Polish morphonotactics in first language acquisition

Paulina Zydorowicz

Wiener Linguistische Gazette
Institut für
Sprachwissenschaft
Universität Wien
74 (2007): 24-44

Introduction

In this report the author will try to show the interface between phonology and morphology on the basis of phonotactics or rather morphonotactics. Therefore, the main focus of the empirical study is the investigation of Polish consonant clusters with and without morphological boundaries. It is assumed that in languages a given number of clusters will arise at morpheme boundaries. Although these morphonotactic clusters are often marked, they will be produced/acquired by children more easily than lexical clusters. A morphological cluster is more likely to be retained in production as it serves a morphological function (a new semantic or grammatical meaning is conveyed).

In Chapter 1 the author will present Polish (mor)phonotactics. Subsequently, Polish clusters will be examined according to the criterion of markedness. For this purpose the author will refer to the Optimal Sonority Distance Principle (the OSDP) developed by Dziubalska-Kołaczyk (2002). Chapter 3 will be devoted to the description and analysis of the empirical study of Polish morphonotactics on the basis of the data coming from the field of first language acquisition. Finally, in Chapter 4 the author will show in what direction the study will develop.

1.0 Polish morphonotactics

In Chapter 1.0 Polish morphononactics will be discussed. Firstly, actual numbers of possible consonant combinations in all word positions will be presented. Secondly, the author will show how morphonotactic clusters come into being.

1.1 Polish morpheme-internal and morphological clusters

The first inventory of consonant clusters in Polish was compiled by M. Bargiełówna (1950). The author enumerates all possible consonant combinations in the word initial, medial and final position. The table below presents the number of clusters in each position in a word.

THE NUMBER OF CONSONANTS IN A CLUSTER	**THE NUMBER OF INITIAL CLUSTERS**	**THE NUMBER OF MEDIAL CLUSTERS**	**THE NUMBER OF FINAL CLUSTERS**
DOUBLES	231	534	100
TRIPLES	165	754	26
4-MEMBER CLUSTERS (AND MORE)	15	134	12

Table 1: The number of clusters in Polish in the word initial, medial and final position according to Bargiełówna (1950)

Additionally, Bargiełówna makes a distinction between clusters which occur within a morpheme, at morpheme boundaries as well as native and non-native clusters giving numbers for each subcategory of clusters. Table 2 below presents initial doubles.

INITIAL DOUBLES	
The number of realised clusters	231
❖ The number of native clusters	216
The number of clusters within a morpheme	191
The number of clusters across morpheme boundaries	59
The number of clusters present both within a morpheme and across morpheme boundaries	34
❖ The number of non-native clusters	15

Table 2 The statistics of initial doubles according to Bargiełówna (1950)

In this group the most active consonants (i.e. the ones which serve as the first element of the cluster) are: /v/ (begins 19 cluster types), /k/ (begins 16 cluster types), /z/ (begins 16 cluster types), /s/ (begins 15 cluster types), /g/ (begins 15 cluster types), /□/ (begins 15 cluster types).

MEDIAL DOUBLES	
The number of realised clusters	534
❖ The number of native clusters	479
The number of clusters within a morpheme	305
The number of clusters across morpheme boundaries	353
The number of clusters present both within a morpheme and across morpheme boundaries	179
❖ The number of non-native clusters	55
The number of clusters in compounds	3

Table 3 The statistics of medial doubles according to Bargiełówna (1950)

In this group the most active consonants (i.e. the ones which serve as the first element of the cluster) are: /w/ (begins 34 cluster types), /r/ (begins 34 cluster types), /j/ (begins 33 cluster types), /l/ (begins 29 cluster types), /m/ (begins 28 cluster types), /x/ (begins 28 cluster types). /n/ (begins 25 cluster types).

FINAL DOUBLES		
The number of realised clusters	100	
❖ The number of native clusters		78
❖ The number of non-native clusters	22	

Table 4 The statistics of final doubles according to Bargiełówna (1950)

In the case of final doubles, almost all of them occur within a morpheme. Only isolated cases occur at morpheme boundaries, for example, /jɕ/ in *czyjś* (somebody's) as well as several dubious cases such as /kw/ or /tw/. In this group the most active consonants (i.e. the ones which serve as the first element of the cluster) are: /r/ (begins 14 cluster types), /l/ (begins 10 cluster types), /w/ (begins 9 cluster types), /n/ (begins 8 cluster types).

INITIAL TRIPLES	
The number of realised clusters	165
❖ The number of native clusters	160
The number of clusters within a morpheme	65
The number of clusters across morpheme boundaries	110
The number of clusters present both within a morpheme and across morpheme boundaries	15
❖ The number of non-native clusters	5

Table 5 The statistics of initial triples according to Bargiełówna (1950)

In this group the most active consonants are: /s/ (begins 30 cluster types), /z/ (begins 27 cluster types), /f/ (begins 23 cluster types), /v/ (begins 19 cluster types).

