN, CORONAL}}$ >> IDENT$_{\text{PLACE}}$

s tʃ	AGREEPLACE$_{\text{CONTIN, CORONAL}}$	IDENT$_{\text{PLACE}}$
s tʃ	*!	▨
☞ ʃ tʃ		*

A crucial problem with Rochoń's account is that it does not take into consideration the directionality of place assimilation, which, as we shall see, is leftward in bimorphemic cases. As with voicing, we will adopt a cue-based account following Steriade. Steriade (1999: 20) observes the following classes of right-anchored place contrasts:

88. Class A: contrast permitted only before V
(e.g. Japanese)

Class B: contrast permitted only before V and approximants
(e.g. Late Latin)

Class C: contrast permitted only before V and approximants and in V_#
(e.g. Diola Fogny)

Class D: contrast permitted in all or most contexts where obstruents occur
(e.g. English)

These generalisations can be translated into the following constraints. I will replace the term approximant with a more general one, i.e. sonorants, which also includes nasals:

89. (i) *αplace / _ V
(ii) *αplace / _ [son]
(iii) *αplace / V _ #
(iv) *αplace / _ [-son]

As in case of voicing, the place hierarchy is based on the amount of place cues present in the speech signal. Consonants before vowels are best cued for its place of

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[26] Note that the same ranking operates for the small number of prefixed words where the prefix assimilates to the place of articulation of the stem-initial consonant. Sometimes the prefix *z-* assimilates to [ɕ ʑ ʃ ʒ], depending on the voicing and place of articulation of the stem-initial consonant

articulation, less so before other sonorants and even less after vowels. Consonants followed by obstruents basically have no transitional cues and the listener can rely only on the spectrum of the consonant[27]. Assimilation is most likely to affect C_1 in a C_1C_2V context because C_2 is much better cued than C_1.

Polish belongs to Class D, i.e. it preserves place contrast in all positions, which means that all the above constraints are outranked by PRESERVE PLACE:

90. **PRESERVE PLACE**
(i) *αplace / _ [-son]
(ii) *αplace / V _ #
(iii) *αplace / _ [son]
(iv) *αplace / _ V

Additionally, the place grammar must be ranked below $\text{AGREEPLACE}_{\text{CONTIN,CORONAL}}$ to account for the fact that consonant clusters with the specifications [+contin], [+coronal] always agree in the place of articulation. If $\text{AGREEPLACE}_{\text{CONTIN,CORONAL}}$ was ranked below PRESERVEPLACE, then the grammar could produce outputs where clusters of coronal continuants do not share the same place featuers. Unlike *αplace constraints and *αvoice constraints, $\text{AGREEPLACE}_{\text{CONTIN,CORONAL}}$ is not cue-based. As mentioned above, $\text{AGREEPLACE}_{\text{CONTIN,CORONAL}}$ is articulatorily based and therefore it will not be replaced with a corresponding (cue-based) *αplace constraint. Thus, the ranking for Polish looks as follows:

91. $\text{AGREEPLACE}_{\text{CONTIN,CORONAL}}$
\>>
PRESERVE PLACE
\>>
*αplace / _ [-son]
*αplace / V _ #
*αplace / _ [son]
*αplace / _ V

Note that $\text{AGREEPLACE}_{\text{CONTIN,CORONAL}}$ only specifies that a cluster consisting of coronal continuants must agree in the place of articulation but it does not say anything about the directionality of spreading of the place features. The place of articulation of a cluster with the specifications [+contin], [+coronal] is determined

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[27] The list does not include place neutralisation in retroflexes, where the preceding context is more important than the following one.

by the *αplace grammar, i.e. the grammar will select the cluster where the place of articulation spreads from C_2 to C_1.

After adding the IDENT$_{\text{NASAL}}$, IDENT$_{\text{CONTIN}}$, which I will replace with the corresponding PRESERVE constraints to match the constraints used in the PLACE and the VOICING grammars, i.e. PRESERVENASAL, PRESERVECONTIN, the grammar for the oral features of clusters in monomorphemic words will look as follows:

92. *Ranking for monomorphemic words*

AGREEPLACE$_{\text{CONTIN,CORONAL}}$
\>>
PRESERVE PLACE, PRESERVECONTIN,[28] PRESERVENASAL
\>>
*αplace / _ [-son]
*αplace / V _ #
*αplace / _ [son]
*αplace / _ V

8.2. Consonant clusters in morphologically complex words

In morphologically complex words, the resultant clusters can violate the phonotactic generalisations applying to monomorphemic words. Below, I briefly summarise the facts and the results of the experiments:

93. Coronal obstruent clusters in mono- and bimorphemic words in Polish

Cluster		*Monomorphemic words*	*Across prefix-stem boundary*	*Across stem-suffix boundary*
heterorganic	zʒ / zʑ		✓	not attested
homorganic	zz	✓	✓	not attested
	ʒʒ		✓ (~10%)	not atested
	ʑʑ		✓ (~10%)	not attested
	ʑdʑ			✓

In most cases, the prefix remains unchanged (with the exception of voicing assimilation that affects all obstruent clusters). The experimental data discussed in this chapter indicate that, in general, morphologically complex words do not respect the ranking AGREEPLACE$_{\text{CONTIN,CORONAL}}$ >> PRESERVEPLACE. Crucially, this ranking

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[28] If PRESERVE is treated as a constraint belonging to the MAX family, then PRESERVECONTIN is satisfied also in forms where plosives change into affricates. Plosives are [-continuant], while affricates are [-continuant] [+continuant]. Thus, affricates violate DEP$_{\text{CONTINUANCY}}$ but not MAX$_{\text{CONTINUANCY}}$.

indicates one important difference between consonant clusters in monomorphemic words and clusters resulting from prefixation/suffixation. In monomorphemic consonant clusters, articulatorily based constraints, such as AGREEPLACE$_{\text{CONTIN,CORONAL}}$, can outrank perceptually (cue-based) constraints. In clusters resulting from prefixation/suffixation, on the other hand, articulatorily-based constraints are lower ranked in order to allow maximal contrast in the output and a clear preservation of the morpheme boundary effects. Superficially, the data may indicate that there is a separate grammar for clusters in monomorphemic words and clusters resulting from a morphological operation (This issue will discussed below). The tableau below illustrates the derivation of unassimilated prefixed words.

94. PRESERVEPLACE >> AGREEPLACE$_{\text{CONTIN,CORONAL}}$

z+ [ʒ	PRESERVEPLACE	AGREEPLACE$_{\text{CONTIN,CORONAL}}$
☞ z+ [ʒ		*
ʒ+ [ʒ	*!	
z+ [ʑ		
☞ z+ [ʑ		*
ʑ+ [ʑ	*!	

The PLACE ranking is independent of the VOICING ranking. Below, I show the VOICING ranking above the PLACE ranking:

95. *αvoice/_[-son]>>PRESERVEVOICE>>*αvoice/_[long son], PRESERVEPLACE

z+ [ʃV	*αvoice/ _ [-son]	PRESERVE VOICE	*αvoice/ _ [long son]	PRESERVE PLACE
z+ [ʃV	*!			
☞s+ [ʃV		*		
ʃ+ [ʃV		*		*!
ʒ+ [ʃV	*!			

In prefixed words, PRESERVENASAL, PRESERVECONTIN are still highly ranked. The prefix does not take on the nasality or continuancy specifications of the stem-initial consonant, e.g. *[z+ɲ]ieść* (lay, inf.), *[z+b]ić* (break, inf.). Thus, the grammar for the prefixed/suffixed words looks as follows:

96. *Ranking for prefixed/suffixed words*

PRESERVE PLACE, PRESERVECONTIN, PRESERVENASAL
>>
AGREEPLACE$_{\text{CONTIN,CORONAL}}$
>>
*αplace / _ [-son]
*αplace / V _ #
*αplace / _ [son]
*αplace / _ V

As pointed out above, that indicates that we need two separate grammars for Polish: one for monomorphemic words and one for prefixed words. One way of getting out of this problem is to posit a highly-ranked constraint that prevents place assimilation across prefix-stem boundaries. Alignment constraints (McCarthy & Prince 1993, 2000) play this role. The constraint must align the left edge of the stem and the consonant feature:

97. ALIGN-LEFT (F, STEM): *working version*
For every consonant feature F, there is a stem such that the left edge of the stem coincides with the left edge of that stem.

Additionally, I will define the Alignment constraint operating in the morphophonology of Polish in terms of *Crisp Edge* (Itô & Mester 1994, 1999) to block any place feature spreading from the stem-initial consonant to the prefix. The definition of *Crisp Edge* proposed by Itô & Mester looks as follows:

98. CRISPEDGE (PCAT): PCat is crisp
Let A be a terminal (sub)string in a phonological representation, C a category of type PCat, and A be-the-content of C. Then C is crisp (or has crisp edges) if and only if A is a PCat.

Thus, the final definition of ALIGN-LEFT (F, STEM) for Polish has the following form:

99. ALIGN-LEFT (F, STEM): *final version*
For every consonant feature F, there is a stem such that the left edge of the stem coincides with the left edge of that stem and the left edge of the stem is *crisp*.

Once top-ranked, ALIGN-LEFT (F, STEM) blocks assimilation across stem and the prefix but allows assimilation morpheme internally. There is no need to posit separate grammars for prefixed and monomorphemic words:

100. ALIGN-LEFT(F,STEM)
\>>
AGREEPLACE$_{\text{CONTIN,CORONAL}}$
\>>
PRESERVE PLACE, PRESERVECONTIN, PRESERVENASAL
\>>
*αplace / _ [-son]
*αplace / V _ #
*αplace / _ [son]
*αplace / _ V

101. ALIGN-LEFT(F,STEM)>>AGREEPLACE$_{\text{CONTIN, CORONAL}}$>>PRESERVEPLACE

z+ [ʒ	ALIGN-LEFT(F,STEM)	AGREEPLACE$_{\text{CONTIN, CORONAL}}$	PRESERVE PLACE
☞ z+ [ʒ		*	
ʒ+ [ʒ	*!		*

Needless to say, ALIGN-LEFT(F,STEM) is outranked by the VOICING grammar proposed in 82. above as voicing assimilation is insensitive to morpheme boundaries.

102. *αvoice/_[-son]>>PRESV>>*αvoice/_[long son]>>ALIGN-L(F,STEM)

z+ [ʃV	*αvoice/ _ [-son]	PRESERVE VOICE	*αvoice/ _ [long son]	ALIGN-LEFT(F,STEM)
z+ [ʃV	*!		*	
☞s+[ʃV		*		*

So far we have discussed place assimilation in prefixed and monomorphemic words. In general, suffixed words behave in a similar way to monomorphemic words, i.e. coronal fricatives/affricates agree in place of articulation, while other types of CC clusters preserve their place of articulation. As mentioned in section 2., the suffix analysed in this chapter has the form –^{pal}*e*. *Pal* is a floating feature [-back] (cf. Gussmann 1992b), which in Polish is either realised as a glide-like element /j/ after the stem-final consonant, or, in the case of coronal obstruents, a change of their place of articulation to alveolo-palatal. I will not provide a detailed analysis of the realisation of the suffix -^{pal}e[29] on each consonant of Polish. For a more detailed analysis and a historical development see Rochoń (2000, ch. 4)[30] or Sanders (2003). My focus here is on the prefix/suffix asymmetry. In the discussion below, I will use a cover constraint FAITHAFFIX (Ussishkin 2005) to account for the palatalisation of stem-final consonants. FAITHAFFIX requires that material belonging to an affix be realised faithfully. FAITH is used as a cover term for the following correspondence-theoretic constraints (Ussishkin 2005: 193):

103. MAXAFFIX: Every input segment affiliated with an affix has a correspondent in the output.

DEPAFFIX: Every output segment affiliated with an affix has a correspondent in the intput

IDENTAFFIX: Correspondent affixal segments have identical featural specifications.

Note, however, that in Polish the suffix -^{pal}e consist of a segment and a floating feature. According to the definition of MAXAFFIX above, the constraint is satisfied as long as the vowel /e/ is realised on the surface even if the floating feature has no correspondent on the surface. Below, I will redefine the FAITHAFFIX constraints proposed by Ussishkin so that they refer to segments as well as features associated with affixes.

104. MAXAFFIX: Every input segment and feature affiliated with an affix has a correspondent in the output.

DEPAFFIX: Every output segment and feature affiliated with an affix has a correspondent in the intput

IDENTAFFIX: Correspondent affixal segments and features have identical featural specifications.

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[29] The other option would be to analyse –^{pal}e as *–je*, i.e. the suffix would retain its underlying form /je/ after labials (and velars which are not discussed in this thesis), however, in case of coronals the glide would trigger palatalisation of the preceding consonant and merge with it. This analysis runs into a problem as it would indicate that clusters like /tj/ are not permitted in Polish and they must merge into the corresponding palatal fricative/affricate like /tɕ/. Polish, however, allows /Cor+j/ clusters, e.g. *[dj]abeł* (devil, nom. sg.).

[30] Zsiga (2000) provides a phonetic explanation leading to the development of secondary palatlised coronals into palatal consonants, i.e. during the transition from C to the following /j/ a /ɕ/-like element is created. This element may become quite long and thus more prominent than /j/.

I assume that FAITHAFFIX will cover the three constraints as defined in 104. above. FAITHAFFIX must outrank PRESERVEPLACE, which is shown in the tableau below:

105. FAITHAFFIX >> PRESERVEPLACE

sp] +^{pal}e	FAITHAFFIX	PRESERVEPLACE
☞ spʲ]+e		*
ɕpʲ]+e		**!
sp]+e	*!	

In both cases, the suffix affects the place of articulation of the stem-final consonant by triggering its palatalisation. However, in the second candidate, palatalisation also spreads to the stem penultimate consonant.

As mentioned above, the spreading of palatalisation from C_2 to C_1 in suffixed words is not always blocked. It takes place if both stem-final consonants are coronal fricatives/affricates. However, these cases do not provide a ranking argument between FAITHAFFIX and AGREEPLACE$_{\text{CONTIN, CORONAL}}$ since palatalisation is realised on at least one consonant in both cases. Whether these two constraints are ranked with respect to each other or not, the fully assimilated cluster is the winner.

106. FAITHAFFIX, AGREEPLACE$_{\text{CONTIN, CORONAL}}$ >> PRESERVEPLACE

st] +^{pal}e	FAITHAFFIX	AGREEPLACE$_{\text{CONTIN,}}$ CORONAL	PRESERVEPLACE
stɕ]+e		*!	
☞ ɕtɕ]+e			**
st]+e	*!		

The ranking so far looks as follows:

107.
VOICING grammar
\>>
ALIGN-LEFT(F,STEM), FAITHAFFIX
\>>
PLACE grammar

The above ranking accounts for the realisation of consonant clusters in monomorphemic, prefixed and suffixed words. The VOICING grammar is top-ranked since voicing assimilation in Polish overrides prosodic and morphological boundaries. By ranking ALIGN-LEFT(F,STEM) above the PLACE grammar, we achieve the asymmetric behaviour between prefixed words vs. the monomorphemic and suffixed ones. The Alignment constraints refer only to the left edge of the stem and that is why we find clusters like /s+ç/ only across the prefix-stem boundary, while in monomorphemic and suffixed words such clusters must agree in their place specification. Similarly, FaithAffix must outrank PreservePlace to ensure the realisation of the floating feature present in the suffix.

The data suggests, however, that there is a strict ranking FaithAffix >> Align-Right(F,Stem). When the suffix -^{pal}*e* is added to a stem, the stem final consonant (cluster) is always affected, e.g. *mo[st]* → *mo[çtç]+e* (bridge nom./loc.). The floating palatal feature, which is a part of the suffix, travels from the suffix to the stem changing the place of articulation of the stem-final consonant (cluster). Anytime the floating feature is realised, Align-Right(F,Stem) is violated, which indicates that Align-Right(F,Stem) must be dominated by FaithAffix.

108. FaithAffix >>Align-Right(F,Stem) >> AgreePlace$_{\text{contin, coronal}}$

st] +^{pal}e	FaithAffix	Align-Right(F,Stem)	AgreePlace$_{\text{contin, coronal}}$
stç]+e		*	*!
☞ çtç]+e		*	
st]+e	*!		

Note that Align-Right(F,Stem) is violated whether only the stem-final consonant is palatalised, as in *stç]+e*, or whether the whole cluster is palatalised, as in *çtç]+e*. The final decision is made by AgreePlace$_{\text{contin, coronal}}$, which selects the fully assimilated *çtç]+e* as the winner.

The ranking FaithAffix >>Align-Right(F,Stem) >> AgreePlace$_{\text{contin, coronal}}$ >> PreservePlace also accounts for the lack of assimilation of C_1 in stem-final clusters, where C_2 is a nasal or a labial, e.g. /sn/ or /sp/. In these clusters, the highly ranked FaithAffix will force palatalisation of the stem-final nasal or labial. There is, however, no constraint in the grammar that would propagate the spread of palatalisation from the stem-final nasal or labial to the preceding consonant. AgreePlace$_{\text{contin, coronal}}$ does not apply to these clusters: nasals are [-contin] and labials are [-coronal]. Thus, any consonant preceding stem-final nasals or labials will surface unchanged due to PRESERVEPLACE. This is represented in the tableau below:

109. FAITHAFFIX >>ALIGN-RIGHT(F,STEM) >>AGREEPLACE$_{\text{CONTIN, CORONAL}}$>> PRESERVEPLACE

sp] +^{pal}e	FAITHAFFIX	ALIGN-RIGHT(F,STEM)	AGREEPLACE$_{\text{CONTIN,}}$ CORONAL	PRESERVE PLACE
☞ spʲ]+e		*		*
ɕpʲ]+e		*		**!
sp]+e	*!			

There is no ranking argument between ALIGN-LEFT(F,STEM) and FAITHAFFIX. The prefix *z-* satisfies both constraints as long as it is realised on the surface without taking on the place features of the stem-initial consonant:

110. FAITHAFFIX, ALIGN-LEFT(F,STEM) >> AGREEPLACE$_{\text{CONTIN, CORONAL}}$

z+ [ʑ	FAITHAFFIX	ALIGN-LEFT(F,STEM)	AGREEPLACE$_{\text{CONTIN,}}$ CORONAL
☞ z+ [ʑ			*
ʑ+ [ʑ	*!	*	

Note that FAITHAFFIX was partly introduced to ensure the realisation of the floating feature present in the suffix. Polish does not have prefixes with floating features and so no ranking argument can be established between FAITHAFFIX and ALIGN-LEFT(F,STEM). The question arises whether the lack of prefixes with floating features is an accidental gap or whether it results from the fixed ranking ALIGN-LEFT(F,STEM) >> FAITHAFFIX. The problem is that since there are no inputs with prefixes containing floating features, the ranking can be neither justified nor disproved. Thus, we do not know whether there really is an asymmetry concerning the ranking of FAITHAFFIX with respect to ALIGN-RIGHT(F,STEM) and ALIGN-LEFT(F,STEM). The only thing we can be sure of is that there is a strict ranking between ALIGN-RIGHT(F,STEM) and FAITHAFFIX. The final ranking looks as follows:

111. VOICING grammar
>>
ALIGN-LEFT(F,STEM), FAITHAFFIX
>>
ALIGN-RIGHT(F,STEM)
>>
PLACE grammar

9. Summary and conclusions

In this chapter, I have supplied experimental data suggesting that clusters resulting from prefixation and suffixation behave differently in terms of place feature spreading from C_2 to C_1. In prefixed words, place does not spread from the stem-initial consonant (C_2) to the prefix-final consonant (C_1). In suffixed words, on the other hand, the place specification travels more freely from C_2 to C_1. This asymmetry between prefixed and suffixed words was explained in terms of language processing. The two major aspects are (Hay 2003):

- *left-to-right processing*: beginnings of words are more important in recognition and therefore tend to be unchanged. That is the reason why the prefix does not take on the place of articulation of the stem-initial consonant. The endings of words play a lesser role in word recognition and so consonants in stem-final position are more prone to be affected by assimilatory processes.
- *preference to process stems before affixes*: it is easier to access stems if there is a clear boundary between the prefix and the stem (hence no assimilation in prefixed words).

The spreading of palatalisation from C_2 to C_1 in suffixed words is affected by the place of articulation of C_2. Place assimilation is most frequently triggered by coronal obstruents. Labials and nasals propagate palatalisation to a much lesser extent than coronal obstruents. The explanation of this asymmetry was sought in phonetics. Acoustically, the onsets of plain and palatalised labials are identical (palatalisation of labials is realised as a separate off glide), hence the lack of assimilation before palatalised labials. The same generalisation applies to the palatal nasal /ɲ/, i.e. it is realised asynchronously as the dental nasal /n/ + the platal glide /j/. Consequently, the onsets of the plain and the palatal nasals do not differ.

The last section of this chapter provided an OT analysis of the prefix-suffix asymmetry in Polish. The aim of this section was to show how functionally based generalisations regarding language behaviour can be captured in a neat an elegant way by a formal grammar. In this respect, formal and functional approaches complement each other. The functional approach tries to find an explanation why a given linguistic phenomenon occurs, while the formal one tries to build a formal modal a given linguistic phenomenon.

There are a few outstanding issues that need further consideration.

- *prosodic structure and prefixation*: In this chapter, I have only looked at the place of assimilation of a monoconsonantal prefix. Needless to say, when a prefix of this shape is added to a verb, the prosodic structure of the prefixed word is unchanged. The following question arises: Is palatalisation less/more frequent if a syllabic prefix (a prefix that constitutes a syllable on its own, e.g. *pod-*) is attached to the stem?
- *correlation between assimilation and stress*. In my data, the prefix always constituted a part of the stressed syllable and it was hardly ever affected by palatal assimilation. Would it be the same if the prefix was in an unstressed syllable? If more contrast is to be preserved in stressed syllable, then we would also expect less assimilation in stressed syllables and more in unstressed ones. This type of positional markedness may also be one of the sources of asymmetry between the degree of assimilation in suffixed and prefixed words. Clusters resulting from suffixation are always either fully or partly contained in the unstressed syllable of the affixed word. Thus, they are in a perceptually less salient position, where less contrast needs to be preserved. Consequently, assimilation is more widespread in suffixed than in prefixed words. Further studies are required to answer these questions.

CHAPTER 4

TRUNCATION IN POLISH[1]

0. Introduction

This chapter examines the formation of truncates in Polish. I analyse a large corpus of hypocoristics, and truncated forms found in school slang. The formation of hypocoristics again indicates that the left edge of the stem is more salient than the right one. A great majority of truncated pet names consist of a portion of material taken from the left edge of the full name. Right-edge oriented hypocoristic formation is less frequent. In the school slang truncation almost all the new forms are left-edge oriented. Thus, the study of Polish truncation reveals that LEFT ANCHORING is preferred over RIGHT ANCHORING. I argue, however, against Nelson (2003), that in spite of this preference, RIGHT ANCHORING cannot be done away with. Polish truncation shows that RIGHT ANCHORING, although rare, cannot be replaced by other ANCHOR constraints, such as ANCHORING to head foot.

