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ACQUISITION OF COMPLEX STRUCTURES IN GREEK: A GP AND AN OT APPROACH*

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Abstract
In the phonological acquisition of Greek simplified versions of onsets and codas emerge in parallel. Drawing on a longitudinal corpus of data from children acquiring Greek as their mother language, varying in age from 1;10 to 3;05.23, we will focus on the emergence of stop + liquid clusters in initial position and the emergence of codas in all word positions. This paper will present a characterisation of these facts in Government Phonology terms as the delayed licensing of empty nuclei and dependent structure, which present marked phonological structures. Furthermore we will give an analysis within Optimality Theory where the interaction of constraints such as ONSET, *COMPLEX, NO-CODA, *[+TRILLED], MAX, MAX-C# and IDENT will account for the emergence of unmarked structures, their position in the word, and the gradual production of complex structures in the course of language development.

1. Introduction

This paper investigates the acquisition of [stop + liquid] clusters in word initial position and the emergence of codas in all word positions in Greek. The corpus of data discussed covers the acquisition stages between the ages of 1;10 to 3;05.23. Two approaches to the acquisition process that proceeds from less to more complex structures will be discussed. In Government Phonology, the process will be analysed as the delayed licensing of marked phonological

* This paper is the result of joint research conducted at the University of Leiden between 2000 and 2001. Authors are given in alphabetical order. All data quoted were collected by the second named author who in subsequent research developed a database of longitudinal production data under the auspices of ULCL. For more details see Tzakosta (2004).

structures that include empty nuclei and dependent structure within a constituent. In Optimality Theory, constraint interaction will account for the emergence of unmarked structures, on the one hand, and the gradual production of complex structures in the course of language development, on the other. The two approaches bring us to the same conclusion; word final codas are acquired before word internal codas and word initial consonant clusters before word internal clusters. Such facts are relevant to findings stemming from experimental tasks, which underline the prominent position of segments/clusters/syllables occupying word edges and the weak character of word medial segments/clusters/syllables (cf. Smith 2002). More specifically, marginal constituents tend to resist deletion/simplification, whereas word medial constituents are prone to deletion, simplification or assimilatory processes.

The paper proceeds as follows; section 2 presents the data compared to cross-linguistic research findings, section 3 gives the GP account, section 4 presents the analysis in OT and section 5 gives some concluding remarks.

2. Data survey

Cross-linguistic studies on the acquisition of complex onsets which consist of [stop + liquid] clusters show that these clusters undergo reduction in the early stages of language development. This is attributed to the need of these complex structures to fit into the children's unmarked CV syllable templates. This template forces complex onsets to be realized as simplex segments syllabified within a simplex non-branching onset. This acquisition pattern has been demonstrated cross-linguistically for Dutch (Fikkert 1994), English (Demuth and Fee 1995, Gnanadesikan 2004, Pater 1998), German (Grijzenhout and Joppen 1998), Polish (Lucaszewicz 2000), French (Rose 2000), and Greek (Tzakosta 1999, Kappa 2003), among others. It is important to note that the segment that tends to be preserved is the least sonorous member of the cluster. As a result, liquids usually undergo deletion. Sonority seems to play a dominant role in simplification processes of all cluster types (see references above).

Codas, on the other hand, undergo deletion or epenthesis. Again, both processes of deletion and epenthesis serve to retain the CV syllable type. Within the acquisition path, deletion, which creates shorter words, precedes epenthesis. Epenthesis occurs in advanced developmental phases when disyllabic and longer forms are produced. The general conclusion is that codas (particularly internal codas) present structures that involve complex rhymes, which according to the argumentation here, consist of complex structures that emerge later in child language. Thus, the goal at the beginning of language development is the accomplishment of CV syllables. This is overwhelmingly supported by the Greek data that we now present.

2.1 Data Collection

The data we draw on come from a corpus of longitudinal production data from 3 children acquiring Greek as their mother tongue. We consider children who were recorded at different but overlapping age groups so as to create a continued stretch from age 1;10 to 3;05.23. Our data are drawn from the three children given in (1) for the periods indicated in parentheses.