MEDIAL TRIPLES	
The number of realised clusters	754
❖ The number of native clusters	615
The number of clusters within a morpheme	97
The number of clusters across morpheme boundaries	518
❖ The number of non-native clusters	5
The number of clusters in compounds	139

Table 6 The statistics of medial triples according to Bargiełówna (1950)

In this group the most active consonants are: /r/ (begins 108 cluster types), /n/ (begins 82 cluster types), /w/ (begins 71 cluster types), /t/ (begins 60 cluster types), /s/ (begins 57 cluster types).

FINAL TRIPLES	
The number of realised clusters	26
❖ The number of native clusters	16
The number of clusters within a morpheme	9
The number of clusters across morpheme boundaries	7
❖ The number of non-native clusters	10

Table 7 The statistics of final triples according to Bargiełówna (1950)

4- (AND MORE) MEMBER INITIAL CLUSTERS	
The number of realised clusters (all are native)	15
The number of clusters within a morpheme	6
The number of clusters across morpheme boundaries	9

Table 8 The statistics of 4- (more) member cluster initial clusters according to Bargiełówna (1950)

4- (AND MORE) MEMBER MEDIAL CLUSTERS	
The number of realised clusters	134
❖ The number of native clusters	109
The number of clusters within a morpheme	11
The number of clusters across morpheme boundaries	98
❖ The number of non-native clusters	25
The number of clusters in compounds	4

Table 9 The statistics of 4- (more) member cluster medial clusters according to Bargiełówna (1950)

4- (AND MORE) MEMBER FINAL CLUSTERS	
The number of realised clusters (all are native)	12
The number of clusters within a morpheme	2
The number of clusters across morpheme boundaries	11

Table 10 The statistics of 4- (more) member cluster final clusters according to Bargiełówna (1950)

On the basis of the data presented above the richness of Polish phonotactics is evident. However, one cannot ignore the fact that hundreds of different clusters are morphological in nature, that is, they arise at morpheme boundaries due to affixation. One can make an observation that as the number of elements in a cluster grows, the cluster is more likely to contain a morphological boundary. For instance, there are 59 initial doubles containing a morpheme boundary compared to 191 lexical clusters. However, already in the case of initial triples one can notice that there are almost twice as many morphonotactic clusters (110) as lexical ones (65). In the case of 4-member initials a slight majority of them are morphological in nature. In the case of medials the pattern is as follows: there are 305 lexical clusters and only 48 more morphonotactic clusters (i.e. 353); in the case of medial triples there are over five times more morphonotactic clusters than lexical ones (lexical: 97 vs. morphonotactic: 518). As far as finals are concerned, most of the morphonotactic clusters occur among 4-(and more) member clusters whereas doubles and triples are rather lexical in nature. The occurrence of such regularities and patterns in Polish indicates that complex clusters are indeed tolerated in a language, especially when they fulfil a morphological function. The author will try to verify this observation on the basis of an empirical study investigating the behaviour of clusters in the process of first language acquisition.

1.2 The nature of morphological clusters

Most of the clusters come into being through derivation rather than through inflection. Morphological clusters come into being through adding a prefix ending with a consonant e.g. dawać [*to give*] - **od**|dawać [*to give back*] or through adding a suffix beginning with a consonant e.g. wstyd (*n*) [*shame*] - wstyd|**liwy** (*adj*) [*shameful*].

Table 11 below presents examples of inflectional and derivational affixes which when added to a word may lead to creating a cluster at a morphological

boundary. The selection of the morphemes above was based (mainly) on Mizerski's *Język polski. Encyklopedia w tabelach* (2000).

DERIVATIONAL PREFIXES (ending with a consonant)
Nouns: przeciw-, kontr-, nad-, super-, hiper-, eks- śród-, pod-, bez-, przed-
Verbs: nad-, ob-, od-, pod-, przed-, roz- , dez-, nad-, od-, pod-, współ-,
Consonantal prexifes of verbs: w-, wz-, ws-, z-, s-
Adjectives: współ-, nad-, ponad-, hiper-, super-, bez-, przed-, post-,

DERIVATIONAL SUFFIXES (beginning with a consonant)
Nouns: (-da)**,** -nie, -cie, -ka, -ctwo, -stwo, -two, -cja, -zja, -ki, -ba, -twa, -ca, -ciel,
-nik, -nica, -niczka, -czy, -niczy, -nia, -dło, -szczyzna, - szczak, -na, -czyk -czuk, -sko, -sztyl,
-cia, -cio
Verbs: -nąć, -nieć,
Adjectives: -ny, -ki, -czy, -liwy, -ski, -ni,

INFLECTIONAL MORPHEMES
Nouns: -mi [mi]
Verbs: -ł [w], -śmy [ɕmɨ], -ście [ɕtɕe], -my [mɨ] , -cie [tɕe] , -wszy [fʃɨ],
Adjectives: -szy [ʃɨ], naj- [naj] (prefix)