The chapter is organised as follows. First, I outline the formation of hypocoristics in Polish and discuss the feature changes affecting them. I show that the formation of truncates is only sensitive to the base stem-edges and disregards any stress or foot boundary information. Further, I provide an OT analysis of Polish truncates. I concentrate on word-minimisation and TETU effects found in truncates. A large portion of this section is devoted to the study of word-medial cluster syllabification and it is demonstrated that Polish optimal syllables obey the Word-Based Syllable Principle (Steriade 1999). In the next sections, I discuss the formation of school slang truncation and the role that RIGHT ANCHORING plays in the formation of truncates.

1. Hypocoristic formation in Polish

This section is largely based on Szpyra (1995). It discusses the formation of both truncated and non-truncated hypocoristics as well as the feature changes affecting Polish hypocoristics, i.e. palatalisation and voicing assimilation.

1.1. Basic facts

Non-truncated hypocoristics are formed by means of attaching of one of the following suffixes[2] to the noun stem:

1. *-ka/ -ek*[3]	Dorot+a	Dorot+ka
	Alfred	Alfred+ek
-cia/ cio[4]	Manuel+a	Manuel+cia
	Melchior	Melchior+cio
-usia/ -uś	Kamila+a	Kamil+usia
	Edward	Edward+uś
-unia/ -unio	Dorot+a	Dorot+unia
	Alfred	Alfred+unio

The same suffixes can be appended to a truncated stem:

2. *-ka/ -ek*	Dorot+a	Dor+ka	Alfred	Al+ek
-cia/ -cio	Manuel+a	Man+cia	Melchior	Mel+cio
-usia/ -uś	Kamil+a	Kam+usia	Edward	Ed+uś
-unia/ -unio	Dorot+a	Dor+unia	Alfred	Al+unio

Truncated stems can also be appended with bare inflectional suffixes *–a/-o*:

3.	Dorot+a	Dor+a	Ignac+y	Ig+o
	Jolant+a	Jol+a	Bolesław	Bol+o

It is also possible to attach more than one diminutive suffix to the stem:

4.	Hilar+y	Hil+ek	Hil+ecz+ek
	Jolant+a	Jol+usia	Jol+uś+ka

---

[1] This chapter is a revised and extended version of Głowacka (2004)

[2] Apart from the suffixes listed in 1., other diminutive suffixes can be used though only sporadically, e.g. *–eńka/-eniek* (Jolant+a → Jol+eńka, Jan → Jasi+eniek), *-ula/-ulek* (Anastazj+a → Nast+ula, Jan → Jasi+ulek), *-uchna* (Anastazj+a → Nast+uchna). Some suffixes attach only to stems ending in a specific consonant, e.g. *–na* attaches only to velar stems (Bogdan+a → Bo[g]+na, Barbara → Ba[x]+na).

[3] Most diminutive suffixes are morphologically divisible into the proper diminutive suffix and the inflectional ending, e.g. *–ka* consists of the diminutive suffix *-k-* and the inflectional ending *–a*.

[4] In Polish orthography, the letter <i> in CiV indicates palatalisation of the preceding consonant. It does not represent a separate vowel sound.

1.2. Consonantal changes in hypocoristics

1.2.1. Voicing assimilation

Stem final obstruents take on the voicing specifications of the following suffix initial consonant. When the suffixes *–[k]a*, *-[t͡ɕ]a/-[t͡ɕ]o* are attached to a stem ending in a voiced obstruent, the obstruent is devoiced. This is a general process affecting the entire Polish vocabulary not only hypocoristics:

5.	I[d]ali+a	I[t+k]a
	Do[b]iesław	Do[p+t͡ɕ]o

1.2.2. Palatalisation

Stem final velars and coronals (except liquids) are palatalised when the endings $-^{pal}a/-^{pal}o$ are attached. This process is characteristic of hypocoristic formation[5]: The following changes take place:

6.	/t/ → /t͡ɕ/	Ger[t]rud+a	Ger[t͡ɕ]+a
	/d/ → /d͡ʑ/	Radosław	Ra[d͡ʑ]+o
	/s/ → /ɕ/	Wie[s]ław+a	Wie[ɕ]+a
	/z/ → /ʑ/	Dy[z]m+a	Dy[ʑ]+o
	/n/ → /ɲ/	Ge[n]owef+a	Ge[ɲ]+a
	/t͡s/ → /t͡ɕ/	Lu[t͡s]jan	Lu[t͡ɕ]+o
	/t͡ʃ/ → /t͡ɕ/	Mie[t͡ʃ]ysław+a	Mie[t͡ɕ]+a
	/ʃ/ → /ɕ/	Ry[ʃ]ard	Ry[ɕ]+o
	/ʒ/ → /ʑ/	Gra[ʒ]yn+a	Gra[ʑ]+a
	/k/ → /t͡ɕ/	Wi[k]tor	Wi[t͡ɕ]+o
	/g/ → /d͡ʑ/	Bry[g]id+a	Bry[d͡ʑ]+a
	/x/ → /ʃ/	Le[x]osław	Le[ɕ]+o

If the truncated stem ends in a cluster of dental/alveolar consonants, the whole cluster is palatalised:

7.	Erne[st]	Ne[ɕt͡ɕ]+o
	Wa[nd]+a	Wa[ɲd͡ʑ]+a

---

[5] It is necessary to distinguish between the inflectional suffixes *–a/-o* and the hypocoristic suffixes $-^{pal}a/-^{pal}o$. The inflectional suffixes do not trigger palatalisation, while the hypocoristic suffixes (containing the floating palatal feature) do. See chapter 3 where the floating palatal features are introduced.

Apart from the palatalisation phenomenon described above, Polish also has a process that replaces stem final consonants (or consonant clusters), regardless of their quality, with the voiceless alveo-palatal fricative /ɕ/. The process affects non-truncated stems:

8.	Zygmu[nt]	Zygmu[ɕ]
	Jadwi[g]+a	Jadwi[ɕ]+a
	Zo[fj]+a	Zo[ɕ]+a
	Ada[m]	Ada[ɕ]
	Anto[ɲ]+i	Anto[ɕ]

as well as truncated stems:

9.	Zbi[gɲ]ew	Zby[ɕ]+o
	Do[r]ot+a	Do[ɕ]+a
	Ka[t]arzyn+a	Ka[ɕ]+a
	Ba[rb]ar+a	Ba[ɕ]+a
	Kie[jst]us	Kie[ɕ]
	He[l]en-a	He[ɕ]+a
	Teo[d]or+a	Teo[ɕ]+a, Te[ɕ]+a
	Sta[ɲ]isław	Sta[ɕ]

Diminutive suffixes can be attached to stems whose final consonant(s) underwent /ɕ/ substitution:

10.	Ba[ɕ]+a	Ba[ɕ]+ka, Ba[ɕ]+unia
	Sta[ɕ]	Sta[ɕ]+ek

Theoretically, we might say that the stem is truncated and the suffix *-ɕ* is attached. Note, however, that in all the examples above, /ɕ/ is always preceded by a vowel. Thus, we would have to assume that *-ɕ* can only attach to V-final stems. That requirement would violate one of the basic rules of Polish morphology, namely, that noun stems must be C-final. Szpyra (1995: 33-34) proposes that stem final consonants are subject to /ɕ/ substitution (and /x/ substitution discussed below) due to the phenomenon of complete melody prespecification in the template of the truncate. I do not agree with this view. /ɕ/ and /x/ substitutions can apply both to truncated and non-truncated names. It might be quite difficult, if not impossible, to set up a template for non-truncated names. There is a great deal of variation in the shape and length of non-truncated hypocoristics. I want to propose that /ɕ/ and /x/ are morphemes consisting solely of floating features. /ɕ/ consists of the floating feature [+pal], just like the other palatalising suffixes discussed above, and additionally of the features [-voice], [+cont] and [-nasal]. The suffix must be fully aligned with the right edge of the stem. No template specification is required and so the same suffix can be used for truncated and non-truncated hypocoristics. Why does /ɕ/ replace the whole stem-final cluster? Theoretically, we might expect only the stem-final consonant to undergo the /ɕ/ substitution, e.g. *Zugmunt* ⟶ **Zygmunɕ*. Note, however, that word-final [-Cɕ] clusters are very rare and there are only two types of such clusters, i.e. [-mɕ] and [-rɕ]. Similarly, word-medial [-Cɕ] cluster are not very frequent either and they occur only on the morpheme boundary with a palatalising suffix *–*^{pal}*e* or *–i*. It might be possible to substitute only the stem-final consonant with /ɕ/ and preserve the remaining stem-final consonants. However, in most instances, the resultant cluster would violate Polish phonotactic restrictions. Based on these generalisations, language users build a paradigm of hypocoristic formation, where the stem-final consonant or consonant cluster is fully replaced by /ɕ/. I conclude that due to *Paradigm Uniformity*, stem-final clusters always fully undergo /ɕ/ substitution, even in the marginal cases where the resultant cluster would be an acceptable one.

1.2.3. Depalatalisation

The suffix *–ek* causes depalatalisation of stem final consonant(s). The process turns the stem final alveo-palatal consonants into their dental or alveolar counterparts:

11.	Da[ɲ]iel	Da[n]+ek
	Ro[ɕt͡ɕ]isław	Ro[st]+ek
	Spy[t͡ɕ]imir	Spy[t]+ek
	Nie[t͡ɕ]isław	Nie[t͡s]+ek
	Go[d͡ʑ]imir	Go[d͡z]+ek

It is questionable whether depalatalisation is triggered by the suffix *–ek*. In all the cases, the palatal consonant in the non-truncated name is followed by /i/, which always triggers palatalisation of the preceding dental. In Polish, sequences like */ti/ or */ni/ are not permitted either stem-internally or across stem-boundaries. I assume that the stem-final consonant in the truncate depalatalises because the original trigger of palatalisation, i.e. the following /i/, is no longer present.

Polish also possesses augmentative forms of address which can be used to express one's unfriendly attitude towards the name's bearer or disapproval of their actions. Augmentatives are formed by replacing stem final consonant(s) with the voiceless velar fricative /x/. The process affects non-truncated stems:

12.	Zygmu[nt]	Zygmu[x]
	Jadwi[g]+a	Jadwi[x]+a
	Zo[fj]+a	Zo[x]+a
	Ada[m]	Ada[x]
	Anto[ɲ]+i	Anto[x]

as well as truncated stems:

13.	Zbi[gɲ]ew	Zby[x]+o
	Do[r]ot+a	Do[x]+a
	Ka[t]arzyn+a	Ka[x]+a
	Ba[rb]ar+a	Ba[x]+a
	Kie[jst]us	Kie[x]
	Małgo[ʒ]at+a	Go[x]+a
	Teo[d]or+a	Teo[x]+a, Te[x]+a
	Sta[ɲ]isław	Sta[x]

Diminutive suffixes can be attached to stems whose final consonant(s) underwent /x/ substitution. Thus derived form has the semantic\pragmatic meaning of a hypocoristic:

14.	Ba[x]+a	Ba[x]+na
	Sta[x]	Sta[x]+unio
	Zby[x]	Zby[x]+unio

As with /ç/ substitution discussed above, I assume that /x/ is a morpheme that consists of a bundle of features. The only difference between /ç/ and /x/ is that /x/ is specified as [-pal].

2. The prosodic form of Polish truncates

According to McCarthy & Prince (2001), in languages without quantity distinctions, the minimal phonological word must be bisyllabic. I want to argue that truncation reveals the shape of the minimal prosodic word in Polish, i.e. that of a bisyllabic foot.

Thus, a typical truncate consists of two syllables. In truncates with V-initial suffixes, the first syllable corresponds to one of the edges of the base stem. The second syllable contains an additional base consonant and a morphological ending (ME)[6]:

15.	A.ga.t+a	A.g+a
	Bal.ta.zar	Bal.t+ek
	Ma.tyl.d+a	Tyl.d+a

In truncates with C-initial suffixes, the first syllable corresponds to one of the edges of the base stem, while the second syllable is the ME:

16.	Al.fred	Al.+cio	*Al.f+cio
	Do.ro.t+a	Dor.+ka	
	Mal.wi.n+a	Win.+ka	
	Del.fi.n+a	Del.+ka	*Del.f+ka

The main difference between the two forms of truncates is that in truncates with C-initial suffixes only one stem consonant is preserved, while in truncates with V-initial suffixes two stem consonants are preserved.

2.1. Truncates with disyllabic suffixes

Once we add a disyllabic suffix, such as *-unia*, to the truncated stem, the resultant hypocoristic will be trisyllabic. It should be pointed out that the disyllabic suffixes are much less frequent than the monosyllabic ones: there is always a monosyllabic alternative suffix, whereas the reverse is not the case. Also, the disyllabic suffixes express a greater degree of familiarity than the monosyllabic ones, in particular *–a/-o* and *–ka/-ko*. I assume that the disyllabic truncates containing the monosyllabic suffix are the unmarked cases and they provide the basis for the formation of truncates with disyllabic suffixes. Any truncate with a disyllabic or longer suffix is built on the stem formed for the truncates with monosyllabic suffixes. Thus, the monosyllabic suffixed truncates and disyllabic suffixed truncates are related to each other via the output-output correspondence, e.g. *Do.ro.t+a* → *Do.r+a* → *Do.r+u.nia*.

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[6] As mentioned in section 1., Polish abounds in diminutive suffixes, many of which are used sporadically. I will concentrate on the ones that are truly productive and most frequent. I will use the suffixes *–a/-ka* for feminine truncates and *–o/-ek* for masculine truncates.

2.2. Formation of truncates

There are two alternative ways of forming truncates in Polish: stem initial truncation and stem final truncation. In what follows, I will call stem initial truncation Type A truncation and stem final truncation Type B truncation. The generalisations are drawn on a database containing 556 truncated names where 60% are Type A truncates, 35% Type B truncates and 5% other (see APPENDIX 23):

17.	*Base*	*Type A*	*Type B*
	Dag(már+a)	(Dág+a)	(Már+a)
	Prak(séd+a)	(Prákę+a)	(Séd+a)
	Mo(ník+a)	(Móni+a)	(Ník+a
	Fer(dýnand)	(Férd+ek)	(Nánd+ek)
	Il(défons)	(íld+ek)	(Fóns+ek)
	Ha(lín+a)	(Hál+a)	
	Ag(nészk+a)	(Ág+a)	
	Ar(kádiusz)	(Ár+ek)	
	Be(nédykt)	(Bén+ek)	
	Klo(týld+a)		(Týld+a)
	(Gèor)(gín+a)		(Gín+a)
	Do(brógost)		(Góst+ek)
	(Bálbin)		(Bín+ek)

2.2.1. Type A truncation

In Type A truncates, the left edge of the truncate coincides with the left edge of the base. Consequently, if the base is onsetless, the truncate will have no onset either. On the other hand, if the base begins with a very complex consonant cluster, that cluster will be fully preserved in the truncate:

18.			
	V-initial	Alin+a	Al+a
	C-initial	Danut+a	Dan+a
	CC-initial	Skarbimir	Skarb+ek
	CCC-initial	M[ɕt͡ɕ]isław	M[ɕt͡ɕ]is+ek

The base is shortened to form, together with the ME, a disyllabic word. No elements are skipped while copying from the base into the truncate. The syllabification of the base does not determine the syllabification of the truncate. Type A truncates preserve minimally one consonant and maximally two consonants in its stem final position:

19.	a. C-final	O.(dý.li+a)	(Ó.d+a)	
		Ce.(lí.n+a)	(Cé.l+a)	
		Hi.(pó.lit)	(Híp.+cio)	
		Ste.(fá.ni+a)	(Stéf.+cia)	
		(Szczé.pan)	(Szczé.p+ek)	
	b. CC-final	Al.(dó.n+a)	(Ál.d+a), (Á.l+a)	
		Ok.(sá.n+a)	(Ók.si+a)	
		An.(tó.n+i)	(Án.t+ek)	
		Bal.(tá.zar)	(Bál.t+ek)	
		(Krýs.pin)	(Krýs.p+ek)	
		Ger.(trú.d+a)	(Gér.t+a)	*(Gér.tr+a)
		Am(bró.ż+y)	(Ám.b+ek)	*(Ám.br+ek)

2.2.2. Type B truncation

In Type B truncation, the right edge of the truncate stem coincides with the right edge of the base stem:

20.	a. C-final	Al.(dó.n+a)	(Dó.n+a)
		(Àn.to).(ní.n+a)	(Ní.n+a)
		(Gót.fryd)	(Frý.d+ek)
	b. CC-final	Do.(bró.gost)	(Gós.t+ek)
		Lam.(bér.t+a)	(Bér.t+a)
		Fer.(dý.nand)	(Nán.d+ek)
		(Ál.brecht)	(Bréch.t+ek)

No elements are skipped while copying from the base into the truncate. The syllabification of the base does not determine the internal syllabification of the truncate. However, the syllabification of the base has an impact on the formation of Type B truncates: the left edge of the truncate generally coincides with the left edge of the last full syllable of the stem:

21.	a. V-initial	Jo.(án.n+a)	(Ási.+a)
	b. C-initial	A.(ná.tol)	(Tó.l+o)
		Bo.(żý.dar)	(Dá.r+ek)

c. CC-initial	Ger.(trú.d+a)	(Trú.d+a)
	Man.(fré.d+a)	(Fréd.+ka)
	Am.(bró.ż+y)	(Bró.ż+ek)
	(Mél.chior)	(Chió.r+ek)

It seems that only CC clusters with a sharp rise in sonority are preserved initially in Type B truncates (this point will be revised below):

22.	Krys.pin	Pi.n+ek	*Spi.n+ek
	Dag.ma.r+a	Ma.r+a	*Gma.r+a
	An.zelm	Zel.m+ek	*Nzel.m+ek
	Lu.kre.cj+a	Kre.ci+a	

2.2.3. Variation

In general, the maximum of two base consonants are preserved in the truncate stem final position. In some cases, however, only one medial consonant is preserved in the truncate even though the base contains two. This type of variation applies to medial resonant + obstruent clusters:

23.	*Type A*		*Type B*	
	Arkadiusz	Ar+ek		
	Manfred	Mani+ek	Hortensj+a	Teni+a
	Alfons	Al+ek	Adolf	Dol+ek

On the other hand, there are numerous examples where truncates preserve both the resonant and the obstruent present in the base form:

24.	*Type A*		*Type B*	
	Alfred	Alf+ik	Lambert+a	Bert+a
	Sylwester	Sylw+ek	Gryzeld+a	Zeld+a
	Anton+i	Ant+ek	Ferdynand	Nand+ek
	Gertrud+a	Gert+a		

Some names give rise to two truncated stems:

25.	*Type A*		*Type B*	
	Albert	Al+ek/ Alb+ek	Matyld+a	Tyl+a/ Tyld+a
	Sambor	Sam+ek/ Samb+ek	Rajnold	Nol+ek/ Nold+ek
	Gerwaz+y	Ger+ek/ Gerw+ek		
	Anzelm	An+ek/ Anz+ek		

2.3. Why Type B truncation cannot be reduced to prosodic head faithfulness

Consider the examples:

26.	Klo.(týl.d+a)	(Týl.d+a)
	Lam.(bér.t+a)	(Bér.t+a)
	Mar.(lé.n+a)	(Lé.n+a)
	Mo.(ní.k+a)	(Ní.k+a)
	Ok.(sá.n+a)	(Sá.n+a)
	Prak.(sé.d+a)	(Séd.+ka)
	A.(ní.t+a)	(Ní.t+a)
	Bal.(bí.n+a)	(Bí.n+a)
	Dag.(má.r+a)	(Má.r+a)
	Am.(bró.ż+y)	(Bró.ż+ek)
	Bar.(ná.b+a)	(Ná.b+ek)
	Pan.(krá.c+y)	(Krá.c+ek)

The above examples might indicate that truncation is sensitive to the prosodic structure of the base: the truncated forms are copies of the head foot in the base form. The hypothesis that truncates are faithful to the base prosodic head would not, however, account for the formation of the following hypocoristics, where only the final unstressed syllable is preserved in the truncate:

27.	(Zýg.fryd)	(Frý.d+ek)
	(Wíl.helm)	(Hél.m+ek)
	(Nór.bert)	(Bér.t+ek)
	(Mán.fred)	(Fré.d+ek)
	(Já.kub)	(Kú.b+a)
	(Mél.chior)	(Chió.r+ek)
	(Lón.gin)	(Gí.n+ek)
	(Krýs.pin)	(Pí.n+ek)
	Do.(bró.gost)	(Gós.t+ek)
	Fer.(dý.nand)	(Nán.d+ek)

Furthermore, the hypothesis that the formation of truncates is sensitive to foot boundaries in the base would incorrectly predict the following forms:

28.	a.	Ar.(ká.diusz)	*(Ká.d+ek)	(Á.r+ek)
		Be.(né.dykt)	*(Né.d+ek)	(Bé.n+ek)
	b.	Do.(bró.gost)	*(Bró.ż+ek)	(Gós.t+ek)
		Do.(mí.nik)	*(Mí.n+ek)	(Ní.k+o)

c. Fer.(dý.nand) *(Dý.n+ek) (Fér.d+ek), (Nán.d+ek)

All the above base forms are trisyllabic with the primary stress falling on the penult. We might expect this particular syllable to be preserved in the truncate. However, we actually find the opposite, i.e. it is the first or/and the last syllable that is preserved in the truncate and not the stressed penult.

There is one important morphological difference between the nouns in 26 and nouns in 27 and 28. All the bases in 26 contain an overt inflectional ending, while those in 27 and 28 do not. Consequently, stress is assigned to different stem syllables in names with an overt inflectional ending and in names with a zero inflectional ending. In 26, the stem is followed by a monosyllabic suffix. Thus, the last syllable of the stem occupies the penultimate position in the word and so it receives the primary stress. In 27 and 28, the stem is not followed by any affixes and so the stress falls on the penultimate syllable of the stem. It is only a coincidence that in some cases the base head foot and the truncate overlap. The theory that truncation in Polish is sensitive to stem boundaries provides a unified account of all the cases discussed in this chapter. These generalisations go against a proposal recently put forward by Nelson (2003). Nelson suggests that no reference to the right edge of the base is necessary in the formation of truncates as all the cases of the 'apparent' right-edge oriented truncation can be accounted for by head-foot faithfulness. A full discussion of Nelson's proposal is in section 6 below.

3. An OT account of Polish truncation

This section provides an OT analysis of Polish truncates. First, I present the model. I argue that Polish truncates obey the word-minimality requirement and that the shape of the Minimal Polish word is that of a bisyllabic trochee. Next, I study the syllabification of word-medial clusters in the formation of Type B truncates. Lastly, I show that Polish hypocoristics show a number of TETU effects, e.g. *COMPLEXSYLL, that are best analysed in terms of Positional Markedness.