(1) *Child 1*: Bebis (1;10-2;01.05)
Child 2: Dionisis (2;01-2;09)
Child 3: Marilia (2;07.26-3;05.23)

2.1.1. Stop + liquid Clusters

In (2-4) we provide data showing the emergence of [stop + liquid] clusters from Bebis, Dionisis and Marilia, respectively. [1] The data in (2a-b), (3a-b) and (4a-b) show simplification of clusters to simplex consonants, up to age 2;07. Child productions are governed by sonority and markedness scales. In other words, the less sonorous member of the cluster is retained. Liquids seem to never be preserved in simplified forms.[2] The data in (3c-d) and (4c) exemplify the acquisition of *CL* clusters. At this stage all *CR* clusters are systematically substituted with *CL* clusters, illustrating that /l/ is treated as more unmarked than /r/. At age 2;09 the first emergence of *CR* clusters is seen (3e), and at age 3;01 both cluster types are successfully acquired in word initial position, as shown by (4d).

(2) *Child 1: Bebis*

(a) /'**kr**e.as/	→	['**c**e.as]	'meat'	(1;10)
(b) /'**tr**o.ne/	→	['**t**o.ne]	'eat'	(2;01.05)

(3) *Child 2: Dionisis*

(a) /**tr**i.'pi.tses/	→	[**t**o.'pi.teθ]	'hole'	(2;01.16)
(b) /'**pr**a.si.no/	→	['**p**a.ti]	'green'	(2;02)
(c) /**kr**i.'o.nu.me/	→	[**kl**i.'o.nu.me]	'be cold'	(2;07.14)
(d) /'**pl**i.ktro/	→	['**pl**i.to]	'piano key'	(2;08.02)
(e) /'**pr**a.γma.ta /	→	['**pr**a.γma.ta]	'thing'	(2;09)

[1] Accents in all data mark stress whilst full stops indicate syllable boundaries.

[2] See van der Pas (2004) for a different account in which CONTIGUITY governs cluster reduction and, consequently, liquids are preserved irrespective of the degree of markedness of the reduced segment. CONTIGUITY tends to be respected in stressed syllables.

(4) *Child 3: Marilia*

(a) /**br**o.'sta/ → [**b**o.'çta] 'in front' (2;07.28)

(b) /'**tr**e.no / → ['**t**e.no] 'train' (2;07.28)

(c) /'**kr**i.o/ → ['**kl**i.o] 'cold' (2;08.07)

(d) /'**tr**i.a̯/ → ['**tr**i.a] 'three' (3;01.20)

An interesting observation to be made with regard to stress is that, stress seems to play no role in the retention of clusters in acquisition, since both stressed and unstressed syllables equally undergo cluster simplification at all developmental phases (cf. Tzakosta 2005, for detailed discussion). Although we do not discuss the acquisition of word internal clusters, data such as (3d) are indicative of the fact that word initial clusters are acquired prior to word internal clusters. From the above data, we can sketch the acquisition pattern for consonant clusters in Greek as in (5);

(5) simplex/unmarked C » initial CL » initial CR » word internal clusters

Let us now consider data for word final versus word internal codas.

2.1.2. Codas

The segments that occupy coda positions in Greek are /s/, /r/ and /n/ in final position and /l/, /r/, and /n/ word internally. The data from the three children in the survey, in (6-8) show that acquisition of final codas precedes word internal codas. In (6a-b) both word final and word internal codas are not yet acquired at age 1;11. In (6c and 7a&c) we see the emergence of final codas at an age when internal codas (7b) are not yet acquired. At this stage in the acquisition of final codas, more unmarked segments are preferred, so that /s/ is produced as /θ/ (7a&c). At the later age of 2;09, /n/ is faithfully produced in final coda position (7d). Although all possible codas in Greek share the characteristic of coronality, /s/ (mainly produced as [θ]) and /n/ tend to be acquired first, as shown in all examples in (7).

(6) *Child 1: Bebis*

(a) /fo**s**/ → [fo] 'light' (1;11.07)

(b) /'va**l**.to/ → ['va.to] 'put it' (1;11.09)

(c) /'γa.te**s̯**/ → ['γa.te]/['γa.te**s**] 'cat' (2;01.05)

(7) *Child 2: Dionisis*

(a) /'a**n**.θro.po**s**/	→ ['a.θo.po**θ**]	'man'	(2;07.4)
(b) /ka**l**.'tsu.la/	→ [ka.'tu.la]	'sock'	(2;05.08)
(c) /'jo**r**.γo**s**/	→ ['γo.γo**θ**]	'George'	(2;06.15)
(d) /'pe**r**.nu**n**/	→ ['pe.nu**n**]	'to get'	(2;09)

In the data in (8), at age 2;11 internal codas are still not produced (8a-b). Finally at age 3;05 internal codas emerge (8e) at a stage when marked segments are still barred in final coda position (8c-d).