Table 11 Examples of derivational and inflectional affixes in Polish

Due to the richness of Polish morphology (especially derivational morphology) one might expect an enormous number of different morphonotactic clusters (which is indicated in tables 1-10 in the previous section). This is true in the case of the Polish *inventory* of clusters, however, in the process of language acquisition not all morphonotactic possibilities will be exploited. The child is unlikely to use such affixes as kontr- (*kontrkandydat*) [*rival*], eks- (*eks-mąż*) [*ex-husband*], post- (*postkomunistyczny*) [*post-Communist*], -szczyzna (*dulszczyzna*) [≈ *Grundyism*] since such forms are infrequent in child-directed speech, and in an early stage of language acquisition a child does not normally have the need to use such advanced vocabulary. The occurrence of clusters with certain affixes will also depend on the stage of acquiring morphology (the child may not have mastered certain morphological forms yet e.g. the perfective participle *przyszedłwszy* [*having come*- the perfective participle]).

Apart from morphonotactic clusters the emergence of which has just been discussed, in Polish there are not only lexical clusters e.g. /pt/ in *ptak* [*bird*] but also clusters which occur as a result of allomorphic vowel deletion (or mobile

vowel) e.g. *len* [*flex, linen*] vs. *lnu* [*flex, linen*- GEN.PL.] where /ln/ comes into existence only because /ɛ/ has been deleted. Similarly, there are clusters whose position in a word may change e.g. medial /jʦ/ in *miejsce* [*place*-NOM.SG.] can become a final cluster in *miejsc* [*place*-GEN.PL]. Such clusters obviously deserve a different status but in the empirical study they will be included into the lexical category since they do not contain a morphological boundary.

2. Consonant clusters according to the Optimal Sonority Distance Principle

Clusters may be looked at from the perspective of markedness (Eckmann 1977). Markedness when applied to onsets and codas states that the longer the onsets and codas are, the more marked they are. A few studies in phonology revealed that shorter onsets and codas were preferred over the longer ones, therefore the latter ones are often reduced. The studies also show that more modifications occur when the length of onsets and codas increases. It is also worth noting that the status of onsets and codas is not equal. If onsets and codas have the same number of segments, codas are more marked and there are more modifications in codas (Carlisle, 1994).

Another way of assigning markedness to clusters is by referring to the notion of sonority which is understood as a perceptual effect in the ear of the listener and is influenced by the obstruction of the vocal tract, the amount of energy exerted during production and complexity of articulatory movements (Dziubalska-Kołaczyk 2002). Thus the most sonorous sounds are vowels, then semi-vowels, liquids, nasals, fricatives, affricates and the least sonorous of all sounds, plosives.

All clusters which occur in the empirical research have been classified as preferred or dispreferred according to the Optimal Sonority Distance Principle (the OSDP) which stems from the Beats-and-Binding Phonology developed by Dziubalska-Kołaczyk (2002). The Beats-and-Binding phonology, in turn, is embedded in a framework of Natural Phonology (Donnegan & Stampe 1979, Stampe 1979). "The Optimal Sonority Distance Principle defines the way in which segments should order themselves in a successful sequence: the relations between sonority distances between pairs of neighbouring phonemes should be optimally balanced. (…) Optimal sonority relations take the form of well-

formedness conditions holding for double, triple and n-member clusters in all positions of a word (Dziubalska-Kołaczyk, 2002: 114)". The following section will provide sonority conditions for clusters in all word positions.

2.1 Sonority conditions for double clusters

The preferred initial double clusters are defined by the following condition:

C_1C_2V	**|son (C_1)- son C_2| ≥ |son(C_2)- son (V)|** **i.e.: sondis (C_1, C_2) ≥ sondis (C_2, V)**

Graph 1. Sonority condition for double initial clusters (Dziubalska-Kołaczyk, 2002:115).

The condition reads:

In word-initial double clusters the sonority distance (sondis) between the two consonants should be greater than or equal to the sonority distance between a vowel and a consonant neighbouring on it (Dziubalska-Kołaczyk, 2001:80).

The medial double clusters are defined by the following condition:

$V_1C_1C_2V_2$	**|son (V_1) - son C_1| ≥ |son (C_1) - son (C_2)| <** **< |son (C_2) – son (V_2)|** i.e.: sondis (V_1, C_1,) ≥ sondis (C_1, C_2) < sondis (C_2 -V_2)

Graph 2. Sonority condition for double medial clusters (Dziubalska-Kołaczyk, 2002: 118).

The condition reads:

For a word-medial double cluster, the sonority distance between the two consonants should be less than between each of the consonants and its respective neighbouring beat, and it may be equal to the distance between the first consonant and the beat preceding it (Dziubalska-Kołaczyk, 2002: 118).

The final double clusters are defined by the following condition:

VC_1C_2	**|son (V)- son C_1| ≤ |son(C_1)- son (C_2)|** i.e.: sondis (V, C_1,) ≤ sondis (C_1, C_2)

Graph.3 Sonority condition for double final clusters (Dziubalska-Kołaczyk, 2002: 117).