3. 1. The model (adopted from Itô & Mester 1997)

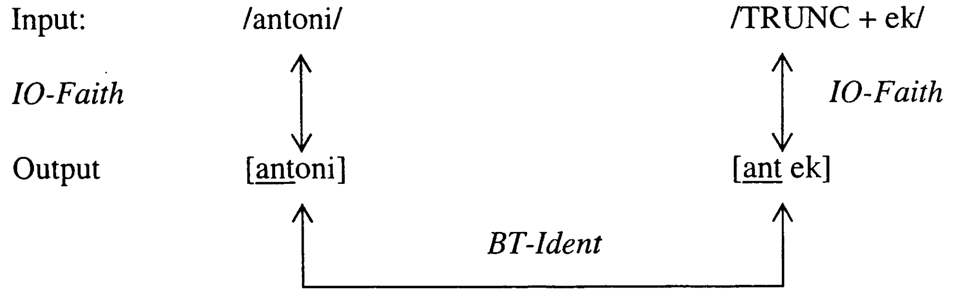
Itô & Mester (1992) introduce the idea of a non-templatic approach to so-called templatic effects. It is shown that the considerable prosodic variety of truncated forms can be reduced to a very simple core: they are all instances of the unmarked prosodic word (PWord) of the language. It is demonstrated that the notion of 'unmarked PWord' cannot adequately be captured by some kind of templatic pool – rather it must be formally expressed by a set of constraints leaving a certain amount of variation space: hence the observed variety of prosodic shapes.

Further developed within OT under the slogan 'Emergence of the Unmarked' (McCarthy & Prince 1994, 1995) for reduplication, this approach has given rise to a nontemplatic analysis of truncation (Benua 1995) schematically summarised below with structural markedness constraints sandwiched between dominant IO-Faithfulness and dominated truncation specific Faithfulness.

29. *general-purpose maximiser*		*size restrictors*		*truncation-specific maximiser*
MAX-IO	>>	e.g., ALL-FT-R, PARSE-σ, FT-BIN, etc.	>>	MAX-BT

The analysis below builds on the idea that truncation is governed by OO-Identity constraints – here, MAX-B(ase)-T(runcatum) – on the correspondence between the truncate and its base, not by IO-FAITH constraints (e.g. MAX-IO).

30.



3.2. Word minimisation in Polish truncation

In their study of Diyari reduplication, McCarthy and Prince (1994) find that the reduplicant exhibits a form which happens to coincide with the Minimal Word (MinWd) in this language: $(\sigma\sigma)_{Ft}$. They propose that MinWds are unmarked PWords. According to McCarthy & Prince (2001), in languages without quantity distinctions the minimal PWord must be a bisyllabic foot[7]. Similarly, Downing (2005) argues that the unmarked shape of a truncate is two syllables. Thus, in Polish, the unmarked minimal PWord arises when the following PWord-Restrictor constraints are strictly respected. A detailed discussion of these constraints can be found in chapter 2 where stress in Polish is analysed:

31. *PWord Restrictor Constraints*:

PARSE-SYLL:	*Parse syllables*
FT-BIN:	*Foot Binarity*
RIGHTMOST	*Align (Hd-Ft, R, MWd, R)*
ALL-FT-L	*All Feet Left*
FT-FORM=T:	*Trochaic Foot Form*

Perfect satisfaction of the PWord-Restrictor constraints is only possible when the PWord contains a single binary foot. Word minimality is enforced when the PW-Restrictor constraints dominate the faithfulness constraint MAX-BT. The tableaux below illustrate the operation of the PWord-Restrictor constraints. MAX-IO is not included. A hypothetical trisyllabic candidate will violate FT-BIN if all the syllables are parsed (candidates (a) and (b)). If it contains only a single binary foot, it will violate PARSE-SYLL because one of the syllables will remain unparsed (candidates (c) and (d)). The winner is candidate (e) which, in spite of violating MAX-BT, satisfies the two PWord-Restrictor constraints.

---

[7] This requirement does not seem to be met by many Polish (content) words of the shape (C)VC with only one syllable, e.g. *dom* (house, nom. sg.). Most of these monosyllabic words are masculine nouns in the nominative or accusative case with no overt inflexional ending. In other cases a suffix is attached and the noun surfaces as disyllabic, e.g. *dom+u* (house, gen. sg.). Following, e.g. Gussmann & Kaye (1993), Gussmann (1997), Rowicka (1999), I assume that (C)VC nouns are disyllabic with the second nucleus surfacing only in certain cases. I assume that the unmarked minimal PWord in Polish is a trochaic foot.

32. FT-BIN, PARSE-SYLL., >> MAX-BT

Input: σσσ	FT-BIN	PARSE-SYLL	MAX-BT
a. (σ)(σ́σ)	* !		
b. (σσ)(σ́)	* !		
c. (σ́σ)σ		* !	
d. σ(σ́σ)		* !	
☞ e. (σ́σ)			σ

A 4-syllable candidate illustrates the operation of RIGHTMOST and ALL-FT-L. I will not discuss FT-FORM=T, which is top-ranked in Polish even in non-truncated words. Similarly, I will not discuss RIGHTMOST, which can be violated only in a certain class of borrowings (see chapter 2).

33. ALL-FT-L>> MAX-BT

Input: σσσσ	ALL-FT-L	MAX-BT
a. σ (σ́σ)σ	*!	
b. (σ̀σ)(σ́σ)	*!*	
☞ c. (σ́σ)		σσ

ALL-FT-L is violated by any candidates that contain any feet misaligned with the left edge. In candidate (a), the head foot is misaligned with the left edge by one syllable and in candidate (b) by two syllables. The winner is candidate (c) which satisfies ALL-FT-L but violates MAX-BT by not preserving all the input material.

According to the model presented in 30, PWord-Restrictor constraints should be ranked between MAX-IO and MAX-BT. Thus, the ranking MAX-IO>> PWORD-RESTRICORS >>MAX-BT is the hallmark of truncation. This is represented below with a real example:

34. MAX-IO >> FT-BIN, PARSE-SYLL >> MAX-BT

Base: fer.dy.nand Input: /TRUNC + ek/	MAX-IO	FT-BIN	PARSE-SYLL	MAX-BT
a. dy.(nán.d+ek)			*!	fer
b. (dỳ.)(nán.d+ek)		*!		fer
☞c. (nán.d+ek)				ferdy
d. (án.d+ek)				ferdyn!
e. (dý.nand)	-ek!			fer

As in case of German (Itô & Mester 1997), in Polish truncation, the morphological ending (the suffix *–ek* in the tableau above) is the only input element to reckon with. Any candidate that does not contain this suffix violates MAX-IO. TRUNC is an empty morpheme whose form is governed by the PWord-Restrictor constraints sandwiched between MAX-IO and MAX-BT. The preservation of base segments in the truncate is regulated by low ranking of MAX-BT. If we look at the above tableau, we will see that candidate (e) violates the top-ranked MAX-IO. Candidates (a) and (b) are trisyllabic, thus violating the PWord-Restrictor constraints. MAX-BT selects as the winner candidate (c) as it preserves more base material than candidate (d).

3.3. Deriving the differences between Type A and Type B truncates

I assume that there are no separate grammars for the two types of truncates. There is only one grammar for Polish truncates. Further, Type A/B specifications are a part of the input, in the same manner as morphological endings are. Effectively, there are three elements of the input: the empty morpheme /TRUNC/, a morphological suffix and the truncate type specification.

3.4. ANCHORING and CONTIGUITY

The main argument I want to defend is that the formation of truncates in Polish is sensitive to the edges of the base stem. Related to this issue is the proposal made by McCarthy & Prince (1995, 2001) that the reduplicant and the base must share an edge element, initial in prefix reduplication, final in suffix reduplication. Similarly, in many languages (e.g. Nelson 2003), the forms resulting from truncation anchor to either/or both edge(s) of the base. In Polish, Type A truncates always anchor to the left edge of the base. The following ANCHORING constraint (McCarthy & Prince 1995) is visible in Type A truncates in Polish (subject to revision):

35. ANCHOR-BT-L: *Anchor the left edge of the Base (subject to revision)*
Any element at the left periphery of the base has a correspondent at the left periphery of the Truncate.

Under this definition, any forms that do not strictly obey ANCHOR-BT-L are disallowed:

36. Celin+a *El+a
Florentyn+a *Lor+a, *Ren+a
Benedykt *Ned+ek

In Type B truncation, the right edge of the truncate stem is anchored to the right edge of the stem base. Here, if ANCHORING referred to the right edge of the base rather than the right edge of the stem, then any suffixes present in the base would have to be preserved in the truncate, e.g. *Ambroż+y* → **Broż+y+ek* (instead of *Broż+ek*). Thus, the following ANCHORING constraint operates in Type B truncates:

37. ANCHOR-BT-R: *Anchor the right edge of the Base stem*
Any element at the right periphery of the base stem has a correspondent at the right periphery of the Truncate stem.

At this point, it may seem that LEFT and RIGHT ANCHORING refer to the edges of different categories, i.e. ANCHOR-BT-L refers to the MWord edge, while ANCHOR-BT-R refers to the stem edge. In Polish, prefixation does not apply to proper names. Consequently, the left edge of the base always coincides with the left edge of the stem. Thus, the definition of ANCHOR-BT-L can be reformulated in the following way:

38. ANCHOR-BT-L: *Anchor the left edge of the Base stem (revised version)*
Any element at the left periphery of the base stem has a correspondent at the left periphery of the Truncate stem.

Both LEFT and RIGHT ANCHORING refer uniformly to stem edges. The only difference between Type A and Type B truncates is that they anchor to different stem edges.

Following the model schematically represented in section 3.1. above, ANCHOR constraints must be sandwiched between MAX-IO and MAX-BT, just like PWord-Restrictor (PWR)[8] constraints:

39. MAX-IO >> ANCHOR-BT-L, PWR >> MAX-BT

Base: Ferdynand Input: TRUNC + ek$^{\text{Type A}}$	MAX-IO	ANCHOR-BT-L	PWR	MAX-BT
☞ a. (Fer.d+ek)				ynand
b. (Fe.r+ek)				dynand!
c. (Dy.n+ek)		*!		fer and
d. Fer.(dy.n+ek)			PARSE-SYLL ALL-FT-L	and

---

[8] In the rest of this chapter, I will represent all five PWR constraints, i.e. FT-FORM=T, FT-BIN, PARSE-SYLL, RIGHTMOST, ALL-FT-L, in one column under the heading PWR. If there is a violation of one or more of them, I will specify in the tableau which constraint is violated.

Candidate (c) fails ANCHOR-BT-L. Candidate (d) is trisyllabic and so the initial syllables remains unfooted, which incurs a violation of PARSE-SYLL and ALL-FT-L. The remaining two candidates satisfy ANCHOR-BT-L as well all the PWR. However, the winner is candidate (a) because it preserves more base material than candidate (b).

The same ranking will produce the right output for Type B truncation:

40. MAX-IO >> ANCHOR-BT-R, PWR >> MAX-BT

Base: Ferdynand Input: TRUNC+ek$^{\text{Type B}}$	MAX-IO	ANCHOR-BT-R	PWR	MAX-BT
☞ a. (Nan.d+ek)				Ferdy
b. (An.d+ek)				Ferdyn!
c. (Na.n+ek)		*!		Ferdyn [illegible]
d. Dy.(nan.d+ek)			PARSE-SYLL ALL-FT-L	Fer

There is another candidate that appears in neither of the above tableaux:

41. MAX-IO >> ANCHOR-BT-L, PWR >> MAX-BT

Base: Ferdynand Input: TRUNC+ek$^{\text{Type A}}$	MAX-IO	ANCHOR-BT-L	PWR	MAX-BT
☞ a. (Fer.d+ek)				ynand
b. (Fe.r+ek)				dynand!
☜ c. (Fen.d+ek)				rdyna

All the candidates satisfy ANCHOR-BT-L and PWR. Candidate (b) fails MAX-BT, but the remaining two candidates tie on this constraint. However, in candidate (c), the undesirable winner, the linear ordering of segments of the base is not preserved in the truncate. It is vital not to skip any segments when copying from the base into the truncate. Candidate (c) does not meet this requirement. It violates CONTIGUITY (e.g. McCarthy & Prince 1995: 371, Benua 1995):

42. CONTIGUITY-BT: *Contiguity between the Base and the Truncate*
The portion of Truncate standing in correspondence to the Base forms a contiguous string.

CONTIGUITY can only be violated when there is a vowel hiatus in the base, which indicates that CONTIGUITY must be outranked by ONSET:

43. ANCHOR-BT-L, ONSET >> CONTIGUITY

Base: Teodozj+a Input: TRUNC+a$^{\text{Type A}}$	ANCHOR-BT-L	ONSET	CONTIGUITY
☞ a. (To.dzi+a)			*
☞ b. (Te.dzi+a)			*
c. (Te+a)		*!	

If CONTIGUITY was above ONSET, then candidate (c), with the onsetless second syllable, would be the winner. Still, the grammar selects two winners, each of them fails CONTIGUITY. Both forms are actually attested in Polish. However, in case of names with the medial vowel hiatus, it is hard to predict which of the two selected forms (if not both) would come into use. The choice seems to be random[9]:

44.	B[ɛ.a]t+a	B[ɛ]ci+a
	L[ɛ.ɔ]nor+a	L[ɔ]ni+a
	T[ɛ.ɔ]dor+a	T[ɔ]dzi+a, T[ɛ]dzi+a
	T[ɛ.ɔ]dozj+a	T[ɔ]dzi-a, T[ɛ]dzi+a
	J[ɔ.a]chim	J[a]kim
	Mat[ɛ.u]sz	Mat[u]sz

Consider, however, the examples below. At the first glance, they might be taken as evidence that ONSET is ranked above ANCHOR-BT-L:

45.	Adolf+a	Dolf+a
	Anit+a	Nit+a
	Eryk+a	Ryk+a

The same truncates can be obtained if we assume that the above examples are cases of Type B truncation rather than of Type A truncation and thus obey ANCHOR-BT-R rather than ANCHOR-BT-L:

---

[9] Another way of avoiding vowel hiatus is glide formation. Strings consisting of a V followed by a high V avoid hiatus by gliding the high vowel, e.g. *P[a.u]lina* → *P[aw]lina* (proper name). Hiatus can also be resolved by glide insertion:

/iV/ → /ijV/	tr[i.ɔ] → tr[i.jɔ]	*trio*
/uV/ → /uwV/	akt[u.a]lny → akt[u.wa]lny	*current*
/Vi/ → /Vji/	kok[a.i]na → kok[a.ji]na	*cocaine*
/Vu/ → /Vwu/	muz[ɛ.u]m → muz[ɛ.wu]m	*museum*

Neither glide formation nor glide insertion applies to strings with non-high vowels, e.g. *p[ɔ.ɛ]ta* (poet), *s[ɛ.a]ns* (show) (Rubach 2000). Thus, vowel elision is the only way to avoid a hiatus of non-high vowels.

46. ANCHOR-BT-R, ONSET

Base: A.dol.f+a Input: TRUNC+a$^{\text{Type B}}$	ANCHOR-BT-R	ONSET
☞ Dol.f+a		
A.d+a	*!	*

Still, there remain cases, where the medial syllable is selected and which cannot be accounted for by ANCHOR-BT-R. It should be pointed out that the truncate is built on the medial syllable only when the base is V-initial:

47.	A.po.lo.ni+a	Po.l+a
	A.nas.ta.z+y	Nas.t+ek
	E.u.fro.zy.n+a	Fru.zi+a
	A.po.li.na.r+y	Po.li

These forms can be produced by the grammar if ONSET is unranked with respect to ANCHOR:

48. ANCHOR-BT-L, ONSET >> PWR

Base: A.po.lo.ni+a Input: TRUNC+a$^{\text{Type A}}$	ANCHOR-BT-L	ONSET	PWR
☞ a. (Po.l+a)	*		
☞ b. (A.p+a)		*	
c. A.(po.l+a)		*	ALL-FT-L! PARSE-SYLL

When ANCHOR-BT-L and ONSET are unranked, all the candidates tie and pass on to PWR, which selects two winners, i.e. candidates (a) and (b). Candidate (c), being trisyllabic, fails ALL-FT-L and PARSE-SYLL. The actual attested form is candidate (a). However, it may simply be a matter of chance which of the forms selected by the grammar survives in the language. In case of *Apoloni+a* → *Pol+a*, the candidate that obeys ONSET is regularly used in language, while in case of *Ewelin+a* → *Ew+a*, it is the candidate that obeys ANCHOR-BT-L that is regularly used in language. It may well be the case that both forms are attested, e.g. *Anastaz+y* → *Anas* or *Nast+ek.*

In vowel initial names, it is not only the vowel that can be dropped in the truncate but the whole initial syllable. This option is not available in C-initial bases:

49.	E[w].fro.zy.n+a	Fru.zi+a	*[w]fru.zi+a
	A[w].gus.ty.n+a	Gus.t+a	*[w]gus.t+a

Truncating only the initial vowel would produce a form with an initial consonant cluster [wfr] or sequence [wgu] that are unattested in Polish.

The above ranking will correctly exclude truncates based on the middle syllable of a C-initial base:

50. ANCHOR-BT-L, ONSET >> PWR

Base: Fer.dy.nand Input: TRUNC+ek$^{\text{Type A}}$	ANCHOR-BT-L	ONSET	PWR
☞ a. (Fer.d+ek)			
b. (Dy.n+ek)	*!		

The winner is candidate (a) since it passes all the constraints. Candidate (b), on the other hand, loses on ANCHOR-BT-L. It is possible for truncates that are formed from a V-initial base not to anchor to the left edge of the base. This is due to the fact that ANCHOR and ONSET are unranked with respect to each other: the candidate that obeys ANCHOR fails ONSET, while the candidate that obeys ONSET fails ANCHOR. Consequently, the two candidates tie. This is not possible in case of truncates formed from a C-initial base. Here, both candidates (the one based on the stem edge syllable and the one based on a medial one) have onsets and so there is only one winner, i.e. the candidate that obeys ANCHOR.

3.5. The onset of Type B truncates

The ranking MAX-IO >> ANCHOR-BT-R >> PWR >> CONTIGUITY >> MAX-BT incorrectly predicts that if a Type B truncate is formed from a base containing a medial consonant cluster, then that cluster should be fully preserved in the truncate, irrespective of its size and complexity:

51. MAX-IO >> ANCHOR-BT-R, CONTIGUITY, PWR >> MAX-BT

Base: Gaspar Input: TRUNC+ek$^{\text{Type B}}$	MAX-IO	ANCHOR -BT-R	CONTIGUITY	PWR	MAX-BT
☜ a. (Pa.r+ek)					gas!
☞ b. (Spa.r+ek)					ga

MAX-BT automatically selects *Spa.r+ek* because it preserves more base material than *Pa.r+ek*, which is the attested form. *Spa.r+ek* cannot be ruled out by any Polish specific phonotactic constraint since word initial /sp/ clusters are common in Polish.

Neither is it the case that structures with branching syllable nodes are prohibited in Polish truncates, as happens, e.g. in Spanish (cf. Pineros 2000). Polish allows Type B truncates with a branching onset in the first syllable, e.g. *Manfred+a → Fred+ka*. The following singleton onsets are found in Type B truncates formed from bases with medial clusters:

52. R – resonant, O – obstruent, N - nasal

a.	RR	He[n.r]yk+a	[r]yk+a
		Ko[n.r]ad	[r]ad+ek
		Ma[r.l]en+a	[l]en+a
		Sza[r.l]ot+a	[l]ot+a
		He[r.m]an	[m]an+ek
		Ra[j.m]und	[m]und+ek
b.	RO	Wi[l.x]elm	[x]elm+ek
		Ba[l.b]in+a	[b]in+a
		Ho[r.t]ensj+a	[t]eni+a
		A[n.z]elm	[z]elm+ek
c.	OO	Ga[s.p]ar	[p]ar+ek
		Ju[s.t]yn+a	[t]yn+a
		Ro[k.s]an+a	[s]an+a
		O[k.t]avi+a	[t]+usia
		Ja[d.v]ig+a	[v]ig+a
		E[g.b]ert	[b]erc+ik
d.	ON	Da[g.m]ar+a	[m]ar+a
		Lu[d.m]ił+a	[m]ił+a
		I[g.n]ac+y	[n]ac+ek
		Pa[f.n]uc+y	[n]uci+o

There are only two types of word medial clusters that are fully preserved in the truncate: O + L(iquid) and O + G(lide). No medial RG or NG clusters were found in my data:

53.	OL	Lu[kr]ecj+a	[kr]eci+a
		Eu[fr]ozyn+a	[fr]uzi-a
	OG	Rości[sw]aw	[sw]aw+ek
		Miło[sw]aw	[sw]aw+ek

Only CC clusters that constitute optimal syllable onsets in terms of Syllable Sonority Sequencing, i.e. clusters with a sharp rise in sonority (e.g. Steriade 1982, Clements 1990, Rice 1992, Morelli 1999) are fully preserved in the onset position.

What about medial CCC clusters? In all the CCC medial clusters the syllable boundary is set after the first consonant and the following two consonants are preserved in the truncate:

54.	ROR	Ma[n.fr]ed+a	[fr]ed+ka
		Ge[r.tr]ud+a	[tr]udzi+a
		Pa[n.kr]ac+y	[kr]ac+ek
		Me[l.xj]or	[xj]or+ek
		A[l.br]echt	[br]echt+ek
		A[m.br]oż+y	[br]oż+ek
	OOR	Go[t.fr]yd	[fr]yd+ek
		Zy[k.fr]yd	[fr]yd+ek

In all these cases, truncate initial clusters are OR, as in 53. The only exception is *Sy[kst]us → [t]usi-ek*, This is the only example of a medial OOO cluster. Here, only one O is preserved in the truncate, which suggests that only one O is incorporated into the onset.

3.5.1. Word-Based Syllable Principle

In what follows, I want to propose that the left edge of Type B truncates is determined by Word-Based Syllabification Principle (Steriade 1999). As Steriade points out, syllable edges are domains whose edges lack well-defined perceptual correlates, unlike, e.g. PWord boundaries or MWord boundaries. Thus, to discover that *thin+er* is bimorphemic and to discover where the morpheme boundary is, the learner must process the paradigmatic knowledge that *thin+er* is related to *thin*. The process of learning syllables is fundamentally different because it cannot be assisted by paradigmatic reasoning of this sort. Since syllable structure cannot be supported by many perceptual correlates, the learning of syllable structure must proceed by exploiting the assumption that syllable edges bear a structural similarity to the edges of better known constituents, such as words. This is the core of Steriade's Word-Based

Syllables hypothesis[10]. Basically, speakers rely on inference when they try to locate word-medial syllable boundaries and one guideline in the process is the similarity between word edges and syllable edges. Speakers will opt for parses that maximize the similarity of word edges (whose structure is known) to syllable edges (which are to be discovered). As Steriade points out, her approach is similar to the earlier *Legality Principle* (Hooper 1972, Pulgram 1970) that states that syllable edges must represent possible word edges. A critical difference between the two approaches is that for Steriade, the similarity between word and syllable edges is a heuristic guideline – one among others – in a process of inference. Other factors involved in establishing syllable edges may be ease of articulation or ease of perception. The Word-Based Syllable hypothesis predicts that in circumstances where multiple guidelines to division conflict, the conflict will be reflected in increased response variability to tasks like hyphenation. This is exactly what can be observed in Polish with respect to medial OR cluster syllabification. Polish has word-initial clusters of the form OR, which might indicate that word-medially such clusters will be syllabified as syllable onsets. However, Polish speakers syllabify sequences like VORV as either VO.RV or V.ORV. Here, we have two factors in conflict: the word-edge guideline, whereby OR clusters should be syllabified as syllable onsets, and ease of articulation, whereby complex onsets should be dispreferred. The result is a non-uniform syllable division of the word-medial cluster by speakers of the same speech community. In the *Legality Principle*, syllable boundaries are not inferred but somehow directly perceived.