(8) *Child 3: Marilia*

(a) /ka**l**.'son/	→ [ka.'jon]	'tights'	(2;11.18)
(b) /ka**r**.'ðu.la/	→ [ka.'ðu.la]	'heart'	(2;11.12)
(c) /ba.'ba**s**/	→ [ba.'ba**ç**]	'daddy'	(3;03.14)
(d) /'jo**r**.γo**s**/	→ ['jo:.γo**θ**]	'George'	(3;05.02)
(e) /'vo**l**.ta /	→ ['vo**l**.ta]	'walk'	(3;05.02)

These data illustrate two important points. First, final codas are acquired prior to internal codas and secondly, the acquisition of structures (i.e. constituent structure) is independent of the acquisition of segments (i.e. melody). The latter point is illustrated by the fact that despite the large gap between the realisation of final versus internal codas (internal codas are realized a year later than word final codas, cf. (6c) vs. (8e)), the segmental content of final codas is still not faithfully produced at the time internal codas are acquired, cf. (8d) where /s/ is still produced as /θ/ at age 3;05. As in the acquisition of clusters, stress sheds no light on this acquisition pattern. To summarise, we can trace the acquisition path of codas as given in (9);

(9) no codas (resulting in deletion) » final codas » internal codas

Combining the data on clusters presented in (2-4) with that for the coda in (6-8), we tabulate our findings in (10) below. The ages given in the table reflect stages at which the relevant structures to be acquired can be considered stable in the grammar of the child, rather than the age at which these structures are first produced.

(10)

Age	Clusters CL	Clusters CR	Final codas	Internal codas
1;11	✗	✗	✗	✗
2;01	✗	✗	✓	✗
2;06	✓	✗	✓	✗
2;09	✓	✓	✓	✗
3;06	✓	✓	✓	✓

Thus the acquisition path that we elaborate on in the following two sections is the one in (11);

(11) final codas » initial CC » internal codas

3. Government Phonology Analysis

Government Phonology (GP henceforth), is a framework that defines prosodic positions by licensing, thus every position within a phonological word must be licensed (cf. Kaye et al. 1990). The source of all licensing potential, defined as the head of the phonological word, is a nuclear position that is itself not licensed. This head nucleus licenses other nuclei within the domain which then in turn license onsets. Thus the structure of the phonological domain may be viewed as consisting of pairs of onset-nuclear sequences, where each nucleus licenses the onset to its left.

3.1 Final Codas

The structure of final codas assumed in GP following Kaye (1990), is an onset followed by an empty nucleus. This is also the position assumed in the acquisition of final codas in French (cf. Goad 1998). The sanctioning of empty categories such as empty nuclei is defined in the Empty Category Principle (Kaye 1990) that specifies strict conditions under which positions may remain without content. In the case under review here, the empty nucleus following a word final coda is characterised in terms of a parameter that determines whether or not final empty nuclei are allowed in a language. Consider the parameter in (12).

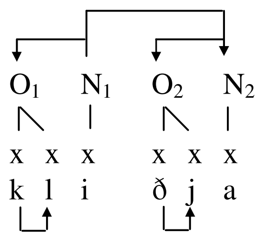
(12) *Final empty nucleus parameter*
Final empty nuclei are licensed OFF/[ON]

The universal default setting of this parameter is 'OFF' so that word final nuclei must always be realised in word final position, explaining the lack of word final codas in early child language, universally. In a case where the input to child language consists of a word with a final coda, the option of deletion or insertion of material may be used to give outputs that conform to this parameter setting. Thus the acquisition of codas, here translates into a change in the setting of the parameter in (12) from 'OFF' to 'ON'. Note that acquisition here does not involve the altering of structure, which we consider to be a more advanced stage than the mere switching of a parameter.

3.2 Initial Consonant Clusters

A word initial CC in GP is represented as a branching onset where the second member is dependent on the first or in other words, where the first member governs the second. Such a governing relation, that involves a more complex structure than a simplex onset, must be licensed by a following nucleus. The general notion of licensing within a phonological domain has been extended in Harris (1997) under the *Principle of Licensing Inheritance* from which it follows that the further removed a nuclear position is from the head nucleus, the less licensing potential it receives. Licensing potential is thus viewed as tracing its way through the phonological word from the head. The early acquisition of initial consonant clusters shown in the data for Greek, aids us in establishing the nuclear head to be in initial position in this language. This means that under Licensing Inheritance, the nucleus with the greatest licensing potential is in initial position. It follows from this that the licensing path from the head nucleus to the dependant onset in initial position is shorter than to any other onset dependant (such as that of an internal cluster), in the phonological domain. Thus the word initial cluster, which is nearest to the nuclear head, is the first to be acquired. Consider the illustration in (13).