The condition reads:

In word-final double clusters the sonority distance (sondis) between the two consonants should be greater than or equal to the sonority distance between a vowel and a consonant neighbouring on it (Dziubalska-Kołaczyk, 2002: 117).

2.2 Sonority conditions for triple clusters

This section presents sonority conditions for triple clusters in all positions in a word. The preferred triple initials are defined by the following condition:

$C_1C_2C_3V$	**$\lvert son\ (C_1) - son\ C_2 \rvert < \lvert son(C_2) - son\ (C_3) \rvert \geq \lvert son\ (C_3) - son\ (V) \rvert$** i.e., sondis ($C_1$, C_2) < sondis (C_2, C_3) ≥ sondis (C_3, V)

Graph 4. Sonority condition for triple initial clusters (Dziubalska-Kołaczyk, 2002: 123).

The condition reads:

For word-initial triple clusters, the distance between the third consonant and the second consonant should be greater than or equal to the distance between this third consonant and the vowel, and greater than the distance the second and the first consonant (Dziubalska-Kołaczyk, 2002: 125).

The preferred triple medials are defined by the following condition:

$V_1C_1C_2C_3V_2$	**$\lvert son\ (V_1) - son\ (C_1) \rvert \geq \lvert son(C_1) - son\ (C_2) \rvert$** **&** **$\lvert son\ (C_2) - son\ (C_3) \rvert < \lvert son\ (C_3) - son\ (V_2) \rvert$** i.e., sondis ($V_1$, C_1) ≥ sondis (C_2, C_3) < sondis (C_3,V_2)

Graph 5. Sonority condition for triple medial clusters (Dziubalska-Kołaczyk, 2002: 127).

The condition reads:

For word-medial triple clusters, the distance between the first and the second consonant should be less than or equal to the distance between the first consonant and the beat to which it is bound, whereas the distance between the second and the third consonant should be less than between the third consonant and the beat to which it is bound (Dziubalska-Kołaczyk, 2002: 127).

The preferred triple finals are defined by the following condition:

$VC_1C_2C_3$	**$\lvert son\ (V) - son\ (C_1) \rvert \leq \lvert son(C_1) - son\ (C_2) \rvert > \lvert son\ (C_2) - son\ (C_3) \rvert$** i.e., sondis ($V$, C1) ≤ sondis ($C_1$, C_2) > sondis (C_2, C_3)

Graph 6 Sonority condition for triple final medial clusters (Dziubalska-Kołaczyk, 2002: 125).

The condition reads:

For word-final triple clusters, the distance between the first consonant and the second consonant should be greater than or equal to the distance between this

first consonant and the beat, and greater than the distance between the second and the third consonant (Dziubalska-Kołaczyk, 2002: 125).

The above conditions will be used to classify clusters as preferred or dispreferred in the empirical research in Section 3.

3.0 The acquisition of Polish morphonotactics: a case study

The following section will present the process of acquisition of Polish (mor)phonotactics by a Polish child, Zosia.

3.1 Data source and procedure

In the empirical research the recordings of Zosia have been used. Zosia is a normally developing monolingual child. She was recorded by her parents between the ages 1;7 and 3;2. The data were transliterated in the CHAT format (Mac Whinney, 2000) and examined auditorily by the author.

For the investigation of morphonotactics the following samples were chosen from the database:

PERIOD	**AGE**	**LENGTH OF THE RECORDING**
PERIOD 1	1;7	33: 45 min
PERIOD 2	2;1	39: 25 min
PERIOD 3a	2;8	39: 51 min
PERIOD 3b[1]	2;8	46: 43 min
PERIOD 4	3;2	44: 58 min

Table 12 Data source chosen for the analysis

The four periods enable us to observe how Zosia's (mor)phonotactics develops over time. The time span between particular periods is approximately equal (and amounts to 6, 7, 6, months respectively).

The unit on the basis of which the data is analysed is a word understood as a lexical item- a dictionary word for which one would expect to find a separate entry in a dictionary (Trask, 1997). Phonological words have not been taken into consideration in the present study.

3.2 Results and the analysis

Most of the consonantal changes presented in the tables below are reductions. On several occasions Zosia's cluster modifications did not involve reduction but simply a replacement of one consonant by another. For example, the word *tamten* /tamtɛn/ [*that* (*one*)] was pronounced /tamnɛn/ where medial /mt/ was changed into /mn/ (probably due to the process of consonant harmony characteristic of early phonology). However, such examples were scarce and that is why they were excluded from the analysis for the time being.

Tables 13-21 below contain clusters which are intact (produced correctly) and reduced. In the case of the reduced ones, the tables show what the change was. The notation /st>s ɕ/ means that this cluster was reduced to /s/ or /ɕ/ (the realization varied). Among the group of intact clusters and the reduced ones one can distinguish two subgroups, namely, lexical and morphonotactic ones. Under lexical clusters the author included all clusters without a productive morphological boundary. These include "true" lexical clusters e.g. *ptak* [*bird*], clusters which arise as a result of a mobile vowel e.g. *jedna* [*one*- feminine] (from *jeden* [*one* -maculine]), as well as clusters which arise as a result of other morphological operations (see section 1.2.) e.g. final /ʧp/ in *liczb* [*numbers*-GEN.PL.].