How does the Word-Based Syllables hypothesis apply to Polish Type B truncates? I hypothesise that only clusters that are common word-initially will be preserved in Type B truncates. I consulted *The New Spelling Dictionary* (Polański 2002) to check how many words begin with the clusters corresponding to the word-medial clusters above. The dictionary contains 125,000 words including the latest colloquial expressions and borrowings as well as expressions from the specialist jargons. It is a printed dictionary that is regularly updated by *Komisja Kultury Języka PAN* (The Polish Academy of Sciences Committee of Language Usage) and *Rada Języka Polskiego* (The Council of

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[10] Cf. also Harris (1994) who suggests that word-medial cluster syllabification is largely influenced by

the Polish Language). Basically, this dictionary is a list of words found in present-day Polish, no definitions are included. A large introduction (about 100 pages) provides detailed rules of Polish spelling and hyphenation. I counted only the occurrence of the basic word containing a given cluster and I disregarded its derivatives. For example, in the case of the noun *ksero* (photocopier), I only counted the noun and not the verb *kserować* (to photocopy) which is based on the noun *ksero*. Below, I summarise the results for word-medial CC clusters that do not have a sharp rise in sonority:

55.	*word-medial cluster*		*number of occurrences word-initially*
a.	RR	He[n.r]yk+a	0
		Ma[r.l]en+a	0
		He[r.m]an	0
		Ra[j.m]und	0
b.	RO	Wi[l.x]elm	0
		Ba[l.b]in+a	0
		Ho[r.t]ensj+a	1
		A[n.z]elm	0
c.	OO	Ga[s.p]ar	~350
		Ju[s.t]yn+a	~490
		Ro[k.s]an+a	12
		O[k.t]awi+a	2
		Ja[d.v]ig+a	2
		E[g.b]ert	1
d.	ON	Da[g.m]ar+a	4
		Lu[d.m]ił+a	2
		I[g.n]ac+y	7
		Pa[f.n]uc+y	0

In most cases, the word-medial clusters occur very rarely word-initially. The only clusters that have the occurrence higher than 10 are [ks], [st] and [sp]. [ks] is found in 12 words, 5 out of which are proper names, 4 are chemical substances and only 3 non-specialist words: *ksywa* (nickname), *ksyknąć* (to nudge) and *ksero* (photocopier). A typical monomorphemic Polish word begins with [kʃ] or [kɕ] rather than [ks]. Thus, theoretically, we might predict that if the base name contained a medial cluster like [kʃ]

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the structure of the existing word-initial clusters.

or [kç], then the cluster should be fully preserved word-initially in Type B truncates. No names with these medial clusters were found in my database.

The [st] and [sp] clusters are very frequent so we might expect these clusters to be fully preserved in Type B truncates. Again, a large number of words beginning with [sp] or [st] result from prefixation, so there is a morpheme boundary between [s] and the following consonant. This fact might encourage the speakers to automatically heterosyllabify word medial [s.p] and [s.t] clusters. There is also a fair number of monomorphemic words beginning with [ʃp] and [ʃt] (around 60 of each type). Most of them are borrowings from German that have been in Polish for a long time (at least a century). This fact may lead speakers to conclude that typical word-initial clusters not containing a morpheme boundary are [ʃp] and [ʃt] rather than [sp] and [st]. Similarly, we might predict that if the base name contained a medial cluster like [ʃp] or [ʃt], then the cluster would be fully preserved word-initially in Type B truncates. No names with these medial clusters were found in my database.

Further, we may hypothesise that non-truncated names beginning with /s/+plosive (P) clusters should be rare. In common nouns, initial /s/P clusters result largely from prefixation. Proper names are not prefixed and so they should hardly ever begin with a /s/P cluster. I consulted the online database[11] of first names found in Polish in order to verify this hypothesis. The database consists of 1478 names and contains names that have only recently been borrowed into Polish, e.g. *Sara*, as well as very obsolete old Slavic names that are no longer in usage. Most of the listed names have separate entries that provide information on the origin of the name. I found 20 names beginning with a /s/P cluster. Only 4 of these names can be still attested in Polish: *Stefan/ Stefani+a*, *Stanisław/ Stanisław+a*. There is one borrowed name *Stell+a*, which I have never come across in Polish. The remaining 15 names are old Slavic names derived from the verbs *strzec* (to protect), e.g. *Strzeżymir* (protector of peace), and *stać się* (to become), e.g. *Stanimir* (the one who brings peace), or from the Old Church Slavic adjective *spyti*

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[11] The database can be found at http://www.skarbczyk.com

(futile), e.g. *Spycigniew* (a person who realises that being angry is futile). Needless to say, all these names are no longer used in present-day Polish.

There were three word medial CC clusters that were fully preserved in Type B truncates:

56.

			occurrences word-initially
OL	Lu[kr]ecj+a	[kr]eci+a	~320
	Eu[fr]ozyn+a	[fr]uzi+a	~100
OG	Rości[sw]aw	[sw[12]]aw+ek	~120

All of these clusters are frequent word-initially in monomorphemic words, and, as the Word-Based Syllable hypothesis predicts, they were syllabified as an onset.

Similarly, none of the medial CCC clusters is attested word-initially. However, the resultant truncate-initial clusters [fr], [tr] [kr] and [br] are frequent word-initially[13]:

57.

			occurrences word-initially
ROR	Ma[n.fr]ed+a	[fr]ed+ka	~100
	Ge[r.tr]ud+a	[tr]udzi+a	~310
	Pa[n.kr]ac+y	[kr]ac+ek	~320
	A[l.br]echt	[br]echt+ek	~180
	A[m.br]oż+y	[br]oż+ek	~180
OOR	Go[t.fr]yd	[fr]yd+ek	~100
	Zy[k.fr]yd	[fr]yd+ek	~100

In conclusion, truncates are words and as such they opt for initial clusters that are widely attested in initial position in other monomorphemic words. I propose to incorporate the Word-Based Syllable Principle (WBS) into the grammar.

Ranking WBS above Max-BT will yield the correct result:

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[12] [sw] cannot be reanalysed as a cluster containing a morpheme boundary, i.e. [s+w]. The prefix is voiced before sonorants, so a prefixed cluster would look as follows: [z+w].

[13] The number of words beginning with [fr] is smaller than the number of words beginning with the remaining clusters. This is due to the fact that the number of /f/-initial words is generally smaller than the number of /t/, /k/ and /b/-initial words.

58. WBS >> MAX-BT

Base: Gas.par Input: TRUNC+ek$^{\text{Type B}}$	WBS	MAX-BT
☞ a. Pa.r+ek		gas
b. Spa.r+ek	*!	ga

Spar+ek incurs a violation of WBS because the initial /sp/ cluster is associated with the onset of prefixed words rather than with the onset of monomorphemic words.

WBS >> MAX-BT also allows for preservation of two consonants in the onset position:

59. WBS >> MAX-BT

Base: Am.bro.ż+y Input: TRUNC+ek$^{\text{Type B}}$	WBS	MAX-BT
☞ a. Bro.ż+ek		am
b. Ro.ż+ek		amb!
c. Mbro.ż+ek	*!	a

Candidate (c) is the only one that contains a cluster not attested word-initially and so it is dismissed by WBS. The final selection is made by MAX-BT, which chooses candidate (a) because it preserves more base segments than candidate (b).

In Type A truncates, WBS does not play any role as here the left edge of the truncate is determined by ANCHOR-BT-L, i.e. the base initial cluster must be fully preserved.

3.5.2. Medial cluster syllabification (Rubach & Booij 1990)

Rubach & Booij (1990) conducted a questionnaire in which they asked native speakers of Polish to divide a number of words into syllables. Their study suggests that word-medial syllable edges are not uniformly identified by speakers. Only medial VRRV and VROV clusters are obligatorily split between syllables, while medial VOOV and VORV clusters can be freely syllabified as either VO.OV, VO.RV, or V.OOV, V.ORV.

The following question arises: why was there so much variation in the syllabification of word-medial clusters in Rubach & Booij's experiments, but no variation in the material preserved initially in Type B truncates. There is one substantial difference between these two sets of data. In Rubach & Booij's experiments, the subjects were only asked to divide the words into syllables; they were not expected to form a new word or perform an infixation task on the tested material. Thus, e.g. when they were asked to divide the word *dobry* (good) into syllables, they had three options: *dobr.y, dob.ry* and *do.bry*. The first option was rejected by all the subjects because that would give rise to an onsetless second syllable. This general preference may be triggered by the fact the vowel immediately following a consonant contains cues about the place of articulation of that consonant (see section 7., chapter 3). Thus, in terms of relative perceptibility, C_2 'belongs' to the following V. Further, /br/ is not frequently attested in word-coda position; /br/ is a possible word-coda but not a frequent one. In case of the latter two candidates, the ratio of answers was 19 (*dob.ry*) to 29 (*do.bry*). Whichever option we choose, we get a syllable whose onset will coincide with an existing word onset, [r] or [br], both of which are frequent. Both syllables, *bry* and *ry*, will also fulfil other well-formedness syllable conditions: open syllables ending in [ɨ] are allowed in Polish. Consequently, speakers have a free choice which syllabification to opt for and in fact some of the subjects gave two answers, but still the majority preferred the syllable with a two-consonant onset to the single consonant onset, i.e. you put as many consonants as possible into the onset as along as the onset obeys the Word-Based Syllable Principle. A similar preference could be observed in other tested words containing medial VOrV clusters. I assume that in that case the Word-Based Syllable Principle is best satisfied if the onset is maximally filled with the existing consonantal material. Speakers' might have a very good intuition about the best word onset and thus the best syllable onset but less so about the best word coda and thus the best syllable coda. Polish is a highly inflecting language with a large number of V-initial suffixes. Thus, word-final CC clusters are very unstable in terms of syllabification: they are both in coda position if no suffix is attached, but they are split between the onset and coda once a V-initial suffix follows.

There are a number of reasons why we do not encounter this type of variation in Type B truncation. We might expect names like *Lu[kr]ecj+a* to have two Type B truncates, i.e. *Kreci+a* and *Reci+a*, but only the former nickname is attested. This tendency can be explained in the following way. When forming a truncate, language users are faced with opposing tendencies. On one hand, they try to shorten the full name to the bisyllabic form. On the other hand, they want to preserve as much base material as possible to ensure that the newly created truncate would bear any similarity to the base as well as differ from other truncated names. As mentioned above, truncates have the unmarked prosodic shape, i.e. that of a syllabic trochee. I argue that the same applies to the syllable/word onset. Base medial consonant clusters are syllabified in such a way that the onset of the Type B truncate looks like a typical monomorphemic word onset with the maximum number of admissible base consonants preserved.

3.6. Extrasyllabic consonants

It is a well known fact that Polish allows very complex consonant clusters. Proper names are no exception to this rule, e.g. *[mçt͡ç]isław*. The initial /m/ in *[mçt͡ç]isław* is considered extrasyllabic by many theories of Polish syllable structure. Its incorporation into the syllable would violate the Sonority Sequencing Principle (SSP) (e.g. Clements 1990, Zec 1995) requirement that the syllable onset must have a rising sonority slope. There are various proposals as to where the initial sonorant belongs. Rubach & Booij (1990a) and Rubach (1997) propose that initial extrasyllabic consonants are adjoined directly to the PWord. Rochoń (2000) suggests that they are attached to the foot. According to Bethin (1992), the extrasyllabic consonants are adjoined to a syllable by the Initial Adjunction Rule. In our grammar, the ranking MAX-IO >> ANCHOR-BT-L, ONSET >> PWR >> WBS >> MAX-BT will select the candidate where /m/ is a part of the foot.

60. ANCHOR-BT-L, ONSET >> PWR

Base: [mçt͡ç]i.sław Input: TRUNC+ek$^{\text{Type A}}$	ANCHOR-BT-L	ONSET	PWR
☞ a. (mçt͡çi.s+ek)			
b. m(çt͡ç.is+ek)			ALL-FT-L !

The scenario would slightly change if SSP was ranked above PWR. The winner would be a candidate where /m/ is not a part of the initial syllable, but still the consonant could be included in the foot: *(m.çt͡çi.s+ek)*. However, at this stage we have no justification for ranking SSP above PWR and the ranking SSP >> PWR would a pure stipulation. Thus, truncation does not shed any new light on the treatment of extrasyllabic consonants.

3.7. Truncation and TETU effects

3.7.1. Coda constraint

Voiced obstruents are avoided in coda position in Type A truncates:

61.	E[d.v]ard	E.d+ek	*E[d.v]+ek
	Da[g.m]a.r+a	Da.g+a	*Da[g.m]+a
	I[g.n]a.t͡s+y	I.g+o	*I[g.n]+o
	A[g.ɲ]esz.k+a	A.g+a	*a[g.ɲ]+a

The above examples cannot be an instantiation of a more general constraint against codas. Polish truncates permit consonants other than voiced obstruents in coda position:

62.	A[n.z]elm	Ze[l.m]+ek
	Er.ne[s.t]+a	Ne[ɕ.t͡ɕ]+a
	Pra[k.s]e.d+a	Pra[k.ɕ]+a
	Ge[r.t]ru.d+a	Ge[r.t]+a

Many languages have restrictions on the type of segments that can occur in coda position (e.g. Clements 1990, Goldsmith 1990, Itô 1986, Prince 1984). The avoidance of voiced obstruents in coda position in Polish is an instance of the Emergence of the Unmarked (TETU) (McCarthy & Prince 1994). Voiced obstruents are marked elements from the articulatory point of view and as such they are avoided in coda (which itself is a marked position). Polish bans voiced obstruents in word final position. Polish truncates opt for an even stricter application of this rule. In truncates, voiced obstruents are avoided not only in word final position but also in the coda position of any syllable. The constraint visible in Polish is *VOICEDCODA. The truncates in 61., preserve only the first medial consonant present in the base and resyllabify it as an onset, thus avoiding voiced obstruents in the coda position. The truncates satisfy CONTIGUITY and ONSET at the expense of MAX-BT, which indicates that *VOICEDCODA must be ranked above MAX-BT.

63. ANCHOR-BT-L, ONSET >> CONTIGUITY, *VOICEDCODA >> MAX-BT

Base: Dag.ma.r+a Input: TRUNC+a$^{\text{Type A}}$	ANCHOR -BT-L	ONSET	CONTIGUITY	*VOICED CODA	MAX-BT
☞ a. (Da.g+a)					mar
b. (Da.m+a)			*!		ar
c. (Dag.m+a)[14]				*!	ar

3.7.2. No complex onsets

Another characteristic of Polish truncates is avoidance of complex onsets in the unstressed/final syllable. Branching onsets and onsets containing secondary palatalised segments are not allowed in the onset of unstressed syllables in truncates. In this section, I will present the data and review the available approaches to analysing the data.

3.7.2.1. Branching onsets

Branching onsets do not occur in the unstressed/final syllable of the truncate, although they do in the unstressed syllable of the base:

64.	Ger.trú.d+a	Gér.t+a	*Gér.tr+a
	Am.bró.ż+y	Ám.b+ek	*Ám.br+ek
	Wá.[t͡sw]aw	Wá.[t͡s]+ek	*Wá.[t͡sw]+ek

Polish truncates allow branching onsets in stressed/initial syllables, whether they come from a word-initial or stressed syllable in the base or not:

65.	Klo.týl.d+a	Kló.ci+a
	Ste.fá.ni+a	Sté.f+a
	Ger.trú.d+a	Trú.d+a
	Am.bró.ż+y	Bró.ż+ek
	Eu.fro.zý.n+a	Frú.zi+a
	Mán.fred	Fre.d+ek

Before I offer an analysis, I will briefly outline the distribution and phonetic realisation of secondary palatalised consonants, which can also be analysed as segments occupying two onset positions.

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[14] Another possible candidate is (da.gm+a), which, according to the above ranking would tie with the winner (da.g+a). In the next section, I will introduce a constraint that will rule out (da.gm+a). Similarly, I will not consider (dak.m+a), where the plosive is devoiced. See chapter 3 section 8, where the grammar

As discussed in chapter 3 , Polish has a set of alveolo-palatal consonants /ɕ ʑ t͡ɕ d͡ʑ ɲ/. Additionally, Polish has a set of secondary palatalised alveolar consonants, mostly in words of foreign origin[15]: They occur both in stressed and unstressed syllables.

66.	[t^j]ara	*tiara, nom. sg.*
	[d^j]abeł	*devil, nom. sg.*
	[s^j]esta	*siesta, nom. sg.*
	[l^j]ana	*liana, nom. sg.*
	t[r^j]ada	*triada, nom. sg.*

Consonants with secondary palatalisation are preserved in the stressed syllable of the truncate:

67.	Elż.[b^j]é.t+a	[b^j]é.t+a
	[d^j]o.ní.zj+a	[d^j]ó.n+a
	Mél.[x^j]or	[x^j]ó.r+ek
	[m^j]e.czý.sław	[m^j]é.t+ek

but not in the unstressed syllable of the truncate:

68.	A.mé.[l^j]+a	Mé.l+a
	Grá.[t͡s^j]an	Grá.[t͡s]+ek
	Tó.[b^j]asz	Tó.b+ek
	Dá.[r^j]usz	Dá.r+ek
	Dá.[m^j]an	Dá.m+ek
	Dio.ní.[z^j]+a	Ní.z+a

In phonetic terms, palatalisation in consonants other than alveolo-palatals can be realised either as an approximant like element, e.g. *[p^j]es* (dog, nom. sg.) or as a separate glide, e.g. *[pj]es* (Wierzchowska 1980). The glide pronunciation is definitely the prevailing one in present day Polish (see also my data in chapter 3).

There are a number of phonological analyses of secondary palatalised consonants in Polish. For example, Bethin (1992) argues that palatalised labials are segments with a complex place of articulation (cf. e.g. Clements 1991, Hume 1992, Lahiri & Evers 1991, Sagey 1986) and as such on the surface they must be split into two units, i.e. the consonant and the glide. Thus, an underlyingly non-branching onset with only a palatalised labial in it, becomes branching with one position occupied by the labial

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of voicing in Polish is discussed. The grammar prohibits devoicing of underlyingly voiced obstruents before sonorants.

consonant and one by the glide. Rubach (1984) claims that sequences /CjV/ are derived from underlying /CiV/ sequences via the process of vowel gliding. Once /i/ becomes a glide, it is adjoined to the preceding onset. Whichever approach we adopt, i.e. Bethin (1992) or Rubach (1984), we end up with segments that on the surface occupy two syllabic positions, although underlyingly they are analysed as single units.

3.7.2.2. *COMPLEXSYLL

The ban on branching onsets in unstressed positions is another instance of TETU effect. Prince & Smolensky (1993) propose the constraint *COMPLEX(SYLLABLE) to rule out complex syllable position nodes.

69. *COMPLEXSYLL: *No complex Syllable Position Nodes.*
Syllable position nodes do not branch.

The operation of *COMPLEXSYLL is visible only in the unstressed syllable of the truncate and it does not apply to the stressed ones. *COMPLEXSYLL >> MAX-BT will yield the correct result as long as the onset of the unstressed syllable is non-branching:

70. *COMPLEXSYLL >> MAX-BT

Base: Ger.tru.d+a Input: TRUNC+a$^{\text{Type A}}$	*COMPLEXSYLL	MAX-BT
☞ a. (Gér.t+a)		rud
b. (Gér.tr+a)	*!	ud

Candidate (b) does not satisfy *COMPLEXSYLL since the onset of the second syllable branches. The winner is candidate (a). Although it retains less base material than (b), it does not contain any syllable branching nodes.

The fact that only non-secondary palatalised consonants can occur in unstressed syllables is the direct result of *COMPLEXSYLL as well. Since a secondary palatalised consonant occupies two onset slots, it can be preserved only in stressed syllables.

*COMPLEXSYLL also predicts why certain suffixes, such as –^{pal}*a* or -^{pal}*o*, do not always induce stem final palatalisation:

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[15] See also the discussion of secondary palatalised labials in chapter 3.

71.	a.	Er.ne[s.t]+a	Ne[ɕ.tɕ]+a	
		Al.bi.[n]+a	Bi.[ɲ]+a	
		Wa[l.d]e.mar	Wa[l.d͡ʑ]+o	
	b.	Prze.[m]y.sław	Prze.[m]+o	*Prze.[m^j]+o
		Bo.[l]e.sław	Bo.[l]+o	*Bo.[l^j]+o
		Ste.[f]a.ni+a	Ste.[f]+a	*Ste.[f^j]+a
		No[r].ber.t+a	No.[r]+a	*No.[r^j]+a

In all the above examples the same suffixes are added. However, in 71a., the stem-final consonant is palatalised, while in 71b. it is not. Palatalisation affects only consonants that can be turned into alveolo-palatals. Alveolo-palatals occupy a single syllable slot position and that is why they are permitted to occur in unstressed syllables. The truncate stem-final consonants in 71b. do not have alveolo-palatal counterparts and so the palatalisation would have to be realised as a separate glide following the stem-final consonant. Consequently, the palatalised consonant would occupy two onset slots, which is not permitted in the truncate unstressed syllable.

Highly ranked ANCHOR-BT-L and CONTIGUITY will allow branching onsets in initial/stressed syllables of Type A truncates, e.g. *Flo.rén.t+y* ⟶ *Fló.r+ek.* A candidate where the initial /f/ has been dropped will fail ANCHOR-BT-L and a candidate where /l/ has been dropped in the word-initial onset will fail CONTIGUITY.

The problem with the ranking established so far is that it wrongly penalises Type B truncates with branching onsets in the initial/stressed syllable:

72. CONTIGUITY >> *COMPLEXSYLL >> MAX-BT

Base: Ger.trú.d+a Input: TRUNC+a$^{\text{Type B}}$	CONTIGUITY	*COMPLEXSYLL	MAX-BT
☜ a. (Trú.d+a)		*!	Ger
☞ b. (Rú.d+a)			Gert
c. (Tú.d+a)	*!		Ger r

The winner is currently candidate (b): it obeys CONTIGUITY and it does not have complex onsets in any of the syllables. Low ranking of *COMPLEXSYLL will permit branching onsets in the stressed syllable of Type A truncate, but it will penalise branching onsets in the stressed syllable of Type B truncate.