(13) /kli.'ðja/→ [kli.'ja] 'keys'(2;08.07)



In (13) licensing of the dependent /l/ in O_1 is two moves away from the licensing head nucleus N_1; N_1 licenses the onset head /k/ in O_1, which then licenses its dependent /l/. The onset relation in O_2 on the other hand, is three moves away from the licensing nuclear head; N_1 must first license N_2 which then licenses the onset head /ð/ in O_2. Only after this licensing is O_2 able, via government, to license its dependent /j/. Thus, the shorter licensing path is attained (here acquired) prior to the longer one, and acquisition of initial CC's follows directly from the position of the nuclear head in the phonological domain. Important also is that within branching onsets government and licensing relations are within a constituent i.e. within an onset as opposed to internal codas that involve trans-constituent relations, and are thus later to be acquired. The gradual acquisition of complex structures is equated to the gradual stretch of licensing power within the domain. We do not here go into the details of why /l/ is acquired prior to /r/ but merely state that the phonological expression of /l/ is elementally less complex than that of /r/ and thus requires less licensing power in order to be licensed.[3]

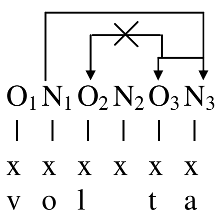
3.3 Internal codas

Internal codas under a GP structure involve an empty position between the coda and the following onset. Both the coda and the following onset are represented in onsets meaning that licensing of the intervening empty nuclear position is sanctioned by proper-government or as in this case, by an inter-onset government relation that holds between the coda and the

[3] The type of licensing that determines the melodic content of a particular position is referred to as a(utosegmental)-licensing. This is to be differentiated from p(rosodic)-licensing that sanctions the presence of positions at different levels of phonological projection, (cf. Harris 1994 for details).

following onset, in the figure in (14) O_2 and O_3 respectively. This trans-constituent government relation that proceeds from right to left must be licensed by a following nucleus N_3. N_3 itself not being the head of the phonological word must acquire such licensing potential from the head nucleus N_1 as illustrated in (14).

(14) /'vol.ta/ → ['vo.ta] 'walk' (2;01)



Simplification of the cluster in (14) results from the inability of the licensing path to be completed at this stage in the childs grammar.[4] Thus, because an internal coda is far removed from the licensing nuclear head on the licensing path, it is later to be acquired.[5]

Acquisition in GP can thus be regarded as the tracing of a licensing path through a phonological domain. The longer the licensing path, the later the acquistion of the structure involved. Let us now see how these insights can be captured in Optimality Theory.

4. Optimality Theory

In Optimality Theory (henceforth OT, Prince and Smolensky 1993) phonological acquisition is explained by means of constraint interaction which results in distinct constraint rankings at different stages of language development. In other words, each developmental phase is

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[4] The structure in (14) assumes a GP version where branching rhymes are disallowed. In more traditional versions of GP the liquid /l/ would be a rhymal complement of N_1 followed by O_3. This structure does not change the point being made here since O_3 and the rhymal adjunct would still contract a government relation that needs to be licensed by the following nucleus.

[5] Under a microscopic view, the licensing of O_3 by N_3 is regarded as involving different injections of licensing power that have a precedence relation so that N_3 must license O_3 separately for different functions such as to have a skeletal position, to have melodic material or to have a government relation with another constituent. Thus the internal coda in (14) is further removed from licensing power than the arrows in the structure depict, (cf. Kula 2002, Kula to appear).

characterized by at least one constraint ranking that reflects on the state of the child grammar at a specific period in the child's phonological development. Constraint (re)-ranking and constraint demotion are considered to be the main mechanisms involved in the process of language development (cf. Tesar and Smolensky 2000).[6] It is generally accepted that children start out with markedness constraints being ranked higher than faithfulness constraints in the initial stage of their grammars (Smolensky et al. 2000, among others). The result is the emergence of unmarked structures in child speech. Constraint demotion further explains the *subset problem*, that is, the problem of how children proceed from unmarked to more marked structures and finally acquire the ambient language. When marked structures are acquired, markedness constraints are demoted below faithfulness constraints. We employ the following constraints to characterise the Greek acquisition path.[7]