Period 1 (Zosia's age: 1;7)[2]

DOUBLES				
	INTACT		**REDUCED**	
	WITHIN A MORPHEME	**ACROSS MORPHEME BOUNDARIES**	**WITHIN A MORPHEME**	**ACROSS MORPHEME BOUNDARIES**
INITIALS				
MEDIALS			wt > t	wk> k **tk**> k **pk**> bᵊk
FINALS				

Table 13 Intact and reduced clusters at the age 1;7

As Table 1 shows, at this stage of acquisition Zosia does not attempt to produce many clusters. The only words which she attempts to produce contain medial clusters which are the least marked clusters and which are likely to occur first, before finals and initials. However, she fails to produce them correctly even in this unmarked position. The explanation is that in an early phase of language acquisition (also at the beginning of the second year of life) children tend to

produce CV syllable structures (i.e. consonant + vowel) (Milewski, 2005). CV structure is the most universal structure present in all languages of the world (Maddieson 1999). Listening to the recordings, one *can* observe some exemplars of clusters produced by Zosia but they appear in rather meaningless phonological sequences uttered when talking to herself while playing. These strings of segments, however, have not been identified as words and thus had to be excluded from the analysis.

Period 2 (Zosia's age: 2;1)

DOUBLES				
	INTACT		**REDUCED**	
	WITHIN A MORPHEME	**ACROSS MORPHEME BOUNDARIES**	**WITHIN A MORPHEME**	**ACROSS MORPHEME BOUNDARIES**
INITIALS			**dr**> d gdʑ> dʑ **gw**> g xts> tɕ tɕ ts **vw**> j **vj**> j	
MEDIALS	**pt** **nd** **nt**	**tk** **fk** **mk** MV **ntʃ**	ɕtɕ> ɕ vj> ɲ **nt**> t **nd**> d	
FINALS			tr> t st> ɕ S s Ph ɕtɕ> ɕ	

Table 14 Intact and reduced doubles at the age 2;1

In Period 2 Zosia made numerous attempts at producing double clusters. She succeeded in producing several medials correctly. These intact medials happen to belong to the lexical as well as the morphological category of clusters. However, looking at the reduced clusters one can immediately notice that all of them are lexical. There are no modifications of morphonotactic clusters, which constitutes the first indirect piece of evidence that morphonotactic clusters do not pose problems in the acquisition of the native language. The fact that Zosia starts to produce certain medial clusters correctly is in line with the universal that medial clusters as the least marked ones are likely to occur first in early production (Dziubalska-Kołaczyk 1999). On the basis of texts produced by children Milewski (2005) points out that medial consonant clusters constitute the most frequent group i.e. they constitute 64.99% of all excerpted clusters, which is only slightly

less than in the case of general/ scientific texts (69.9%) or artistic prose (68.8%).

From the point of view of the OSDP all intact clusters in this sample turn out to be preferred clusters. However, modifications occur both in preferred and dispreferred clusters.

TRIPLES				
	INTACT		**REDUCED**	
	WITHIN A MORPHEME	**ACROSS MORPHEME BOUNDARIES**	**WITHIN A MORPHEME**	**ACROSS MORPHEME BOUNDARIES**
INITIALS			spʃ> p	
MEDIALS				rtk> **fk** **mpk**> **pk**
FINALS				

Table 15 Intact and reduced triples at the age 2;1

At this stage of Zosia's development, she makes the first attempts to produce words containing triple clusters, all of which she reduces. Since there is not much data concerning triples, it is impossible to make a generalization on the relation between lexical and morphonotactic cluster reduction. For the same reason no strong conclusions can be made with reference to the OSDP.

Period 3a (Zosia's age: 2;8)

DOUBLES				
	INTACT		**REDUCED**	
	WITHIN A MORPHEME	**ACROSS MORPHEME BOUNDARIES**	**WITHIN A MORPHEME**	**ACROSS MORPHEME BOUNDARIES**
INITIALS	pʃ dv kɕ gʒ bʒ **dl kl** **bj pj gw pw** ʧt sp st ɕp xtɕ **vj xw sw** mɲ	zb sk sp sx **zj**	pt> p **dl**> j l 0 n **pl**> p **dr**> d **kr**> k **tr**> t gdʑ> dʑ dzv> dz fʃ > ʃ ɕ^{s} xts> ts xtɕ> tɕ ɕɲ> ɕ	**zr**> z **zj**> ʑ^{s}