There are two alternative theories to deal with this asymmetry between stressed and unstressed syllables: Positional Faithfulness and Positional Markedness. Below, I will discuss both of them. First, I will show that a Positional Faithfulness analysis poses certain problems. Next, I will present a Positional Markedness analysis.

3.7.2.3. Positional Faithfulness

Positional Faithfulness (Beckman 1998) is based on the idea that there is an inventory of privileged linguistic positions that play a central role in the phonological systems of the world's languages. Privileged positions, such as root initial syllables or stressed syllables, enjoy some perceptual advantage in the processing system, via either psycholinguistic or phonetic prominence. One of the regularities observed by Beckman is the fact that stressed syllables allow more marked elements and more structure as opposed to the unstressed ones. A similar case can be observed in Polish truncates, i.e. the stressed syllables allow branching onsets, while the unstressed ones do not. Beckman (1998) proposes the constraint MAX-σ́, which favours maximal packing of stressed syllables. The constraint states that every element of the input has a correspondent in the stressed syllable of the output. Violations of MAX-σ́ are incurred by every output segment that is the correspondent of the input segment and does not appear in the stressed syllable in the output. The constraint can be adopted for the Output-Output correspondence as well:

73. MAX-σ́-BT: Every base segment has a correspondent in the stressed syllable of the truncate.

When ranked above *COMPLEXSYLL, MAX-σ́-BT will allow for the preservation of more complex structures in stressed syllables but not the unstressed ones:

74. ONSET >> MAX-σ́-BT >> *COMPLEXSYLL

Base: Ger.trú.d+a Input: TRUNC+a$^{\text{Type B}}$	ONSET	MAX-σ́-BT	*COMPLEXSYLL
☞ a. (Trú.d+a)		ger d	*
b. (Rú.d+a)		gert d!	
c. (Trúd.+a)	*!	ger	

The same ranking will produce the correct Type A truncate based on the same name:

75. ONSET >> WBS >> MAX-σ́-BT >> *COMPLEXSYLL

Base: Ger.trú.d+a Input: TRUNC+a$^{\text{Type A}}$	ONSET	WBS	MAX-σ́-BT	*COMPLEXSYLL
☞ a. (Gér.t+a)			trud	
b. (Gér.tr+a)			trud	*!
c. (Gért.r+a)		*!	rud	*
d. (Gértr.+a)	*!	*	ud	*

Note that candidate (c) violates WBS. As mentioned in section 3.5. above, maximal packing of medial consonants into the onset is the best option as long as the resultant onset is a good word-initial onset.

MAX-σ́-BT produces the correct results for both Type A and Type B truncation. The problem with MAX-σ́-BT is that it predicts different syllabification of medial consonant clusters depending on the position of the stress. For example, it predicts that a VCCCV cluster (consisting of exactly the same sequence of consonants in each case) should be syllabified as VCC.CV if stress is on the first V, and as VC.CCV if stress is on the last V. There is no evidence that syllabification in Polish is in any way affected by stress in either truncated or non-truncated words. For this reason, I decided to reject this analysis.

3.7.2.4. Positional Markedness

Another option is Positional Markedness (Zoll 1998). Positional Markedness refers to marked structures that cannot appear in a given position. Thus, *COMPLEXSYLL is a positional markedness constraint that militates against marked (complex) structures in perceptually less salient positions, such as unstressed syllables. Positional Markedness, requires constraint conjunction (Smolensky 1995), i.e context independent markedness constraints, e.g. *COMPLEXSYLL with a positional constraint that would specify where this marked structure cannot occur. I want to propose that in Polish positional markedness is expressed in the form of COINCIDE constraint (after Zoll 1998).

76. COINCIDE (*complex syllable, non-head σ):
Complex Syllable Position Nodes in unstressed syllables.
Syllable position nodes of unstressed syllables cannot branch.

Although COINCIDE is represented as a single constraint, in fact it is a conjunction of the markedness constraint *COMPLEXSYLL and a positional constraint demanding the coincidence of all syllables with the head of the foot. According to the principle of local conjunction, a given candidate violates the complex (conjoined) constraint if and only if it violates both of its components. Thus, in case of COINCIDE, the constraint would be violated only by a syllable that is unstressed and complex at the same time. Violations of only one of the components of a conjoined constraint do not count. Candidates with complex stressed syllables will satisfy COINCIDE though they would violate one of its components, i.e. *COMPLEXSYLL. Following the principle of positional markedness, the more specific constraint, i.e. COINCIDE in our case, must outrank the more general constraint, i.e. *COMPLEXSYLL. *COMPLEXSYLL, however, must be outranked by MAX-BT to allow surfacing of complex syllables in stressed syllables. Thus, the ranking is: COINCIDE >> MAX-BT >> *COMPLEXSYLL. This ranking will eliminate candidates with branching onsets in unstressed syllables. Note that WBS must also be ranked above MAX-BT to prevent the concentration of the base medial consonants in the coda of the stressed syllable of the truncate:

77. WBS, COINCIDE >> MAX-BT >> *COMPLEXSYLL

Base: Ger.trú.d+a Input: TRUNC+a$^{\text{Type A}}$	WBS	COINCIDE	MAX-BT	*COMPLEXSYLL
☞ a. (Gér.t+a)			rud	
b. (Gér.tr+a)		*!	ud	*
c. (Gért.r+a)	*!		ud	

The same ranking will also allow the correct output for Type B truncates:

78. COINCIDE >> MAX-BT >> *COMPLEXSYLL

Base: Ger.trú.d+a Input: TRUNC+a$^{\text{Type B}}$	COINCIDE	MAX-BT	*COMPLEXSYLL
☞ a. (Trú.d+a)		ger	*
b. (Rú.d+a)		gert!	

The workings of COINCIDE can also be observed in fast speech. Madelska (1987) observes that unstressed syllables in rapid speech undergo consonant deletions and various types of assimilations.

To sum up, both approaches, i.e. Positional Faithfulness and Positional Markedness can yield the correct results. In Positional Faithfulness, however, the fact that there are no complex syllable nodes in the unstressed syllable is a 'by-product' of the operation of MAX-σ́-BT. The constraint itself does not militate against a specific marked position or a specific marked segment. Positional Markedness, on the other hand, clearly specifies that complex syllables are prohibited in unstressed syllables. Moreover, in section 3.8.1. we already argued for one specific Positional Markedness constraint, i.e. *VOICED CODA. *VOICED CODA is a conjunction of two separate markedness constraints: *VOICED (banning voiced segments) and *CODA (banning codas). Of course, we might argue that in Polish truncation we need Positional Faithfulness along with Positional Markedness. However, that would be an unnecessary complication of the grammar if all the TETU effects described in this section can be uniformly expressed in terms of Positional Markedness. Therefore, I will adopt Positional Markedness for the analysis of Polish truncates.

4. Truncates with consonant initial suffixes

In general, C-initial suffixes attach to truncated bases ending in a single consonant:

79.

Balbin+a	Bin+ka
Juzefin+a	Juz+ka
Malwin+a	Win+ka
Praksed+a	Sed+ka
Przemysław	Przem+cio

If the truncate stem ends in two consonants, either the last consonant is deleted and a C-initial suffix is attached, or, when both consonants are retained stem-finally in the truncate, a V-initial truncate is attached:

80.

Me[lxj]or	Me[lx]+uś	Mel+cio	*Me[lx]+cio
Rajnold	Nold+ek	Nol+cio	*Nold+cio
Adolfin+a	Dolf+a	Dol+ka	*Dolf+ka
Esterk+a	Terk+a	Ter+ka	*Terk+ka

What will happen if we take a base with a medial consonant cluster, e.g. *Adolfin+a* and add a C-initial suffix to it?

81. WBS, COINCIDE >> MAX-BT

Base: A.dol.fin+a Input: TRUNC+ka$^{\text{Type B}}$	WBS	COINCIDE	MAX-BT
☜ a. Dól.+ka			a fin!
b. Dól.f+ka	*!	*	a in
☞ c. Dólf.+ka			a in

Candidate (b) fails both WBS and COINCIDE: [fk] is unattested word-initially in monomorphemic words and at the same time the cluster is in the onset of the unstressed syllable. Candidates (a) and (b) satisfy both these constraints. Candidate (c) passes WBS by syllabifying [f] into the coda: [fk] is a bad monomorphemic onset but [lf] is an attested word-final coda. In medial CCC clusters where WBS cannot place the syllable boundary after the first consonant VC.CCV, it will look for the possibility of placing the boundary after the second consonant VCC.CV. Needless to say, this option is only available if the first two consonants constitute an acceptable word-final coda. Effectively, candidate (c) wins. Candidate (a), the expected winner, loses because it preserves less base material than candidate (c).

In spite of the fact that *Dólf.+ka* passes WBS, it still contains the [lfk] cluster that is unattested word-medially in Polish. It is a well-known fact that Polish allows very complicated consonant clusters. However, numerous studies of Polish syllable structure (e.g. Kuryłowicz 1952, Gorecka 1986, 1988, Czaykowska-Higgins 1988, Rubach & Booij 1990, Bethin 1992, Gussmann 1991, 1992, 1997, Cyran & Gussmann 1999, Piotrowski 1992, Gussmann & Kaye 1993, Rubach 1997, Rochoń 2000) show that consonant clustering in Polish is not completely random. However, none of the above studies really concentrates on the possible consonant combinations across syllable boundaries.

Pierrehumbert (2003) argues that phonology involves statistical knowledge and represents generalisations over word-forms in the lexicon. Thus, for example, the more frequent a given consonant combination is, the more likely it is to be encoded in the grammar. Consonant clusters that commonly attested in the lexicon will also be accepted by native speakers in neologisms and in borrowings. Unattested or very rare consonant combinations are less likely to be encoded in the grammar and as such they may tend to be rejected in neologisms and borrowings: language users will modify such clusters so that they have the form of a more frequently attested consonant cluster.

What effect do the Polish consonant combinatorial possibilities have on the formation of truncates? There are two C-initial diminutive suffixes, i.e. *–ka/-ko* and *–cia/-cio.* I compared all the word-medial CCC clusters attested in Polish compiled by Rowicka (1999) with the medial CCC clusters that might result from attaching one of the C-initial diminutive suffixes to the possible CC-final truncated stems. All the CCC clusters (except one) obtained in this way appeared to be unattested in word-medial position in Polish. The only acceptable CCC cluster was [st+k] and this is the only CCC cluster that I found medially in four truncates, e.g. *Ernest+a* → *Nest+ka.* Thus, truncates like **Dolf+ka* are not ruled out by any syllable structure conditions but by more general principles of consonant clustering in Polish. I am not aware of any thorough study of medial consonant clustering in Polish. I will leave this topic for future research.

It should be pointed out that the restrictions on possible word-medial clusters must outrank ANCHOR-BT-R. Otherwise, Type B truncates would be forced to fully preserve the base stem-final consonants in the truncate even if a C-initial suffix is attached to it:

82. ANCHOR-BT-R, COINCIDE, WBS >> MAX-BT

Base: Ǽn.zelm Input: TRUNC+t͡ço$^{\text{Type B}}$	ANCHOR-BT-R	COINCIDE	WBS	MAX-BT
☜ a. Zé[l.+t͡ç]o	*!			an.m
b. Zé[l.m+t͡ç]o		*!	*	an
☞ c. Zé[lm.+t͡ç]o				an

Candidate (a) loses right at the outset because it fails to anchor to the right edge of the base stem. The winner is candidate (c), which, unlike candidate (b), satisfies the highly ranked COINCIDE and WBS.

Thus, the ranking established far truncates looks as follows:

82. MAX-IO >>
ANCHOR, ONSET >>
PWR, CONTIGUITY, *VOICEDCODA, WBS, COINCIDE >>
MAX-BT >>
*COMPLEXSYLL

5. School slang truncation

In this section, I will briefly look at truncates found in school and student slang. The date comes from Kaczmarek et al. (1994), Czeszewski (2001) and an internet search[16]. The full list consisting of around 200 truncates can be found in APPENDIX 24. The aim is to check whether school/student slang truncates follow the same pattern as hypocoristic truncates.

5.1. School slang truncation vs. hypocoristic truncation

Most of the school slang truncates are bisyllabic with the first syllable taken from the base and the second syllable containing the inflectional ending, i.e. they have the same form as hypocoristics:

83.	fi.zý.k+a	fí.z+a	*physics*
	kli.ma.ty.zá.cj+a	klí.m+a	*air-conditioning*
	tak.sów.k+a	ták.s+a	*taxi*
	sta.týs.ty.k+a	stá.t+a	*statistics*
	blon.dý.n+a	blón.d+a	*a blond girl*

---

[16] The main source was *vasisdas – świeże słowa* (vasisdas – fresh words) that can be found at www.vasisdas.friko.pl.

School slang truncates, however, differ from hypocoristic truncates in a number of respects. There are school slang truncates that are entirely built on the two initial syllables of the base, without any inflectional ending attached:

84.	de.zo.dó.rant	dé.zo	*deodorant*
	do zo.ba.czé.nia	dó.zo	*see you later*
	al.kó.hol	ál.ko	*alcohol*
	a.no.rék.tyk	á.nor	*anorexic*
	poz.dro.wié.ni+a	póz.dro	*greetings*

Unlike hypocoristics, school slang truncates allow branching onsets in the unstressed syllable:

85.	poz.dro.wié.ni+a	póz.dro	*greetings*
	ta.blí.c+a	tá.bl+a	*blackboard*
	kum.pé.l+a	kúm.pl+a	*friend*
	ge.o.grá.fi+a	gé.gr+a	*geography*

An overwhelming majority of school slang truncates are anchored to the left edge of the base. There are only 11 (out of about 200) truncates that are built on the base-stem rightmost syllable (86a.), the base middle syllable (86b.) or the base-stem edge elements (86c). Recall that hypocoristics built on the rightmost base-stem syllable (Type B truncates) are quite frequent.

86.	a.	fa.fúł+a	fú.ł+a	*clumsy person*
		kom.pú.ter	pú.ter	*computer*
		za.bá.w+a	baẃ.+ka	*party*
		pròfesór+ka	sor+a	*professor (fem.)*
		przytómn+y	tómn+y	*conscious*
	b.	àm.fe.ta.mí.n+a	fé.t+a	*amphetamine*
	c.	in.tér.net	í.net	*internet*
		pro.fé.sor	psór	*professor*
		w ogóle	wógle	*at all*
		jełóp+a	jép+a	*head*
		kumpél+ka	kúmpl+a	*friend (fem.)*

Finally, a number of school-slang truncates do not have the typical disyllabic form. They are either shorter, i.e. monosyllabic (87), or longer, i.e. consisting of three syllables (88).

87.	pro.fé.sor	próf	*professor*
	spe.cja.lís.t+a	spéc	*expert*
	bró.war	bró	*brewery, beer*

88.	le.gi.ty.má.cj+a	le.gí.t+a	*student ID*
	u.ni.weŕ.sy.tet	u.ní.wer	*university*
	szy.de.ro.wá.ni+e	szy.dé.r+a	*derision*
	in.for.má.ty.k+a	in.fór.m+a	*IT*

The reason why there are monosyllabic truncates may be due to the fact many words have monosyllabic written abbreviations of the base word, e.g. *profesor* → *prof.* Most of the monosyllabic truncates simply take the same form as the written abbreviations. We might also hypothesise that the written abbreviations are based on spoken slang truncates. However, that hypothesis would predict that the written abbreviation of *profesor* should be *psor*[17]. This truncate definitely existed in the pre-war school slang, before the written abbreviation *prof.* came into common use.

Note that all the 12 trisyllabic truncates attested in my database are derived from quite long, minimally 4-syllable words. Shortening these words to disyllables could make the association of the truncate with its base difficult. This restriction does not necessarily apply to hypocoristics which constitute a very limited set of words in a given language. School slang truncates, on the other hand, can be based on any word drawn from the whole lexicon. It is thus important for language users to have enough information/material to be able to associate the truncate with the correct non-truncated word in the lexicon. The same explanation applies to school-slang truncates that contain branching onsets in the unstressed syllable (85 above). Preserving more consonantal material in the truncate facilitates its association with the base form.

5.2. School slang truncation and the OT grammar

As mentioned above, a great majority of the school-slang truncates follow the same rules as hypocoristic truncates. The only cases that would not be covered by the above grammar are truncates with a branching onset in the unstressed syllable and truncates that can be either shorter, i.e. monosyllabic, or longer, i.e. trisyllabic. Such forms, however, are not numerous. Thus, the 'exceptional' truncates would violate Coincide and/or PWR. These constraints interact with the lower ranked Max-BT and control the amount of the base material preserved in the truncate. In certain school slang truncates it is necessary to augment the amount of the base material normally preserved in the truncate so that the truncate would bear enough resemblance to its base and thus be correctly understood by language users. This process is not directly controlled by the formal grammar of truncate formation but by the general principles of pragmatics and communication that require a linguistic expression to contain enough information to convey the desired meaning. In general, school slang truncates follow the same rules as hypocoristic truncates unless that would make the retrieval of the meaning of the truncate impossible, in which case more material is preserved in the truncate than the grammar predicts.

6. Left Anchoring vs. Right Anchoring

6.1. Right Anchoring - really away? (Nelson 1998, 2003)

Recently, Nelson (1998, 2003) suggested that Right Anchor is superfluous and can be contingent on some other process, such as targeting the stressed syllable. Nelson argues that anchoring can only target positions that are 'acoustically prominent' (stressed) or 'psycholinguistically prominent' (e.g. morpheme initial). The right edge does not qualify as a target for anchoring. Nelson proposes the following typology of base material to which anchoring can apply:

89. Typology of anchoring

Copying of the:		*Truncation*
Left edge	with initial stress	Hungarian hypocoristics /ɛ́rʃebɛt/ → /ɛ́rʃi/
	without initial main stress	French hypocoristics /karolín/ → /karó/
Right edge	with final stress	Catalan hypocoristics /səlβəðó/ → /βəðó/
	without final stress	*See discussion below*
Stressed syllable	not necessarily at edge	English hypocoristics /rəbɛ́kə/ → /bɛ́ki/

---

[17] In Poland, secondary school teachers are addressed as *Mr/Mrs Professor*, hence the word has a high frequency of occurrence among secondary school students.

What this system rules out is explicit targeting of the unstressed right edge, e.g. *Cánada* → **Náda*. All the cases of truncation outlined above can be accounted for by means of two constraints, i.e. ANCHOR-LEFT and MAX-σ́ (where each segment in the main stressed syllable of the base must have a correspondent in the reduplicant or truncate). ANCHOR-LEFT accounts for all the cases of word/morpheme initial truncation. MAX-σ́, on the other hand, accommodates cases where only the main stressed syllable is kept in the truncate, irrespective of its location in the base. This constraint will also cover cases which were previously analysed by means of ANCHOR-RIGHT. These include reduplication in Manam and Siriono or truncation in Catalan. In all these languages, stress is on the penultimate mora or syllable and reduplication/truncation targets the final (head) foot of the base and so no recourse to ANCHOR-RIGHT is necessary.

As Nelson points out, data from English truncation (Nelson 2003: 37) seem to challenge the generalisation regarding ANCHOR-RIGHT:

90.	párents	rents
	súburbs	burbs
	fréshmen	shmen
	múshroom	shroom
	álligator	gator

Nelson, however, claims that the above examples do not contradict her theory that ANCHOR-RIGHT is unnecessary. Most of these words fall in the domain of 'adolescent language', and are less transparent to the unfamiliar native English speaker. These cases can be considered intentionally masked, part of a secret language using an unnatural system to preserve its covert nature. Moreover, the right edge preserving English truncation does not seem to be productive, in contrast with the much more widely attested left anchored pattern.

I do not agree with Nelson's view. A rule cannot be dismissed only because it belongs to a secret language or because it is less productive then other rules operating in a given language. What is more, secret language rules show exactly what type of processes language users are aware of and what type of processes can potentially be used in language parsing, thus giving us a fuller picture of human linguistic capabilities. These processes may not be very productive or they may be completely absent in other parts of language use due to, e.g. historical incident or psycholinguistic preference, but their existence cannot be dismissed altogether only because they show up in the secret language and nowhere else. It may well be true that RIGHT ANCHORING is visible only in truncation or in secret languages and it plays no role in other parts of the grammar of any language. However, its existence cannot be denied altogether. In fact, truncation and secret languages show that RIGHT ANCHORING exists as a separate constrain in spite of the psycholiguistics preference (left-to-right processing) prevents it from showing up very often in every-day language use. In a sense, secret languages may be the only way for 'disfunctional' processes and constraints to ever show up. Secret languages are meant to 'disguise' the conveyed information and so they will use 'disfuctional' processes for this purpose. Every-day language is meant to be functional and convey the intended information in a clear manner and that is why it will never let 'disfuctional' processes, such as RIGHT ANCHORING, surface.

The Polish data analysed in this chapter look very much like the English data above dismissed by Nelson, i.e. Type B truncates are built on the rightmost material of the base stem rather than on the syllable caring the main stress. It is true that in school slang truncation, Type B truncates are very few and far in between, however, they are much more frequent in hypocoristic formation. My database contains 556 truncated names where 346 (60%) are Type A truncates, 199 (35%) Type B truncates and 21 (5%) other (mainly truncates obeying ANCHOR-EDGE). Again, a great majority of truncates (60%) preserve the left edge of the base, but still quite a substantial number (35%) preserve the right edge of the base. I fully agree with Nelson that the left edge of the word/stem/root, etc. enjoys a privileged status in language processing, hence left edge oriented truncates are more frequent than right edge oriented truncates. I do not agree, however, that ANCHOR-RIGHT can be done away with altogether. It may play a lesser role than ANCHOR-LEFT but its workings are still visible in the language. I propose that there is a fixed universal preference of the sort ANCHOR-LEFT >> ANCHOR-RIGHT and this preference is grounded in left-to-right processing.

6.2. ANCHOR-EDGE

Definitely, at some stage in the history of Polish there was only one grammar, where both ANCHOR-BT-R and ANCHOR-BT-L were top-ranked (ANCHOR-EDGE). There is a small subset of 10 truncates, where both ANCHOR constraints are obeyed at the same time at the expense of CONTIGUITY. All these names are quite 'old-fashioned' and they were given to children born at the outset of the previous century:

91.	Leokadi+a	Lod+a
	Stefani+a	Steni+a
	Regin+a	Reni+a
	Leonor+a	Lor+a

However, at some point the two ANCHOR constraints must have split and two ways of forming truncates were created, one where ANCHOR-BT-L was obeyed and one where ANCHOR-BT-R was obeyed.