(15) *Markedness constraints*

*COMPLEX: no more than one C or one V may associate to any syllable position node

NO-CODA: syllables must not have a coda

*[+TRILLED]: segments must not be characterised by the feature [+TRILLED]

(16) *Faithfulness constraints*

MAX-C#: preserve the C in word final position of the input in the output

MAX: every element in the input has a correspondent in the output

IDENT-F: Preserve the featural composition of target segments

In the following sections, we show how the interaction of these constraints results in the developmental path for the acquisition of initial clusters and codas, that we have deduced from (10).

4.1 Acquisition of Clusters

As we have already seen from the data in 2.1.1, the general pattern of the acquisition of [stop + liquid] clusters in Greek is the one given in (5) and repeated here in (17) for convenience;

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[6] For a different account based on production data, see Tzakosta (2004, and references therein).

[7] The *[+TRILLED] constraint, given under the markedness constraints, belongs to the family of featural constraints, which allow or prohibit certain features of place or manner of articulation from emerging (cf. Pulleyblank 1997 and references therein). *[+TRILLED] disallows the realisation of segments characterised by the feature [+TRILLED].

(17) simplex C » initial CL » initial CR » internal clusters

In OT, the order of cluster acquisition is translated by means of 3 different constraint rankings, which surface successively. To be more specific, these constraint rankings facilitate the gradual emergence of complex structures by the demotion of initially highly ranked markedness constraints. The prediction of the initial constraint ranking given in (18) with respect to the acquisition of initial clusters is cluster simplification through deletion. This is shown in tableau (1), and reflects the first stage in the acquisition of initial clusters.

(18) *COMPLEX » * [+TRILLED], MAX

Tableau 1

/'kreas/	*COMPLEX	*[+TRILLED]	MAX
a.['kre.as]	*!	*	
✦ b.['ce.as]			*

Notice that the *fully faithful* candidate (1a), that is, the candidate most faithful to the input form, is rejected because it crucially violates the high ranked markedness constraints *COMPLEX and *[+TRILLED]. The winning candidate (1b) violates the faithfulness constraint MAX, which, being low ranked, has minimal effects in the selection of the winning candidate. Notice that *[+TRILLED] and MAX are unranked with respect to each other, given that the winning candidate does not provide a constraint ranking argument.

The ranking in (19) represents the next stage in the acquisition of clusters where a particular cluster type, namely CL is preferred over CR. This results from the demotion of *COMPLEX under MAX, making *[+TRILLED] the highest ranked constraint. This bars the emergence of /r/ in initial clusters because its emergence incurs a violation of the highly ranked *[+TRILLED] (2a). Thus, every CR cluster is systematically changed to CL (2b) or reduced to the stop member of the cluster. In the latter case *[+TRILLED] is vacuously satisfied, because there is no [+TRILLED] segment in the output form to violate it.

Consequently, the ranking in (19) provides two optimal outputs, one where a CL cluster surfaces and one with a simplified onset. In case only complex onsets of the CL type are allowed, MAX needs to be ranked with respect to *COMPLEX.

(19) *[+TRILLED] » MAX, *COMPLEX

Tableau 2

/'krio/	*[+TRILLED]	MAX	*COMPLEX
a.['kri.o]	*!		
✦ b.['kli.o]		*	*

Finally, the ranking in (20), in which *[+TRILLED] is demoted, reflects the final stage in the acquisition of initial clusters, where children faithfully reproduce initial onsets of both CL and CR type. Given that general faithfulness is the first priority, the markedness constraints *COMPLEX and *[+TRILLED] are ranked in a lower stratum compared to MAX and are unranked with respect to each other. Tableaux 3 and 4 demonstrate faithful emergence of CL and CR clusters, respectively. High-ranking of MAX motivates production of all target segments. However, IDENT-F, which is not crucial for the selection of the winning candidate in tableaux 2, becomes crucial for the selection of the winning candidate in tableaux 3 and 4. IDENT-F prevents substitution of /r/ for /l/ and vice versa.

(20) IDENT-F, MAX[8] » *[+TRILLED], *COMPLEX

Tableau 3

/'pliktro/	IDENT-F	MAX	*[+TRILLED]	*COMPLEX
a.['pi.tro][9]		*!	*	*
✦ b.['pli.to]				*
c. ['pri.to]	*!			