MEDIALS	**kt** dn^{MV} bw bj kj **ps** **ʦk**^{A} **st sk zd** **ʃʧ ʑdʑ** vj **nt** **ɲtɕ**^{A} **ɲdʑ** lk lj^{PN} wt jdʑ	**pk tk** **ptʃ ptɕ** **pʦ**^{MV} dn gɲ gw dw **sk**^{MV} **ʃk** **ʧk** **ʃn** **ŋk** lk lɲ wk	**tf**> v t dn^{MV}> d dr> d **ftʃ**> tɕ tʃ **ɕt**> t **ɲdʑ**> dʑ lb> b rd^{PN}> d **ʒdʒ**> dʒ	dɲ> ɲ **rn**> n
FINALS	st ʃʧ nʦ **wn**		st> s^{Ph} ɕ^{S} ɕtɕ> ɕ ɲtɕ> tɕ nʦ> ʦ	tw/dw> t^{Ph}

Table 16 Intact and reduced doubles at the age 2;8

TRIPLES				
	INTACT		**REDUCED**	
	WITHIN A MORPHEME	**ACROSS MORPHEME BOUNDARIES CASES**	**WITHIN A MORPHEME**	**ACROSS MORPHEME BOUNDARIES**
INITIALS	spʃ **ɕpj zdj**		**gvj**> **gj** **str**> st **zdr**> zd **zdj**> ʑd^{S} zd **ɕfj**> ɕ	
MEDIALS	mpj	zbj		**mpk**> **mk** rtk> **tk**^{PN}
FINALS		**jɕtɕ**		

Table 17 Intact and reduced triples at the age 2;8

In Period 3 a spurt of clusters in all positions in a word is observable. Together with the growth of Zosia's lexicon new exemplars of clusters occur. Apart from the abundance of medial clusters Zosia starts to produce numerous initials as well as several finals. In this period one can observe a tendency to reduce lexical double clusters while retaining the morphonotactic ones. Only on few occasions are morphonotactic clusters reduced. In table 16 one can also observe that a morphonotactic medial cluster /dn/ is produced correctly while a lexical /dn/ in

jedna [*one*] is intact on one occasion but later it is reduced to /d/ in *jedną* [*one*-ACC].

In the case of triples, there are several reductions of lexical initial clusters and 2 reductions of morphological medials.

As far as markedness is concerned, the results do not seem to be robust. In the case of initials Zosia produces correctly several preferred clusters but also quite a few dispreferred ones. Modifications occur both in the case of preferred clusters and dispreferred ones. The same observation holds true for the medial clusters. Finals which occur in this sample are almost exclusively dispreferred and all reduced finals are marked according to the OSDP.

At this stage of Zosia's linguistic development there occurs only one word with a potential quadruple cluster /stkj/ in *wszystkie* [*all of them*]. It is morphonotactic in nature and it is reduced to /skj/ or /ɕkj/.

Period 3b (Zosia's age: 2;8)

DOUBLES				
	INTACT		**REDUCED**	
	WITHIN A MORPHEME	**ACROSS MORPHEME BOUNDARIES**	**WITHIN A MORPHEME**	**ACROSS MORPHEME BOUNDARIES**
INITIALS	kɕ gʒ pʃ kʃ dv **kl** **pj bj** ʧt sp ɕp sk xʦ xʨ fʃ **xw sw vj** mn mɲ **mj**	zb zg	kt> t pt> t **kr**>k **tr**> t **dr**> d **dl**> j n **dw**> d fʃ> ʃ ɕ x vʑ> ʑ ɕf> ɕ ɕɲ> ɕ sm> ɕ **vj**> j	zr> z **zj**> ʑ[S]
MEDIALS	**kt** **gʒ** dn[MV] kl bj kj pw **st ʃt** **ɕʨ ʃʧ sʦ** vj sw **ŋg**[PN] **ɲʤ ɲʨ**[A] jʤ	**pk tk** **pʨ** tɲ bn **ʧk** **ʨm ʧn** **fk ʃk sk**[A] **ʑɲ ɕm** ʃl ʃw **ŋk mk**[MV]	bj> g dm> d **ftʃ**> ʧ **st**> t **ʃʧ**> ʧ **sm**> s lk> k **lm**> j	**tp**> p **ʧk**> k **zm**> s ʃl> ɕ ʃ **ɲʧ**> ʧ

	wn	**ɲtʃ**[PN] **mn** lk[MV] **ln** jk wk		
FINALS	st ɕtɕ **ŋk** ɲtɕ **lk** **wf**	ɕtɕ	st> s[Ph] sw> s **rf**> f	ɕtɕ> ɕ tw/dw> t[Ph]

Table 18 Intact and reduced doubles at the age 2;8

Period 3b provides us with further examples of clusters. It differs from the earlier periods (especially from period 3a) in that certain clusters appear for the first time e.g. initial /kʃ fʃ mn / medial /gʒ ʃt sw/ as well as final /ŋk lk wf/. This emergence of new clusters can be explained by the fact that in this particular sample certain words appear for the first time. These new examples, however, do not change the general pattern of reductions. Most reductions occur in lexical clusters whereas the morphonotactic ones, with several exceptions, are produced correctly.