7. Previous analyses

Truncation in Polish has not received much attention in linguistics literature. For example, Grzegorczykowa et al. (1998: 119), the most thorough study of Polish morphology, devotes one paragraph to this phenomenon. It is simply stated that in hypocoristic formation various parts of the stem can be truncated and it is impossible to predict what part of the base stem will be preserved in the truncate.

There is only one extensive study of Polish truncates, i.e. Szpyra (1995). Szpyra distinguishes between hypocoristics that start at the left edge of the base and hypocoristics that 'begin in the middle of a word' (Szpyra 1995: 35). This formulation is very imprecise as it indicates that you can take almost any part of the base stem, add a diminutive suffix to it and form a hypocoristic. My analysis shows that there are specific restrictions as to what part of the base stem can be incorporated into the truncate. I have demonstrated that truncate edges coincide with base stem edges and truncates do not constitute a random portion of the base.

Szpyra proposes the following template for truncated forms:

92. OAV C_1C_2,

where C_1 is more sonorous than C_2.
O obstruent, A approximant

The template is a syllable that consists of the nucleus optionally preceded by the onset of maximally an obstruent and an approximant, and followed by the coda of minimally one consonant and maximally two consonants of falling sonority. The fall in the sonority in the coda can be minimal. The syllable conforms to the most unmarked type (as defined by Clements 1990) because it tolerates only onsets with a maximal rise in sonority and codas with a minimal fall in sonority. The formation of truncates consists in the association of melody of the base form to the template. Once the template is filled, a diminutive or morphological suffix is added and the templatic syllable is resyllabified.

There are a number of problems with this approach. I will enumerate them below:

- Szpyra does not distinguish between hypocoristics with V-initial suffixes and hypocoristics with C-initial suffixes. Her theory predicts that after the formation of the templatic syllable you can take any suffix and append it to that syllable. Szpyra makes a brief observation that the selection of a shorter or longer form of the templatic syllable is often connected with the choice of the diminutive suffix, but she does not provide any analysis of this phenomenon. She does not explain why derivation at one level, i.e. the formation of the templatic syllable, should be sensitive to operations at the next derivational level, i.e. when the suffix is attached. We must assume that after the second derivational level, there is another derivational level, where some sort of repair strategies apply and delete one stem final consonant when a C-initial suffix is attached.

- As Szpyra admits herself, the above template can apply only to truncates that 'start at a later point in the word' (Type B truncates in my analysis). Truncates that are formed at the left edge of the base (Type A truncates) would conform to the template only as far as the formation of coda is concerned. Szpyra takes the formation of Type B truncates as evidence that Polish syllables conform to the Sonority Sequencing Principle (SSP). In this way she tries to account for the fact that word-medial sequences, such as /st/ or /dv/, i.e. consonant clusters that occur word-initially in non-truncated words, do not occur initially in Type B truncates:

93.	Gaspar	Par+ek	*Spar+ek
	Ja[dv]ig+a	Wig+a	*[dv]ig+a

However, if we assume that truncates must conform to the SSP, we have no way of explaining why even very complex consonant clusters, such as *[mɕt͡ɕ]isław* → *[mɕt͡ɕ]is+ek,* should be retained in the onset position in Type A truncates. Theoretically, we might posit different grammars for the two types of truncates. Theory-wise, however, this would be a costly solution. My account provides a unified treatment of both types of truncates where both types of truncates differ only in different ANCHOR specifications.

- Szpyra's approach excludes any truncates whose stems end in a cluster of stops or a cluster consisting of a stop followed by a fricative because these clusters do not comply with the requirement that there must be a fall in sonority in the coda. Such clusters, however, are preserved in truncates, e.g. *Wiktori+a* → *Wikt+a, Praksed+a* → *Pra[kɕ]+a.* Furthermore, it is not clear how Type B truncates with a nasal in the onset, e.g. *Ferdynand* → *Nand+ek,* would fit into Szpyra's template. The template specifies that there can only be an obstruent or/and approximant in the onset. My account, where the left edge of Type B truncates obeys the Word-Based Syllable Principle, predicts that any type of consonant can be in the onset position in the truncate as long as that consonant or consonant cluster is frequently attested in word-initial position in monomorphemic words as well.
- Szpyra claims that palatalised labials, coronals and dorsals cannot be found in the final position of the truncated stem because these sounds never occur at the end of Polish syllables and words. However, once the templatic syllable is formed, a palatalising suffix can be attached to it. The problem is that the palatalising suffix is attached to the templatic syllable at the next derivational level, where the templatic syllable is treated as a stem. Palatalisation can take place when a palatalising suffix is attached to a stem. This is very common in Polish inflectional paradigms. In fact, palatalisation takes place also in hypocoristic formation but it only applies to truncates

where the stem final consonant can be turned into an alveolo-palatal consonant. For example, palatalisation does not apply to labials because they cannot become alveolo-palatals. Szpyra suggests that stem-final palatalisation can take place in some cases due to the partial pre-specification of the template. This would mean that we would have to lexically mark these truncates where the template can be pre-specified. In my analysis, this pattern of palatalisation falls out directly from the constraint ranking. Thus, for example, labials cannot be palatalised because palatalised labials occupy two onset positions and there is a ban on branching onsets in unstressed syllables. Furthermore, the pre-specification approach indicates that stem final palatalisation is a property of the stem. It is not quite true because stem final palatalisation is induced by the following suffix. If we assume that the stem final consonant is prespecified, then that would mean that it can become palatal before any suffix. There are, however, suffixes that do not trigger palatalisation.

8. Conclusions

The findings of this chapter again support the claim that the left edge of the stem enjoys a privileged status in the grammar. The two corpuses of truncates analysed here, i.e. hypocoristic truncates and school slang truncates, indicate that language users prefer truncates built on material taken from the left edge of the base. This preference applies to 60% of hypocoristics and around 90% of school slang truncates. The data clearly show that the left edge of the word plays a crucial role in information retrieval. It is definitely easier to associate the truncate with the correct base form if both words begin with the same sound or syllable. The task is more difficult if the truncate and the base only end in the same sound or syllable. The left-edge preference can be put down to left-to-right processing (Cutler et al. 1985) which will favour left edge oriented truncation to right edge oriented truncation. If the leftmost base material is preserved in the truncate, speakers will be able to 'search' their mental lexicon much faster and thus match the truncate with the correct base form much faster as well.

This mental lexicon search is less important in the case of hypocoristics. First, the set of first names constitute only a small subset of the whole lexicon, which largely facilitates the search. Second, even if we do not associate the nickname with the correct full name, (e.g. we think the first name of somebody called *Ala* is *Alicja* rather than *Alina*), the communication process will not be affected as long as we know what person we are referring to. This is also the reason why certain truncates correspond to more than one full name. However, if we do not decipher correctly the semantics of a truncate referring to a common name, then this might lead to confusion or even a communication breakdown. Effectively, right edge oriented anchoring tends to show up in contexts where language users are not under the pressure to always get the perfect match between the truncate and its corresponding base, e.g. pet names. It is not surprising that right edge anchoring can also be found in secret languages which are meant to be misleading and confusing. Employing processes that are not commonly found in the core grammar of a given language, such as anchoring to the right edge, will definitely serve this purpose.

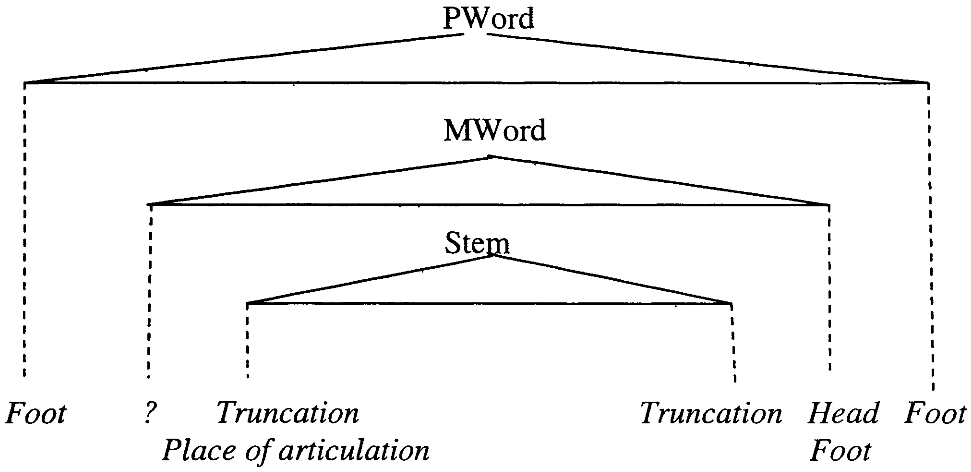
SUMMARY AND CONCLUSIONS

The thesis focuses on the interaction of ALIGNMENT with prosody and morphology. Three issues are central in this study:

- the asymmetric strength behaviour of LEFT and RIGHT ALIGNMENT/ ANCHORING,
- what types of prosodic/morphological boundaries or phonological features can LEFT and RIGHT ALIGNMENT/ ANCHORING apply to,
- what prompts the asymmetries between LEFT and RIGHT ALIGNMENT/ ANCHORING.

The generalisations regarding ALIGNMENT in Polish are schematically summarised below:

1.



With regards to the first issue, the data analysed in chapter 3 (affixation) and chapter 4 (truncation) indicate that, in terms of frequency, LEFT ALIGNMENT/ANCHORING is preferred to RIGHT ALIGNMENT/ANCHORING. Thus, in affixation, the place of articulation hardly ever spreads from the stem-initial consonant to the prefix, which shows that LEFT ALIGNMENT is obeyed in prefixation. The stem-final consonant is usually palatalised by the following suffix, which indicates that RIGHT ALIGNMENT is not obeyed in suffixation. Once the stem-final consonant changes its place of articulation, the place feature tends to spread to the immediately preceding consonant so that the whole cluster agrees in the specification [pal]. Similarly, in truncation, LEFT ANCHORING prevails over RIGHT ANCHORING in that a great majority of truncates are built on material taken from the leftmost two syllables of the base.

LEFT and RIGHT ALIGNMENT/ ANCHORING are also asymmetric with regards to the type of morphological and prosodic category that they can align with. Thus, RIGHT ALIGNMENT applies to stems, MWords and PWords. LEFT ALIGNMENT, on the other hand, applies only to stems and PWords. This asymmetric behaviour of LEFT and RIGHT ALIGNMENT/ ANCHORING is really striking. One might expect the opposite, i.e. more variation in the case of LEFT ALIGNMENT rather than RIGHT ALIGNMENT: this is what is generally observed in the literature (e.g. McCarthy & Prince 1993). I will come back to this issue below.

With regards to the second issue, the data analysed in this dissertation indicate that in truncation and in affixation, both LEFT and RIGHT ALIGNMENT/ ANCHORING uniformly refer to the morphological category of stem and disregard any prosodic boundaries. In this respect, Polish behaves unlike, e.g. Axininca Campa (McCarthy & Prince 2001), where affixation is sensitive to the syllabification of the base, or, e.g. English, Spanish and Catalan, where truncation is sensitive to foot boundaries. The importance of the left edge of the stem is further enhanced by the formation of right-edge oriented Type B truncates. The discussion in chapter 4 clearly shows that the left edge of these truncate coincides with the most frequent onset types attested in unprefixed words.

The alignment to morphological or morphosyntactic categories seems to be much ‘stronger’ in Polish than alignment to prosodic categories. As discussed in chapter 2, even the head foot, which itself is a prosodic category, right aligns with the MWord rather than with the PWord. The boundaries of PWords are marked only by secondary stresses; the primary stress makes no reference to Pwords at all. I attribute this heavy reliance on morphological boundaries to the properties of Polish stress, which disregards the morphological composition of words and gives language users hardly any clues about the internal structure of morphologically complex words.

What causes this asymmetry between secondary and primary stresses? Polish is a highly inflecting language with a very regular stress with only a handful of words that are lexically marked for stress. Prosodic alignment with the stem or root is almost impossible as that would often result in the primary stress falling three or four syllables from the end of the edge of the MWord. The other option is to align the head foot with the PWord consisting of a MWord followed by clitics, which might result in the primary stress falling on the clitic rather than on the MWord. However, sequences of clitics in Polish do not have a fixed order and many of the clitics do not have a fixed place in a phrase or sentence, i.e. they may precede or follow the MWord. Placing the main stress on a clitic would not be the best choice as that would not give the listener/speaker many clues as to where the MWord ends or begins. Further, finding the right boundary of the MWord would not be an easy task as it might be obliterated by all sorts of assimilations taking place on MWord + clitic boundary if the stress was on the clitic. Aligning the head foot with the right edge of the MWord is an effective way of marking the right boundary of the MWord. The left edge of the MWord does not need to be marked by stress as it seems to be clearly marked in other ways, e.g. syllabification and underapplication of various assimilatory or neutralisation processes at or across the clitic + MWord boundary (Kraśka-Szlenk 2003):

- *Syllabification*: The word creates a domain for syllabification in Polish. The syllable boundary coincides with the clitic + MWord boundary. This is clearly noticeable when a C-final proclitic attaches to a V-initial MWord. The VC=VC clitic + MWord juncture is syllabified as VC.VC (1a) rather than V.CVC, which happens MWord internally (1b):

2.	a.	nad=oknem	nad.ok.nem	*na.dok.nem	*above the window*
	b.	komod+a	ko.mo.d+a		*chest of drawers*

- *Glottal stop insertion*: V-initial MWords are optionally pronounced with a weak glottal stop, especially after a V-final MWord (3a). V-final proclitics followed by V-initial MWords behave in the same way (3b). Word-internally, vowel hiatus cannot be resolved by a glottal stop insertion (3c):

3.	a.	okno Anny	okno [ʔ] Anny	*Anna's window*
	b.	na oknie	na [ʔ] oknie	*on the window*
	c.	kakao	*kak[aʔo]	*cocoa*

- *Devoicing*: In general, obstruent devoicing is observable in two environments in Polish: when the obstruent is final in the intonational phrase and in word-final position when the following word begins with a vowel or a sonorant. There is no neutralisation of voicing of obstruents in word-medial position, even if they are immediately followed by sonorants or vowels. Pre-sonorant obstruent devoicing does not apply to proclitics. Thus, proclitics which end in a voiced obstruent, e.g. prepositions, do not devoice before a vowel initial or sonorant initial MWord (see 2a. above). Here, we can notice a difference between the behaviour of proclitics and enclitics or between the onset and the coda of the MWord. When a sonorant initial clitic is added to a word ending in a voiced obstruent, the obstruent devoics:

4.	spójż=no	spój[ʃ]=no	*look (emph.)*
	zrób=mu	zró[p]=mu	*do for him*

- *Lack of palatal assimilation*: This phenomenon was discussed in chapter 3, i.e. prepositions ending in dental obstruents do not palatalise if the following MWord begins with an alveolo-palatal obstruent, e.g. *nad ziemią* → *na[d ʑ]emią* (above the ground).

However, it is disputable whether the left boundary between the MWord and the proclitic is actually clearly marked. All the types of clitic + MWord boundary markings mentioned above also apply to the prefix + stem boundary. Effectively, from the phonological point of view, the following phrase

5. od = nad + ziem+nego przejścia *from the over ground passage*
o[d = n]a[d+ʑ]iem+nego przejścia
from over....ground passage

can be interpreted in three ways:

6. clitic + clitic + MWord
clitic + prefix + stem
prefix + prefix + stem

From the phonological point of view, there is no way of telling which interpretation is correct, however, the syntactic and pragmatic contexts will indicate which interpretation is the most suitable one. Basically, the lack of devoicing in *od* and the lack of palatalisation in *nad* only tell the listener that the string of sounds that they hear consists of a stem preceded by two constituents that might be either clitics or prefixes or a combination of both. The left edge of the MWord is only marked in cases where the left edge of the MWord coincides with the left edge of the stem.

From the functional point of view, it is not necessary to mark the left edge of the MWord if the right edge is already clearly marked. The MWord needs to be marked in some way in order to facilitate syntactic parsing but this is already done by aligning the head foot with the right edge of the MWord, and there is no need for marking the left edge as well. In fact, it is more economical to leave the option of left edge marking for a different category in order to avoid 'overcrowding' LEFT ALIGNMENT with a large number of different kinds of constituent marking. This is particularly important in a morphologically and syntactically complex language like Polish, where a large number of grammatical categories need to be marked in some way in order to facilitate language parsing/processing. Marking only left edges of all the prosodic and morphosyntactic categories in a morphosyntactically rich language might actually lead to confusion and even hinder language parsing because too many categories would make use of LEFT ALIGNMENT. Thus, secondary stresses can freely mark the left edge of the PWord without causing any disruption in retrieving the information about the location of the MWord in a phrase. Aligning the head foot with the MWord rather than the PWord is functionally based. RIGHTMOST is not only responsible for assigning the main stress to the correct syllable. It also plays an important role in language parsing by indicating the number of MWords in a phrase by marking the right edges of the MWords.

Another issue briefly touched upon in this dissertation is the type of phonological material that obeys ALIGNMENT. Here, we looked at two phonological features, i.e. voicing and palatalisation. Again, we observed an asymmetry between these two features. In general, no ALIGNMENT constraints, either LEFT or RIGHT, can apply to voicing. Voicing spreads leftwards across the whole obstruent cluster, irrespective of the fact whether this is a monomorphemic cluster or whether it is a cluster containing a word, morpheme, foot or syllable boundary. A full understanding of the reasons lying behind this asymmetry requires a more in-depth analysis of the articulatory and perceptual properties of voicing and palatalisation in Polish, which will give more insight into why it is easier to control the spread of palatalisation than the spread of voicing. The study of palatalisation in Russian (Kochetov 2002) reveals a complex relationship between the primary place of articulation of both C_1 and C_2 and the spread of palatalisation. The data in chapter 3 shows that the same generalisation applies to Polish. Although the presence of a morpheme boundary does play a role in the [+pal] feature spreading, the primary place of articulation of the consonants involved in the process is equally important. For example, palatalised labials are poor triggers of palatalisation and, similarly, they are least prone to palatalisation. Coronals, on the other hand, are those segments that are easily affected by palatalisation because the process involves changes in their primary place of articulation.

To summarise, there is an asymmetry with regards to the type of prosodic/morphological categories that are marked by ALIGNMENT. In the case of PWord, both the right and the left edges are marked by feet bearing secondary stresses. I assume that marking the edges of PWords is vital in syntactic parsing, an issue not investigated here. It is open to discussion whether it is necessary to mark both edges of the PWord and if so whether one of the edges is 'stronger' than the other. I leave this issue for future research. In the case of MWord, only the right edge is marked. This issue was already discussed above. Stem, again is marked on both edges. Marking the right edge of the stem seems to be superfluous when one takes into account the left-to-right nature of speech processing and lexical access. Note, however, that the right edge of the stem is only relevant for the formation of truncate, mostly hypocoristics. We may hypothesise that the right edge of the stem does not play a significant role in lexical access and thus it is not marked by any phonological properties, e.g. blocking the spreading of place of assimilation between the stem and the suffix, or by prosody, e.g. foot alignment with the right edge of the stem. The right edge of the stem is exploited by metalinguistic processes, such as hypocoristic formation.

One of the main themes of this dissertation is an attempt to answer the following question: What triggers the asymmetry between LEFT and RIGHT ALIGNMENT/ ANCHORING in Polish phonology and morphology? We argue that the reason behind this asymmetry is purely functional and derives from the principles of language processing. The basic principles can be summarised as follows:

- Language is processed left to right and so the left edge of a morphosyntactic category such as root, stem, MWord, etc. is vital in lexical access. Language users will make every effort to keep the left edge of the category in question unaltered.

- Stems are more important in lexical access than affixes. Consequently, stems, in particular the left edge of the stem, are less likely to undergo morphophonological changes than affix. If the structure of the stem is in any way affected by affixation, then it is more likely to be its right edge rather than its left edge.

These two principles explain why LEFT ALIGNMENT prevails in Polish and they account for a great majority of data discussed in this dissertation, namely: lack of place assimilation across prefix-stem boundary and prevalence of Type A truncation over Type B truncation. The only exceptions are the assignment of primary stress and Type B truncation, which follow the rules of LEFT ALIGNMENT/ ANCHORING. This leads us to another issue addressed in this thesis: Does RIGHT ALIGNMENT/ ANCHORING actually exist and if so, then what prompts its existence?

In one of the paragraphs above, we argued that RIGHT ALIGNMENT plays a vital role in language processing as it marks the right edges of MWords, which are functionally and semantically the most prominent constituents of syntactic phrases. Thus, although LEFT ALIGNMENT may be crucial in lexical access, RIGHT ALIGNMENT plays an equally important role at a different level, i.e. that of syntactic parsing.

Chapter 4, however, clearly demonstrates that RIGHT ANCHORING, although less frequent than LEFT ANCHORING, is active in the formation of truncates and cannot be replaced by head foot faithfulness. The conclusion of this chapter was that RIGHT ANCHORING is used in two contexts: when speakers do not need to find the base of the truncate (e.g. hypocoristics) or when speakers deliberately try to obliterate the connection between the base form and the truncate (e.g. secret language). Thus, RIGHT ANCHORING does exist at the morphological level as well but, again, due to left-to-right processing it plays a much more diminished role than LEFT ANCHORING. In conclusion, the data analysed in this dissertation suggests the following preference:

7. LEFT ALIGNMENT/ANCHORING >> RIGHT ALIGNMENT/ANCHORING

However, as we discussed in chapter 4, ANCHORING can also be used to hinder lexical access, e.g. in secret langugaes. In such cases, the preferred ranking of LEFT and RIGHT ANCHORING will be reversed, with RIGHT ANCHORING at the top. This preference is also functionally based: the aim of secret languages is to mask the intended meaning of a word by using processes not commonly attested in every-day language. RIGHT ANCHORING, being employed much less frequently than LEFT ANCHORING in every-day language, serves the purpose of hindering lexical access perfectly well.

Lastly, there a number of issues emerging from this work that require future research as they could not be fully and exhaustively investigated here due to time and resource limitations. One of such issues was already mentioned above, i.e. a more detailed study of what phonological features obey ALIGNMENT and if they do not obey ALIGNMENT, then what prevents them from doing so. The present study of affixation is based on nonce forms and borrowings. An in-depth analysis of the asymmetry between suffixation and prefixation should also include a large corpus study of existing affixed Polish words with varying length of both the affix and the stem, metrical structure and segmental make-up. That would allow us to establish with greater certainty to what extent, if at all, across morpheme boundary assimilations are affected by frequency, phonotactics and metrical structure.

Another issue worth investigating is the relevance of marking the edges of PWords and how this marking interacts with the syntactic properties of the language. Are both edges of PWords equally important in language parsing and if not, then why. Is it usually the left edge of the PWord that prevails?

We should also look more closely at the interaction of edge marking of various grammatical and prosodic categories cross-linguistically. The study of Polish shows that the language does not uniformly select the same edge of each category for marking. Is it possible to have the same edge-oriented ALIGNMENT across all categories? What consequences would it have for language processing/parsing?