Tableau 4

/'tria/	IDENT-F	MAX	*[+TRILLED]	*COMPLEX

[8] In the ranking (18) through (20), MAX is evaluated only for initial clusters.
[9] Candidate (a) vacuously satisfies IDENT-F.

a.[ˈti.a]		*!	*	*
b. ['tli.a]	*!			
✦ c.[ˈtri.a]				*

In tableaus (1-4), with the given respective rankings in (18-20), we have seen how under constraint interaction, here constraint demotion, the acquisition of complex structures in initial position emerges gradually. We now consider how these same principles explain the acquisition of codas in the next section.

4.2 Acquisition of Codas

As discussed in the data in 2.1.2, codas are deleted in all word positions in the early stages of language development, and final codas begin to be preserved before internal ones. In OT terms, this is captured by means of positional faithfulness as shown in the ranking in (21), where the marked final coda position is barred by a highly ranked NO-CODA constraint.

(21) NO-CODA » MAX-C#, MAX

Tableau 5

/fos/	NO-CODA	MAX-C#	MAX
a.[fos]	*!		
✦ b.[fo]		*	*

In tableau 5, production of the final coda in (5a) incurs a violation of a high ranked markedness constraint, which is avoided by deletion of the coda in (5b). The positional and the general faithfulness constraints are unranked with respect to each other because the number of violations does not provide a valid ranking argument.

From the stage of across-the-board coda deletion, we move onto the preservation of final codas by a demotion of NO-CODA thereby making the positional faithfulness constraint MAX-C#, the highest ranked constraint. This is shown in tableau 5 under the constraint ranking in (22). The consequence of (22) is that final codas but not internal codas are preserved (6b).

(22) MAX-C# » NO-CODA » MAX

Tableau 6

/jor'tes/	MAX-C#	NO-CODA	MAX
a.[jor.'tes]		**!	
✦ b.[jo.'teθ]		*	*

Internal codas start emerging only around the age of 3;05.23. This effect is achieved by the demotion of the positional faithfulness constraint MAX-C# by one step, so that the resulting ranking given in (23), has MAX as the highest ranked constraint. MAX-C # and NO-CODA are not ranked with respect to each other as tableau 6 shows. Under this ranking both internal (7b) and final codas are preserved.

(23) MAX » MAX-C#, NO-CODA

Tableau 7

/'volta/	MAX	MAX-C#	NO-CODA
✦a.['vol.ta]			*
b.['vo.ta]	*!		

An additional argument for the role of positional faithfulness in the acquisition of codas in Greek is that in the comparison of the acquisition of /n/, in internal versus final codas, this segment is realised in word final position prior to coda internal position (see 7d). In fact, at the end of our data i.e. age 3;05.23, /n/ is still not yet acquired in internal coda position. This shows that sonority does not play a role in the selection of codas but rather positional faithfulness is the significant factor in the acquisition process.[10] This is a reflection of the not

[10] This seems to be a unique property in the acquisition of Greek as Fikkert (1994) and Levelt (pc.) argue that sonority plays a role in the acquisition of codas in Dutch. Obviously a typology in child speech data on the acquisition of codas would be useful in defining the factors that are decisive for the process universally. We leave this for future research.

trivial point we have already made in the discussion of the data in section 2.1.2, that the acquisition of structure is independent of the acquisition of melody.

5. Conclusion

In this paper we have given data that shows that in Modern Greek final codas are acquired before word initial clusters, which are in turn acquired before word internal codas. We have argued that this acquisition path follows from the acquisition of less complex structures prior to more complex structures. The analysis proposed in GP supports the view that final codas are represented in an onset followed by an empty nucleus, a structure that is less complex than a branching onset or branching rhyme and is thus earlier to be acquired. This is interpreted in the OT analysis as positional faithfulness. In the acquisition of word initial consonant clusters we have shown in OT that the emergence of these clusters results from the demotion of an initially highly ranked *COMPLEX constraint. The validity of such a constraint is substantiated in the GP analysis where under licensing the branching onset in which an initial consonant cluster is contained, requires more licensing potential (reflected in the longer licensing path), than a simplex consonant syllabified in an onset. Finally we have shown how internal codas present the most complex structure because they involve the interaction of different constituents (GP), which do not equate to a position of prominence, and which can thus not be captured under positional markedness in OT. We also hope to have illustrated how the two approaches work to complement each other and reinforce the theoretical position of this paper.

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