TRIPLES				
	INTACT		**REDUCED**	
	WITHIN A MORPHEME	**ACROSS MORPHEME BOUNDARIES**	**WITHIN A MORPHEME**	**ACROSS MORPHEME BOUNDARIES**
INITIALS	spʃ **skl ʃkl** **dvj**		stʃ (stʃʃ)> tʃʃ **ɕfj**> ɕ	
MEDIALS		rpk wtk **spj**		jpj> pj
FINALS		**jɕtɕ**		

Table 19 Intact and reduced doubles at the age 2;8

Since in period 3b there are only few examples of triples it is impossible to make generalisations concerning the relation between lexical and morphological clusters as well as the relation between preferred clusters and the dispreferred ones.

Period 4 (Zosia's age: 3;2)

DOUBLES				
	INTACT		**REDUCED**	
	WITHIN A MORPHEME	**ACROSS MORPHEME BOUNDARIES**	**WITHIN A MORPHEME**	**ACROSS MORPHEME BOUNDARIES**
INITIALS	kt pʃ kɕ dv bʒ kʃ^{PN} tf **kl dr tr** **pj gw** tʃt sp st xʦ ftʃ ʃtʃ sf fʃ zn sm **xw vj vw** mɲ mn **mj**	sp zb zn **zj vw**	kt> t gdʑ> dʑ **dl**> n **tr**> t **dw**> d fʃ> ʃ ʃtʃ> f xtɕ> tɕ xʦ> ʦ ɕɲ> ɕ **ɕl**> ɕ **vr**> l **vw**> v **vj**> j mɲ> ɲ	**zr**> z
MEDIALS	**tk** **ps bʒ** gl pj bj kj kw **dʑv** **ɕt st sk vd** **vʒ** **ʃtʃ ʒdʑ** **ɕɲ** ʃl vj xw **ŋk nt nd** **ɲdʑ ɲtɕ^{A} nʦ^{A}** mɲ mj jʒ wn	**tk pk** **ptɕ** dɲ tɲ bn **tʃk** **sk ʃk fk** **ss** **ɕm ʒn** zj **ŋk mt** lk jk	dn^{MV}> n **ftʃ**> tʃ vj> j **mb**> b lk> k rd> d **rx**> x jd> d jdʑ> dʑ jm> m	**jl**> l
FINALS	ɲtɕ st **jtɕ** ʃtʃ	ɕtɕ ɲtɕ	kt> k st> s^{Ph} ɕ^{S} **rf**> f	

Table 20 Intact and reduced doubles at the age 3;2

Period 4 is a continuation of a trend which started in period 2 and got stronger in 3a and 3b. Table 20 shows that Zosia still happens to reduce some lexical

clusters in all word positions but she fails to produce only two clusters with a morphological boundary. Initial /zr/ is reduced to /z/ probably because Zosia has problems with producing /r/ also in other contexts. Also medial /jl/ turns out be a difficult combination of approximants. In table 20 one can observe a more direct piece of evidence, namely, a morphonotactic initial cluster /vw/ in *włożyć* [*put sth on*, *put sth inside*] does not cause difficulties in production. On the other hand, lexical /vw/ is produced correctly in *włoski* [*hair*-diminutive] but it is reduced in *właśnie* [*just*, *exactly*]. Similarly, a lexical medial /lk/ in *tylko* [*only*] (and it is assumed that *tylko* does not contain a productive morphological boundary) is reduced while morphological /lk/ in *lalko* is produced correctly. Though earlier in period 3a, /lk/ is produced correctly both as a lexical and morphonotactic cluster (*tylko* [*only*] vs. *palasolkę* = *parasolkę* [*a small umbrella*-GEN. SG.]).

With reference to the OSDP one can observe that in the case of initials the results are still inconclusive i.e. both intact and reduced clusters are of the preferred and the dispreferred type. However, in the case of both lexical and morphonotactic medials the majority of intact clusters are preferred. On the other hand, most reductions occur among dispreferred clusters.

TRIPLES				
	INTACT		**REDUCED**	
	WITHIN A MORPHEME	**ACROSS MORPHEME BOUNDARIES**	**WITHIN A MORPHEME**	**ACROSS MORPHEME BOUNDARIES**
INITIALS	**dvj**	**skw**		
MEDIALS	tkj^{A}	**dvr** **mpk** **stk**		jpj> pj
FINALS				**jɕtɕ**> **jɕ**

Table 21 Intact and reduced triples at the age 3;2

In period 4 Zosia pronounced almost all triples correctly. The only two reductions occurred within the morphonotactic group. Clusters /jpj/ in *najpierw* [*first*] and /jɕtɕ/ in *przyjść* [*to come*] were reduced to /pj/ and /jɕ/ respectively. However, on the basis of only few examples it is difficult to draw strong conclusions.

At this stage Zosia produced correctly one quadruple morphonotactic cluster which was /st|kj/ in a word *wszystkie*. In this sample there were no other 4-member clusters.