Further research needs to be done into the role and usage of RIGHT ALIGNMENT cross-linguistically. While LEFT ALIGNMENT may be the default option in most morphological processes, due to left-to-right language processing, RIGHT ALIGNMENT may play an equally important role in syntactic parsing and metalinguistic morphological processes, such as hypocoristic formation.

Another issue worth more thorough investigating is the *Trisyllabic Window Effect* in languages with non-iterative footing and its interaction with lexical stress marking and ALIGNMENT. The metrical stress theory treats the Trisyllabic Window Effect as a 'by product' of *LAPSE or NONFINAL. Should the Trisyllabic Window Effect be built directly into the grammar and what consequences would it have for metrical stress theory?

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APPENDIX 1

Stem-initial CC combinations of consonants tested in experiments 1 and 2.

	ɲ	mʲ	pʲ	bʲ	ʑ	ɕ	m	n	p	b	ʃ	ʒ	z	s
ɕ	√	√	√											
s			√				√	√	√					√
z	√	√		√			√	√		√				
p	√					√		√			√			√
b	√				√							√	√	
m	√							√			√	√		
ʃ			√				√	√	√					
ʒ	√						√							
ʑ[1]														
ɲ														
ŋ														
mʲ														
pʲ														
bʲ														

Shaded cells indicate that a given consonant cannot occur in a stem-initial position. Blank cells indicate unattested consonant combinations.

APPENDIX 2

Prefix z- + C-initial stem

C₁ C₂	ɲ	n	mʲ	m	ɕ	ʃ	s[2]	ʑ	ʒ	z[7]	p	pʲ	b	bʲ
z	√	√	√	√				√/-	√/-	√/-			√	√
s					√/-	√/-	√/-				√	√		
ʑ								√/-						
ɕ					√/-									
ʒ									√/-					
ʃ						√/-								

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[1] /ʑ/ can occur in stem-initial position in CC clusters, e.g. /ʑle/ (badly), but with none of the consonants tested in experiments 1 and 2.

[2] There are very few words that begin with /ss/ or /zz/, e.g. *ssać* (suck, inf.) or *zza* (from behind) and are analysed as monomorphemic. However, historically they can be traced back to polymorphemic words.

APPENDIX 3

CC word-medial/ stem-final clusters

C_1 C_2	ɲ	ɕ/tɕ	ʑ/dʑ	s	z	t	d	p	b	n	m	pʲ/bʲ	mʲ
ɕ	√	√				√				√	√		
ʑ	√		√						√	√	√		
s						√		√		√	√		
z							√		√	√	√		
t						√					√		
d									√		√		
p	√	√		√		√				√			
b					√		√			√			
m		√		√	√	√		√	√	√	√		
ɲ						√			√				
n						√	√			√			
pʲ/bʲ													
mʲ													

APPENDIX 4

CC-final stems + a palatalising suffix

C1 \ C2	ɲ	ɕ/tɕ	ʑ/dʑ	pʲ / bʲ	mʲ
ɲ	√	√	√		
n					
ɕ	√	√		√/-	√/-
tɕ		√/-		√/-	√/-
ʑ	√		√	√/-	√/-
dʑ				√/-	√/-
s				√/-	√/-
z				√/-	√/-
t[3]	√	√/-			√/-
d	√			√/-	√/-
p	√	√			
b	√				
m	√	√	√	√[4]	√[5]
mʲ					
pʲ/bʲ					

---

[3] The cluster(s) /ttɕ/ ~ /tɕtɕ/ can be found in a small number of borrowings, e.g. *mo[tt]-o* → *mo[ttɕ]-e* ~ *mo[tɕtɕ]-e*.

[4] Cluster resulting from denasalisation of nasal vowels in front of plosives, e.g. *gę[mb]+a* → *gę[mbj]+e* (mouth, nom. sg./ loc. sg.)

[5] Cluster found only in a small number of borrowings, e.g. *ga[mm]+a* → *ga[mmʲ]+e*.

APPENDIX 5

Verb prefixation – nonce formation

/n/
nazać
naksić
napkić
nazdić
nagmić

/ɲ/
niabać
niazić
niasnać
niazmić
niachpać

/m/
marlić
magić
mankić
masmić
magbać

/m^j/
miachić
miatmać
miasać
miarnić
miazdać

/s/
sapić
sabzdać
sangać
samdzić
saksać

/z/
zabdić
zalkać
zamtić
zasić
zarmać

/ɕ/
siakić
siagzać
siamzdać
siaździć
siaknić

/ʑ/
ziagdać
ziamić
ziardzać
ziacić
zianiać

/ʃ/
szamić
szadlić
szakać
szamgić
szadbać

/ʒ/
żagić
żandić
żakczyć
żardać
żatnić

/p/
panić
papić
pazbić
paszać
pamkać

/b/
bamdać
bagtyć
banić
bakić
bamać

/p^j/
piadać
piazić
piachmić
piarnić
piasmać

/b^j/
biasgać
biamać
biatlić
biaknić

APPENDIX 6

Verb prefixation – examples:

bić	zbić	*beat*
ciemnieć	ściemnieć	*get dark*
czesać	zczesać	*comb*
robić	zrobić	*do*
szyć	zszyć	*saw*
zielenieć	zzielenieć	*to become green*
gryźć	zgryźć	*bite*
myć	zmyć	*wash*
nieść	znieść	*carry*
pisać	spisać	*write*
siąść	zsiąść	*sit*
grzeszyć	zgrzeszyć	*sin*

APPENDIX 7

verb prefixation – training session.

biegać	zbiegać	*run*
nienawidzić	znienawidzić	*hate*
czernieć	zczernieć	*become black*
sinieć	zsinieć	*become pale*
mierzyć	zmierzyć	*measure*
szarzeć	zszarzeć	*become grey*
marnieć	zmarnieć	*be wasted*
ziębnąć	zziębnąć	*get cold*

APPENDIX 8

Verb prefixation – nonce formation

żagić
piasmać
szakać
ziacić
miatmać
piachmić
miarnić
siaknić
naksić
szamić
nagmić
biamać
ziamić
niazić
mankić
pazbić
bakić
biatlić
zabdić
siagzać
magbać
żatnić
bamać
siamzdać
zalkać
marlić
siakić
piazić
bamdać
niabać
magić
miazdać
samdzić
zarmać
szamgić
miasać
żardać
pamkać
nazać
zianiać
sapić
szadlić
biasgać
szadbać
panić
bagtyć
nazdić
zasić
żandić
piadać
piarnić
bianiać
niasnać
biaknić
ziardzać
saksać
masmić
sangać
niachpać
miachić
sabzdać
zamtić
siaździć
napkić
paszać
żakczyć
ziagdać
niazmić
banić

APPENDIX 9

Verb prefixation – loanwords

/n/
nab
nest
nod
nag
nap

/ɲ/
nick
kneel
need
nip
knit

/m/
mock
mug
melt
match
mop

/mʲ/
mute
muse
meet
miss
mince

/ʃ/
shield
shift
shut
shake
shop
shoot
shaft

/s/
sob
sag
send
solve
sell

/sʲ/
sift
seal
sink
sin
suit

/z/
zoom
zap
zip

/p/
part
puff
patch
parse
pop
paint
pad
pant
peck
pat

/pʲ/
pick
peep
peak
peel
pin
pierce
puke
pinch
piece

/b/
back
bask
bat
ban
bang

/bʲ/
bid
binge
beep
build

APPENDIX 10

Verb prefixation – loanwords (training session)

dance
log
write
read
clean

APPENDIX 11

Verb prefixation – loanwords

shield
pick
peep
peak
back
bask
mince
nab
mute
nest
sob
sag
meet
sift
nod
bid
bat
shift
shut
shake
shop
shoot
shaft
binge
zoom
part
puff
send
zap
seal
zip
patch
parse
beep
nick
miss
solve
peel
pin
muse
pierce
mock
pop
paint
nag
mug
melt
match
sell
pad
build
puke
kneel
nap
need
sink
nip
sin
suit
pinch
bill
piece
mop
pant
peck
knit
pat
ban
bang

APPENDIX 12

Noun suffixation – nonce formation

/-st/

slast	slaści+e
gast+o	gaści+e
knast+a	knaści+e
żast	żaści+e
dźrast+a	dźraści+e

/-zd/

nazd+a	naździe
klazd+a	klaździ+e
bazd	baździ+e
mrazd+a	mraździ+e
gmazd+a	gmaździ+e

/-sp/

masp+a	maspi+e
glasp+a	glaspi+e
zdasp+a	zdaspi+e
krasp+a	kraspi+e
jasp	jaspi+e

/-tp/

latp+a	latpi+e
kjatp+a	kjatpi+e
natp+a	natpi+e
rdzatp+a	rdzatpi+e
tatp+a	tatpi+e

/-zb/

zdazb+o	zdazbi+e
mjazb+a	mjazbi+e
zazb+a	zazbi+e
ńazb+a	ńazbi+e
szazb+a	szazbi+e

/-db/

madb+a	madbi+e
spadb+a	spadbi+e
ładb+a	ładbi+e
szadb+o	szadbi+e
kladb+o	kladbi+e

/-sn/

dlasn+o	dlaśni+e
nasn+o	naśni+e
grasn+a	graśni+e
stasn+o	staśnie
zmasn+a	zmaśni+e

/-tn/

latn+o	latni+e
datn+o	datni+e
czatn+a	czatni+e
mjatn+o	mjatni+e
natn+a	natni+e

/-zn/

dazn+o	daźni+e
kmazn+a	kmaźni+e
bazn+a	baźni+e
spazn+a	spaźni+e
czazn+o	czaźni+e

/-dn/

szadn+a	szadni+e
radn+o	radni+e
zbadn+o	zbadni+e
zjadn+o	zjadni+e
skadn+a	skadni+e

/-nt/

mant	manci+e
rant+a	ranci+e
zjant	zjanci+e
spant+a	spanci+e
kpant+a	kpanci+e

/-ns/

gans+a	gansi+e
stans+a	stansi+e
zlans+a	zlansi+e
słans+a	słansi+e
krans	kransi+e

/-nz/

stanz+a	stanzi+e
panz+a	panzi+e
ranz+a	ranzi+e
janz+a	janzi+e
kłanz+a	kłanzi+e

/-nd/

dand+a	dandzi+e
nand+a	nandzi+e
kland	klandzi+e
gand	gandzi+e
mand+a	mandzi+e

/-sm/

kasm+o	kasmi+e
mjasm+a	mjasmi+e
dasm+a	dasmi+e
gnasm+a	gnasmi+e
stasm+o	stasmi+e

/-tm/

zdatm+a	zdatmi+e
klatm+o	klatmi+e
łatm+a	łatmi+e
szatm+a	szatmi+e
dlatm+a	dlatmi+e

/-zm/

tazm+o	tazmi+e
grazm+o	grozmi+e
ńazm+a	ńazmi+e
stazm+a	stazmi+e
klazm+o	klazmi+e

/-dm/

czadm+o	czadmi+e
śadm+a	śadmi+e
zdadm+a	zdadmi+e
gadm+a	gadmi+e
jadm+o	jadmi+e

APPENDIX 13

Noun suffixation – examples:

miast+o	mieści+e	*town*
band+a	bandzi+e	*gang*
formalizm	formalizmi+e	*formalism*
pism+o	piśmi+e	*writing*
gwiazd+a	gwieździ+e	*star*
wiosn+a	wiośni+e	*spring*
ojczyzn+a	ojczyzni+e	*homeland*

APPENDIX 14

Noun suffixation – training session

blizn+a	blizni+e	*scar*
maszt	maszci+e	*mast*
pasm+o	pasmi+e	*lane*
Wand+a	Wandzi+e	*proper name*
izb+a	izbi+e	*room*
ciast+o	cieści+e	*cake*
most	mości+e	*bridge*
romantyzm	romantyzmi+e	*romanticism*
gniazd+o	gnieździ+e	*nest*
sosn+a	sośni+e	*birch+tree*

APPENDIX 15

Noun suffixation – nonce formation

mant	manci+e
gand	gandzi+e
masp+a	maspi+e
zjant	zjanci+e
nazd+a	naździe
natp+a	natpi+e
szatm+a	szatmi+e
klazm+o	klazmi+e
słans+a	słansi+e
dazn+o	daźni+e
ńazm+a	ńazmi+e
kłanz+a	kłanzi+e
kasm+o	kasmi+e
klazd+a	klaździ+e
zdasp+a	zdaspi+e
rdzatp+a	rdzatpi+e
klatm+o	klatmi+e
radn+o	radni+e
rant+a	ranci+e
grasn+a	graśni+e
janz+a	janzi+e
jasp	jaspi+e
zdazb+o	zdazbi+e
zjadn+o	zjadni+e
kpant+a	kpanci+e
tatp+a	tatpi+e
madb+a	madbi+e
krasp+a	kraspi+e
gast+o	gaści+e
bazd	baździ+e
gadm+a	gadmi+e
żast	żaści+e
gmazd+a	gmaździ+e
latp+a	latpi+e
spadb+a	spadbi+e
stazm+a	stazmi+e
jadm+o	jadmi+e
latn+o	latni+e
kmazn+a	kmaźni+e
zbadn+o	zbadni+e
dźrast+a	dźraści+e
kjatp+a	kjatpi+e
zazb+a	zazbi+e
szadb+o	szadbi+e
stasm+o	stasmi+e
tazm+o	tazmi+e

śadm+a	śadmi+e
ranz+a	ranzi+e
bazn+a	baźni+e
nasn+o	naśni+e
grazm+o	grozmi+e
zdadm+a	zdadmi+e
mand+a	mandzi+e
zdatm+a	zdatmi+e
stans+a	stansi+e
ńazb+a	ńazbi+e
kladb+o	kladbi+e
zmasn+a	zmaśni+e
dlasn+o	dlaśni+e
stanz+a	stanzi+e
nand+a	nandzi+e
dasm+a	dasmi+e
szazb+a	szazbi+e
slast	slaści+e
knast+a	knaści+e
mrazd+a	mraździ+e
spant+a	spanci+e
krans	kransi+e
dand+a	dandzi+e
mjazb+a	mjazbi+e
ładb+a	ładbi+e
natn+a	natni+e
szadn+a	szadni+e
glasp+a	glaspi+e
datn+o	datni+e
czadm+o	czadmi+e
mjasm+a	mjasmi+e
łatm+a	łatmi+e
mjatn+o	mjatni+e
czazn+o	czaźni+e
stasn+o	staśnie
kland	klandzi+e
gnasm+a	gnasmi+e
dlatm+a	dlatmi+e
skadn+a	skadni+e
gans+a	gansi+e
panz+a	panzi+e
zlans+a	zlansi+e
czatn+a	czatni+e

APPENDIX 16

Noun suffixation – loanwords

/-st/
cast
dust
chest
cost
frost
nest
crust
blast
trust
fast

/-sp/
hasp
rasp
wasp
clasp
grasp

/-ns/
bounce
fence
chance
dance

/-nt/
plant
grant
flint
dent
dint
cent

/-nd/
band
friend
brand
hand

APPENDIX 17

Noun suffixation – loanwords (training session)

bread
boost
ghost
mince
lisp
point

APPENDIX 18

Noun suffixation – loanwords

plant
bounce
cast
dust
band
hasp
chest
fence
rasp
friend
wasp
chance
cost
frost
clasp
nest
grant
brand
crust
flint
blast
trust
dent
fast
grasp
hand
dint
cent
blend
dance

APPENDIX 19

Experiment 1 - results

C_1 C_2	n	m	ɲ	mʲ	s	z	ç	ʑ	ʃ	ʒ	p	b	pʲ	bʲ
z	93.9% 108/115	89.7% 104/116	97% 108/111	91% 103/113	30.7% 35/114	97.8% 93/95	23.8% 27/113	94% 99/105	19% 22/113	99% 113/114	9% 100/110	92.9% 106/114	5% 6/114	90% 103/114
s	6% 7/115	10% 12/116	2.7% 3/111	8.8% 10/113	69% 79/114	2% 2/95	71% 81/113		77.8% 88/113		90% 10/110	7% 8/114	94.7% 108/114	9.6% 11/114
ʑ								3.8% 4/105						
ç							4% 5/113							
ʒ										0.8% 1/114				
ʃ									2.6% 3/113					

APPENDIX 20

Experiment 2 - results

C_1 C_2	n	m	ɲ	mʲ	s	z	ç	ʑ	ʃ	ʒ	p	b	pʲ	bʲ
z	93% 109/117	88% 187/212	87.8% 87/99	100% 16/16	15% 31/218	100% 62/62		0	5% 8/157	0	18% 78/429	93% 214/229		0
s	6.8% 8/117	11.7% 25/212	12% 12/99		85% 186/218		71% 5/7	0	86.6% 136/157	0	81.5% 350/429	6.5% 15/229	100% 7/7	0
ʑ								0		0				0
ç							28% 2/7	0		0				0
ʒ								0		0				0
ʃ								0	8% 13/157	0				0

APEENDIX 21

Experiment 3 - results

C_1 $(C_1)C_2$	(s)tɕ	(z)dʑ	(s)pʲ	(z)bʲ	(t)pʲ	(d)bʲ	(s)ɲ	(z)ɲ	(t)ɲ	(d)ɲ	(s)mʲ	(z)mʲ	(t)mʲ	(d)mʲ	(n)tɕ	(n)dʑ	(n)ɕ	(n)ʑ
s	13.7% 15/109		86.6% 97/112				45% 56/124				68.7% 77/112							
z		18.9% 21/111		75.4% 83/110				54.4% 63/116				67% 73/109						
t					99% 109/110				99% 116/117				100% 115/115					
d						98% 108/110				100% 108/108				99% 100/101				
n															72% 78/108	61.8% 68/110	69.5% 73/105	71.8% 79/110
V																	13% 14/105	10.9% 12/110
ɕ	60.5% 66/109	0.09% 1/111	13.3% 15/112				54.8% 68/124				31% 35/112							
ʑ		61% 68/111		24.5% 27/110				45.6% 53/116				33% 36/109						
tɕ					0.09% 1/110				1% 1/117									
dʑ						1.8% 2/110								1% 1/101				
ɲ															2.7% 3/108	2.7% 3/110	4.7% 5/105	5.4% 6/110
pal[6]	25.6% 28/109	18.9% 21/111													25% 27/108	35.4% 39/110	12.3% 13/105	11.8% 13/110

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[6] The column represents cases where the stem-final consonant did not take the alveolo-palatal place of articulation. The final cluster retained its original place of articulation but a glide-like elemnt was inserted in between the stem and the suffix, e.g. *kla/zd/-a* → *kla/zdj/-e*.

APPENDIX 22

Experiment 4 - results

C_1 $(C_1)C_2$	(s)tɕ	(s)pʲ	(n)tɕ	(n)dʑ	(n)ɕ
s	10% 20/191	70% 71/101			
n			77.5% 90/116	76% 74/97	35.7% 24/68
V			1.7% 2/116		42.6% 29/68
ɕ	74% 142/191	19.8% 20/101			
ɲ			2.5% 3/116	3% 3/97	
pal[7]	4.7% 9/191		6% 7/116	9% 9/97	7% 5/68
ø[8]	10.9% 21/191	10% 10/101	12% 14/116	11% 11/97	14.7% 10/68

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[7] The column represents cases where the stem-final consonant did not take the alveolo-palatal place of articulation. The final cluster retained its original place of articulation but a glide-like element was inserted in between the stem and the suffix, e.g. *kla/zd/-a* → *kla/zdj/-e*.

[8] The column represents cases where only the plain suffix –e was attached without any modification of the stem-final consonant(s).