As regards the OSDP one can observe that all but one of the intact clusters are preferred.

3.3 Discussion

Following the stages of Zosia's linguistic development one can observe how phonotactics develops over time. Period 1 provides little data but already in period 2 one can notice a tendency which continues later on and becomes even clearer and stronger in the course of time, namely, morphonotactic clusters are reduced much less frequently than lexical clusters. Such a pattern of cluster production constitutes indirect evidence for the assumption made in the introduction i.e. morphonotactic clusters are produced more easily since they have a special role to fulfil- they convey grammatical or semantic information. In the data analysed so far there are several direct pieces of evidence (moments in the process of acquisition when the same cluster occurs as lexical and morphonotactic). For instance, in period 3a one can observe that a morphonotactic medial cluster /dn/ is produced correctly while a lexical /dn/ in *jedna* [*one*] is intact on one occasion but at a different point in the source material it is realised as /d/ in *jedną* [*one*- ACC]. Similarly, in period 4 a morphonotactic initial cluster /vw/ in *włożyć* [*put sth on*, *put sth inside*] does not cause difficulties in production. On the other hand, lexical /vw/ is produced correctly in *włoski* [*hair*-diminutive] but it is reduced in *właśnie* [*just*, *exactly*]. Finally, in period 4 a lexical medial /lk/ in *tylko* [*only*] is reduced while morphological /lk/ in *lalko* is produced correctly.

4. Perspectives

The empirical study presented in Chapter 3 already demonstrates certain patterns in acquiring clusters with and without morphological boundaries. However, the research is in its initial phase. The author realises the need for a detailed analysis of the data including the counting of the tokens of words produced correctly and erroneously. This is important because there are instances of Zosia pronouncing a cluster in a given word correctly but a few minutes later she reduces the same cluster in the same word. In the case of such a variation it is essential to determine which variant prevails in a given period.

Subsequently, it may also be necessary to apply acoustic analysis of the child's productions in order to verify the auditory observations especially in dubious cases.

Furthermore, in the next stage of research it will be indispensable to make a distinction between inflection, derivation (and possibly compounding) and look at these sub-branches of morphology separately.

The author is currently applying a similar procedure to investigate the process of clusters acquisition in English. Eventually, the data coming from these two typologically different languages will be compared.

---

[1] Because period 3a shows a spurt of cluster production, the sample was enlarged by further 40 minutes of the recording to check whether the pattern of correct production and reductions repeats itself consistently. The investigation showed that the pattern of production and reduction indeed remains the same but the additional sample provided examples of new clusters. Eventually, all periods will be enlarged by further samples.

---

[2] SYMBOLS USED IN THE TABLES 13-21
Bold and underlined clusters are preferred according to the Optimal Sonority Distance Principle
A: a cluster in an affix
MV: a cluster which is a result of a mobile vowel movement
Ph: an allowed phonostylistic reduction
PN: cluster in a proper name
I: interjection
S: softerning

REFERENCES

Bargiełówna, M. (1950): "Grupy fonemów spółgłoskowych współczesnej polszczyzny kulturalnej", in *Biuletyn Polskiego Towarzystwa Językoznawczego*. Vol.10: 1-25. Kraków.

Carlisle, Robert S. (1994): "Markedness and Environment as Internal Constraints on the Variability of Interlanguage Phonology", in Mehmet Yavaş (ed.), 223-265.

Donegan, Patricia & David Stampe (1979): "The study of Natural Phonology" in Dinnsen, D.A. (ed.). *Current Approaches to Phonological Theory*. Bloomington: IUP. 126-173.

Dziubalska-Kołaczyk, Katarzyna (1999): "Early L1 clusters and how they relate to universal phonotactic constraints" in *Proceedings of the 14th International Congress of Phonetic Sciences, San Francisco*. San Fransisco: University of Berkeley, 317-320.

Dziubalska-Kołaczyk, Katarzyna (2002): *Beats-and-Binding Phonology*. Frankfurt am Main: Peter Lang.

Eckman, Fred R. (1977): "Markedness and the Contrastive Analysis Hypothesis" in *Language Learning*. Vol. 27: 315-330.

MacWhinney, B. (2000): *The CHILDES project: Tools for analyzing talk. Third Edition.* Mahwah, NJ: Lawrence Erlbaum Associates.

Maddieson, Ian (1999): "In search of universals" in *Proceedings of the 14th International Congress of Phonetic Sciences*. Vol. 3: 2521-2528.

Milewski, Stanisław (2005): "Grupy spółgłoskowe w języku mówionym dzieci przedszkolnym" in LOGOPEDA 1(1): 5- 32.

Stampe, David (1979): *A dissertation on Natural Phonology*. New York: Garland.

Trask, R.L. (1997): *A Student's Dictionary of Language and Linguistics*. London: Arnold, a member of the Hodder Headline Group.

Yavaş, Mehmet (ed.) (1994): *First and Second Language Phonology.* San Diego, California: Singular Publishing Group Inc.