APPENDIX 23

HYPOCORISTISTIC TRUNCATION

Table 1: FEMININE NAMES

Base Name	Type A Truncate	Type B Truncate	Middle syllable	VV clash	Both edges
Adamin+a	Ad+a				
Adam+a	Ad+a				
Adelajd+a	Ad+a				
Adelin+a Adel+a	Ad+a				
Adolfin+a		Fin+a			
Adolf+a		Dolf+a			
Adriann+a	Ad+a				
Agat+a	Ag+a				
Agnieszk+a	Ag+a				
Albert+a	Al+a	Bert+a			
Albin+a		Bin+a			
Aldon+a	Al+a	Don+a			
Alfons+a		Fonsi+a			
Alfred+a		Fred+a			
Alicj+a	Al+a				
Alin+a	Al+a	Lin+a			
Alojz+a		Lois			
Ameli+a		Mel+a			
Anastazj+a	Nast+ka				
Anatoli+a		Tol+a			
Aniel+a		Nel+a			
Anit+a		Nit+a			
Ann+a	Ani+a				
Antonin+a		Nin+a			
Antoni+a		Toni+a			
Apoloni+a	Pol+a				
Arlet+a	Ar+unia	Let+a			
Augustyn+a		Tyn+a			
August+a		Gust+a Guci+a			
Balbin+a	Balb+usia	Bin+a			
Barbar+a	Basi+a				
Beat+a				Beci+a	
Benedykt+a	Beni+a				
Bibiann+a	Bib+a				
Blandyn+a	Blan+ka				
Bogumił+a	Bodzi+a	Mił+a			
Bogusław+a	Bodzi+a	Sław+a			
Bolesław+a	Bol+a	Sław+a			
Bronisław+a	Broni+a	Sław+a			

Brygid+a	Brydzi+a					
Cecyli+a		Cyl+a				
Celestyn+a	Cel+a					
Celin+a	Cel+a					
Chwalisław+a		Sław+a				
Czesław+a	Czesi+a					
Dagmar+a	Dag+a	Mar+a				
Danut+a	Dan+a					
Delfin+a	Delf+a	Fin+a				
Dionizj+a	Dion+a	Niz+ka				
Dobiegniew+a		Gniew+a				
Dobiesław+a	Dob+ka	Sław+a				
Dobrosław+a	Dob+ka	Sław+a				
Dobromił+a		Mił+a				
Dobromir+a		Mir+a				
Dominik+a		Nik+a				
Donat+a	Don+a					
Dorot+a	Dor+a					
Edyt+a	Edzi+a					
Eleonor+a		Nor+a				
Eligi+a	El+a	Ligi+a				
Elżbiet+a	El+a Elż+unia	Biet+a				
Emanuel+a Manuel+a	Man+a					
Emili+a		Mil+a				
Ernest+a		Nest+a				
Ernestyn+a		Tyn+a				
Erwin+a		Win+a				
Eryk+a		Ryk+a				
Esterk+a		Terk+a				
Eufemi+a		Fem+a				
Eufrozyn+a	Fruzi+a					
Ewelin+a	Ew+a					
Felicj+a	Fel+a					
Florentyn+a	Flor+a					
Franciszk+a	Frani+a					
Fryderyk+a	Frydzi+a					
Gabriel+a	Gabr+ysia					
Gallin+a	Gal+a					
Genowef+a	Geni+a					
Georgin+a		Gin+a				
Gertrud+a	Gert+a	Trud+a				
Godzimir+a		Mir+a				
Grażyn+a	Graż+a					
Gryzeld+a	Gryzi+a ·	Zeld+a				
Gustaw+a	Gust+a					
Halin+a	Hal+a					

Helen+a	Hel+a	Len+a			
Henryk+a	Heni+a	Ryk+a			
Hermenegild+a		Gild+a			
Honorat+a			Nor+a		
Hortensj+a		Teni+a			
Hubert+a		Bert+a			
Idali+a	Id+a				
Idall+a	Id+a				
Ignacj+a	Ig+a				
Iren+a	Ir+a				
Iwon+a	Iw+a				
Izabel+a	Iz+a	Bel+a			
Jadwig+a	Jadzi+a	Wig+a			
Jagod+a	Jag+a				
Janin+a	Jani+a	Nin+a			
Joann+a		Asi+a			
Jolant+a	Jol+a				
Józefin+a	Józi+a	Fin+a			
Juli+a	Jul+a	Jul+a			
Justyn+a		Tyn+a			
Kamil+a	Kam+a				
Karolin+a	Karol+(a)	Lin+a In+a			
Katarzyn+a	Kasi+a				
Kazimier+a	Kazi+a				
King+a	Kini+a				
Klarys+a	Klar+a				
Klotyld+a	Kloci+a	Tyld+a			
Konstancj+a	Kost+ka				
Korneli+a	Kor+a	Nel+y			
Krystyn+a	Krysi+a				
Kunegund+a		Gund+a			
Lambert+a		Bert+a			
Laurentyn+a	Laur+a				
Laurencj+a	Laur+a				
Leokadi+a					Lodzi+a
Leonor+a	Leoni+a			Loni+a	
Lilian+a	Lil+a				
Lubomir+a	Lub+a	Mir+a			
Lucjol+a	Luci+a				
Lucyn+a	Luci+a				
Ludmił+a	Lud+a	Mił+a			
Ludwik+a	Lud+a	Wik+a			
Lukrecj+a	Luci+a	Kreci+a			
Magdalen+a	Magd+a Mad+a	Len+a			
Malwin+a		Win+a			
Małgorzat+a	Małgosi+a				

Małgosi+a		Gosi+a			
Manet+a	Man+a				
Manfred+a	Mani+a	Fred+a			
Marcelin+a	Marci+a				
Marcel+a		Cel+a			
Marcjann+a	Marc+ysia				
Mari+a	Mar+a				
Mariann+a	Mar+a				
Marlen+a		Len+a			
Mart+a	Mar+cia				
Masław+a	Maś+ka	Sław+a			
Matyld+a		Tyld+a Tyl+a			
Melani+a	Mel+a				
Michalin+a	Misi+a Michasi+a				
Mieczysław+a	Mieci+a				
Miłosław+a	Mił+a	Sław+a			
Mirosław+a	Mir+a				
Monik+a	Moni+a	Nik+a			
Nadziej+a	Nadzi+a				
Norbert+a	Nor+a	Bert+a			
Odyli+a	Od+a				
Oksan+a	Oksi+a	San+a			
Oktawi+a	Okci+a Okt+usia	T+usia			
Olg+a	Ol+a				
Olimpi+a	Ol+a				
Otyld+a	Ot+a				
Otyli+a	Ot+a				
Paulin+a	Paul+a				
Petronel+a	Peci+a	Nel+a			
Praksed+a	Praksi+a	Sed+a			
Rajmund+a		Mund+ka			
Regin+a		Gin+a			Reni+a
Renat+a	Reni+a				
Robert+a		Berci+a			
Roksan+a	Roksi+a	San+a			
Roman+a	Rom+a				
Rościsław+a		Sław+ka			
Róż+a	Rózi+a				
Ryszard+a	Rysi+a				
Salome+a	Sal+a	Mea			
Sławomir+a	Sław+ka	Mir+ka			
Stanisław+a	Stasi+a				
Stefani+a	Stef+a				Steni+a
Stell+a	Stel+ka				
Strzeżymir+a		Mir+ka			
Świętomir+a		Mir+ka			

Świętosław+a		Sław+a			
Szarlot+a		Lot+a			
Tatian+a					Tani+a
Tekl+a	Teci+a				
Teodor+a	Teosi+a	Dor+a		Tosi+a Ted+a	
Teodozj+a				Todzi+a	
Teofil+a		Fil+a		Tosi+a	
Tomisław+a		Sław+ka			
Ulryk+a	Ul+a	Ryk+a, Rik+a			
Urszul+a					Ul+a
Walentyn+a	Wal+a				
Waleri+a	Wal+a				
Wand+a	Wandz+ik				
Wand+eczka		D+eczka			
Weronik+a	Wer+a Weron+ka				
Wierzchosław+a		Sław+a			
Wiesław+a	Wiesi+a				
Wiktori+a	Wikt+a				
Wilhelm+a Wilhelmin+a					Wilm+a Wel+ma
Wiolett+a	Wiol+a				
Władysław+a	Władzi+a				
Wojsław+a		Sław+ka			
Zuzann+a	Zuz+a				

Table2: MASCULINE NAMES

Base Name	**Type A Truncate**	**Type B Truncate**	**Middle Syllable**	**VV clash**	**Other**
Adolf	Ad+ek Dol+ek				Alf
Agaton	Adzi+o				
Agenor	Adzi+o				
Albert	Al+ek Alb+ek	Bert Berc+ik			
Albin	Al+ek	Bini+o			
Albrecht	Al+ek	Brecht+ek			
Aleksander	Al+ek				
Aleks+y	Al+ek				
Alfons	Al+ek	Fons+ek			
Alfred	Alf	Fred+ek			
Alojz+y		Lois			
Ambroż+y	Amb+ek	Broż+ek Bros			
Anastaz+y	Anas Nast+ek				
Anatol	Natol	Tol+o			
Anton+i	Ant+ek	Toni			
Anzelm	An+ek Anz+ek	Zelm+ek			
Apolinar+y	Poli				
Arkadiusz	Ar+ek				
Arnold	Arni+o				
Artur	Art+ek	Tur+ek			
Aspazjan	Pazi+o				
August		Guci+o			
Balbin		Bin+ek			
Baltazar	Balt+ek				
Barnab+a		Nab+ek			
Bartłomiej	Bart+ek				
Bartosz	Bart+ek				
Benedykt	Ben+ek				
Beniamin	Beni+o				
Bernard	Beni+o				
Błażej	Błaż+ko				
Bogdan	Bodzi+o Bod+ek				
Bogumił	Bog+uś				
Bogusław	Bog+uś	Sław+ek			
Bolesław	Bol+o				
Bonifac+y	Boni+o				
Bożydar		Dar+ek			
Bronisław	Bron	Sław+ek			
Chwalibóg	Chwał+ek				

Chwalisław	Chwał+ek	Sław+ek			
Cyprian	Cypr+ek Cyp+ek				
Cyriak	Cyr+ek				
Czesław	Czesi+o				
Damian	Dam+ek				
Daniel	Dan+ek				
Danisz	Dan				
Dariusz	Dar+ek				
Dioniz+y	Dion+ek				
Dobiegniew		Gniew+ek			
Dobiesław	Dob+ek	Sław+ek			
Dobrogost		Gost+ek			
Dobromir		Mir+ek			
Dobromił		Mił+ek			
Dominik		Nik+o			
Donat	Don+ek				
Dyzma	Dyzi+o				
Edgar	Ed+a Edzi+o	Gar+ek			
Edward	Ed+a Edzi+o				
Egbert	Edzi+o	Berci+o			
Edmund	Ed+a Edzi+o	Mund+ek			
Edwin	Ed+a Edzi+o	Win+ek			
Egon	Eg+uś				
Eliasz	El+ek				
Eligiusz	El+ek				
Emanuel	Manu				
Emiliusz	Emil				
Emilian	Emil				
Epifan		Fan+ek			
Erazm		Razm+ek			
Ernest	Erni+o	Nest+ek			
Erwin	Er+ek	Wini+o			
Eugeniusz	Geni+o				
Eustach+y		Stasz+ek			
Euzebiusz	Zebek				
Fabrycjan	Fabryc				
Felicjan	Fel+ek				
Feliks	Fel+ek				
Ferdynand	Ferdzi+o	Nand+ek			
Florent+y	Flor+ek				
Franciszek	Frani+o Franc				
Fryderyk	Fryc+ek Fryc				

Gaspar	Gasp+ek	Par+ek			
Gerwaz+y	Ger+ek Gerw+ek				
Gniewosz	Gniew+ek				
Godzimir	Godz+ek	Mir+ek			
Gościmił		Mił+ek			
Gościrad		Rad+ek			
Gotfryd		Fryd+ek			
Gracjan	Grac+ek				
Grzegorz	Grzesi+o				
Grzymisław	Grzym+ek				
Gustaw	Gutek				
Heliodor	Hel+ek				
Henryk	Heni+o	Rycz+ek			
Herbert		Berc+ik			
Herman	Herm+ek	Man+ek			
Hieronim	Hir+ek				
Hilar+y	Hil+ek	Lar+ek			
Hipolit	Hip+ek	Polit			
Hipolis		Polis			
Hubert		Berc+ik			
Ignac+y	Ig+o	Nac+y			
Igor	Ig+o				
Ildefons	Ild+ek	Fons+ek			
Ireneusz	Ir+ek				
Izydor	Izyd Izyt				
Jacent+y	Jac+ek				
Jacek	Jac+uś				
Jakub	Jak	Kub+a			
Jan	Jasi+o Jaś				
Janisław	Jan+ek				
Jarogniew	Jar+ek	Gniew+ek			
Jarosław	Jar+ek				
Jędrzej	Jędr+ek				
Józef	Józi+o				
Joachim				Jakim	
Jordan	Jord+ek				
Julian	Jul+ek				
Juliusz	Jul+ek				
Jurand	Jur+ek				
Kajetan		Tan+ek			
Kazimierz	Kazi+o				
Kiejstus	Kieś				
Kirył	Kir				
Kleofas	Kleo				
Konrad		Rad+ek			
Konstant+y	Kost+ek				

Konstantyn		Tin			
Kornel		Nel+ek			
Kryspin	Krysp+ek	Pin+ek			
Krystian	Kryst+ek				
Krzysztof	Krzysi+o				
Lambert		Berc+ik			
Lechosław					Lesław
Leonard		Nard+ek			
Leopold		Pold+ek			
Libert		Berc+ik			
Longin	Lon+ek Long+uś	Gin+ek			
Lubomir		Mir+ek			
Lucjan	Luc+ek				
Maciej	Maci+ek				
Maksymilian	Maksi+o Maks				
Manfred	Man+ek	Fredzi+o			
Marcelin	Marcel	Celin			
Marek	Mar+uś				
Masław	Masi+ek				
Mateusz				Matusz	
Mauryc+y	Maur				
Melchior	Mel+ek Melch+uś	Chior+ek			
Mieczysław	Miet+ek				
Mikołaj	Mik+uś				
Miłosław	Mił+ek	Sław+ek			
Miłosz	Mił+ek				
Miron	Mir+ek				
Mirosław	Mir+ek Miros				
Mścisław	Mścis+ek	Sław+ek			
Napoleon	Nap+ek				
Niecisław	Niec+ek	Sław+ek			
Nikodem	Nik+o				
Norbert	Norb+ek	Bert+ek			
Odon	Od+o				
Odil+o	Od+o				
Olgierd	Ol+o				
Onufr+y	Nuf+ek				
Oskar	Osi+o	Kar+ek			
Oswald	Osi+o	Waldzi+o			
Pafnuc+y	Pafn+uś	Nuc+ek			
Pankrac+y	Pan+ek	Krac+ek			
Polikarp		Karp+ik			
Prosper	Prosp+ek				
Protaz+y	Proc+ik·				
Przemysław	Przem+ek				

	Przem+o				
Przybysław	Przyb+ko Przyp+ko				
Radosław	Rad+ek				
Radzisław	Rad+ek				
Rajmund	Rajm+ek	Mund+ek			
Rajnold	Rajn+ek	Nold+ek Nol+ek			
Remigiusz	Remi Remiś Rem+ek				
Renat	Ren+ek				
Robert	Rob+cio	Berc+ik			
Roch	Rosi+o				
Roger	Rog+uś				
Roman	Rom+ek				
Rościsław	Rost+ek	Sław+ek			
Rudolf					Rolf
Ruprecht	Rup+ek				
Ryszard	Rysi+o				
Sambor	Samb+ek Sam+ek				
Sebastian	Seb+a				
Serwac+y	Serw+uś				
Sieciech		Ciesz+ek			
Siemowit	Siem+ko				
Skarbimir	Skarb+ek				
Sławomir	Sław+ek	Mir+ek			
Sobiesław	Sob+ek				
Spycigniew	Spyt+ek				
Spycimir	Spyt+ek				
Stanisław	Stasi+o Stasz+ek				
Stefan	Stef+ek				
Strzeżymir		Mir+ek			
Strzeżysław	Strzeż+ek				
Sulimir	Sul+ik				
Sulisław	Sul+ik				
Sykstus		Tusi+o			
Sylwan	Sylw+ek				
Sylwester	Sylw+ek				
Szymon	Szym+ek				
Szczepan	Szczep+ek				
Świętomir		Mir+ek			
Świętosław	Święt+ek				
Tadeusz	Tad+ek Tadz+ik				
Tarzycjusz	Tar+ek .				
Teodor	Teoś			Ted	

Teofil		Fil+ek			
Tobiasz	Tob+ek				
Tomasz	Tom+ek				
Tomisław		Sław+ek			
Tyberjusz	Tyb+ek Tybr+ek				
Tymon	Tym+ek				
Tymoteusz	Tym+ek				
Urban	Urb+ek	Ban+ek			
Ulryk	Ul+ek				
Ursyn		Syn+ek			
Wacław	Wac+ek				
Waldemar	Waldzi+o Wald+i				
Walent+y	Wal+ek				
Wawrzyniec	Wawrz+ek				
Wespazjan	Wesp+ek		Pazi+o		
Wilhelm	Wil+ek	Helm+ek			
Wieńczysław	Win+ek				
Wiesław	Wiesi+o				
Wirzchosław		Sław+ek			
Wiktor	Wit+ek				
Wilhelm	Wil+i Wil+uś				
Wincent+y	Wici+o				
Wirgiliusz	Wir+ek Wirg+uś				
Wisław	Wisi+ek				
Witold	Wit+ek				
Władysław	Władzi+o				
Włodzimierz	Włod+ek				
Wojciech	Wojt+ek				
Wojsław		Sław+ek			
Wszebor		Bor+ek			
Wszeciech		Cisz+ek			
Wszemir	Wszem+ek				
Zbigniew	Zbysi+o				
Zdzisław	Zdzisi+o				
Ziemowit	Ziem+ko				
Zygfryd	Zyg+a	Fryd+ek			
Zygmunt	Zyg+a				

APPENDIX 24

School slang truncation

abstynencj+a	abst+a	*teetotalism*
adidas(+y)	ad+ik(+i), adk+i	*adidas shoe(s)*
agrotechnik+a	agro	*agrotechnology*
akademia ekonomiczna	ekonom	*School of Economics*
akademia medyczna	medyk	*Medical School*
alkohol	alko	*alcohol*
ambitna osoba	ambit	*an ambitious person*
amfetamin+a	amf+a	*amphetamine*
amfetamin+a	fet+a	*amphetamine*
anem+ik	anem	*a slow, unenergetic person*
anorektyk	anor	*an anorexic*
badziewi+e	badziew	*low quality products*
bezczelna osoba	bezcz+yl	*a cheeky person*
bibliotek+a	bibl+a	*library*
biologi+a	biol, biol+a	*biology*
biseksualist+a	biseks	*bisexual*
blondyn+a	blond+a	*a blond girl*
boisk+o	boj+o	*football pitch*
browar	bro	*brewery, beer*
brzydk+a (dziewczyna)	brzyd+a	*ugly (girl)*
bysior	bysi+o	*a big guy*
bufon	buf+o	*a proud person*
chemi+a	chem+a	*chemistry*
chodź no!	cho no!	*Come closer!*
czambuł	czamb+o	*face (derog)*
czekolad+a	czeko	*a black person*
dekagram	dek+o	*10 grams*
dezodorant	dezo, dez+or	*deodorant*
diler	dil, dil+o	*drug dealer*
denaturat	denat	*denatured alcohol*
dermatologi+a	derm+a	*dermatology*
do zobaczenia	dozo	*see you*
dyrektor	dyr, dyr+ek, dyr+o	*director*
dyrektor+ka	dyr+a, dyr+cia, dyr+ka	*director (fem)*
dyskotek+a	dysk, dys+ka, dysk+o	*disco*
dzielnic+a	dzielni+a	*district*
elektrotechnik+a	elektr+a	*electrotechnology*
entymologi+a	ent+a	*entomology*
facet+ka	fac+a, faci+a	*woman (derog)*
facet	faci+o, faci+u	*man (derog)*
Fafik	Faf	*name of a restaurant*
fafuł+a	fuł+a	*a clumsy person*
farmakologi+a	farm+a	*pharmacology*
Feniks	Feni+o	*name of a restaurant*
fitopatalogi+a	fit+a, fit+o	*phytopathology*

fizyk+a	fiz+a	*physics*
fotografi+a	fot+a, fot+ka	*photography*
gaci+e	gać	*pants*
garnek	garn	*soucepan*
garnitur	gajer, gant	*suit*
gaśnic+a (nos)	gaśn+ik	*nose (colloq)*
geografi+a	gegr+a	*geography*
genetyk+a	gen+y	*genetics*
gigabajt	giga	*gigabyte*
gimnastyk+a	gimn+a	*physical education*
gleboznawstw+o	gleb+a	*soil science*
graffiti	graf	*graffiti*
gramatyk+a	gram+a	*grammar*
haszysz	hasz	*hashish*
haszysz afgańsk+i	afgan	*Afghan hashish*
herbat+a	herb+a	*tea*
heroin+a	her+a	*heroine*
histori+a	hist+a	*history*
hipopotam	hip+ciu	*hipopothamus*
homoseksualist+a	homo	*homosexual*
imprez+a	impr+a	*party*
informacj+a	info	*information*
informatyk+a	inform+a	*IT*
internat	inter	*hall of residence*
internet	inet	*internet*
irokez	irok	*cherekee*
jełop+a	jep+a	*head (derog)*
kaganiec (uparty)	kagan	*a stubborn person*
Kasi+a	Kaś	*girl (coll)*
Kałasznikow	Kałach	*kalashnikov*
Kawasaki	Kawa	*Kawasaki motorcycle*
kieliszek	kiel+on	*wine glass*
kierownik	kier, kiero	*manager*
kilobajt	kilo	*kilobyte*
kilogram	kilo	*kilogram*
kilometr	kilos	*kilometre*
klasówk+a	klaks+a	*test*
klimatyzacj+a	klim+a	*air-conditioning*
kodein+a	kod+a	*codeine*
kokain+a	kok+a	*cocaine*
koleg+a	kol+o	*friend*
kolokwium	kolo, koło	*test*
komedi+a	kom+a	*comedy*
komórk+a	kom+a	*mobile phone*
komputer	puter	*computer*
komputer	komp	*computer*
konsekwencj+e	konsekw+y	*consequences*
konspiracj+a	konspir+a	*resistance movement*
korepetycj+e	kor+ki	*private tuition*
koszul+a	koszul	*shirt*

kumpel+ka	kumpl+a	*friend*
kserografia, kserokopia	ksero	*photocopier, photocopy*
labolatorium	lab+o	*laboratory*
legaln+y	legal	*legal*
legitymacj+a	legit+a, legit+ka	*student ID*
lesbijk+a	lesb+a, lezb+a	*lesbian*
libacj+a	lib+a	*party with a lot of drinking*
marihuana	mari+a	*marihuana*
matematyk+	majm+a, matm+a, matem+a	*mathematics*
megabajt	mega	*megabyte*
Mercedes	Merc, Mer+ol	*Mercedes*
metanabol	met+ka	*methyl alcohol*
Microsoft	Mikr+y	*Microsoft*
mikrobiologi+a	mikr+o, mikr+a	*microbiology*
minut+a	min+a	*minute*
muzyk+a	muz+a	*music*
na razie	nara	*see you*
narkotyk+i	nar+y	*drugs*
nawzajem	nawza	*same to you*
negativus (słaby student)	negat	*a weak student*
neurologi+a	neur+a	*neurology*
obuwi+e	obuw	*footwear*
okular+y	okular	*spectacles*
popularne	pop+ek	*cigarette*
poważani+e	poważ+ka	*respect*
pozdrowieni+a	pozdro	*greetings*
prezes	prezi+o	*president*
profesor	psor, psor+ek	*professor*
profesor	sor, sor+ek	*professor*
profesor	prof	*professor*
profesor+ka	sor+a, sor+ka	*professor (female)*
propedeutyk+a	prop+a	*sociology*
prywatka	pryw+a, prywat	*party*
religia	rel+a	*religion*
rewelacj+a	rewel+a	*a piece of news*
schizofreni+a	schiz+a	*schizophrenia*
siłowni+a	sił+ka	*gym*
siostr+a	sior+a	*sister*
skleroz+a	skler+a	*sclerosis*
Sobieski	Sob+ek	*cigarette*
solarium	solar	*sun-bed*
specjalista	spec	*specialist*
spirytus	spir, spirt, spryt, spiryt	*pure alcohol*
spokojnie	spok+o, spoks	*take it easy!*
spontaniczne działanie	spontan	*a spontaneous action*
statystyk+a	stat+a	*statistics*
stomalogi+a	stom+a	*dentistry*
stypendium	styp+a	*bursary*
Sylwester	Sylw+ek	*New Year's party*

symulacj+a	symul+ka	*simulation*
szacunek	szacun	*respect*
szamani+e	szama	*devouring food*
szyderowani+e	szyder+a	*derision*
środki halucynacyjne	halun+y	*hallucinatory substances*
tablic+a	tabl+a	*blackboard*
taksówk+a	taks+a	*taxi*
technik+a	techn+a	*practical classes*
telefon	fon	*telephone*
termodynamik+a	term+a	*thermodynamics*
tragedi+a	trag+a	*tragedy*
przytomn+y	tomn+y	*conscious*
totaln+y, totalni+e	total	*totally*
towaroznawstw+o	towar	*merchandise knowledge*
uniwersytet	uniwer, uniwer+ek, uni	*university*
wiceprzewodnicząc+y	wic+o	*vice-president*
Windows	wind+y	*Microsoft Windows*
w ogóle	wogle	*at all*
w porządku	w porzo	*all right*
zabaw+a	baw+ka	*party*
zaliczeni+e	zal+ka	*credit*
zapałk+i	zap+y	*matches*
zboczeniec	zbok, zbocz+ek	*pervert*
zdziwieni+e	zdziw+ko	*surprise*
znajom+y	znajom	*an acquaintance*
zup+a	zup	*soup*
zwyrodnialec	zwyr+ol	degenerate