Positional and qualitative asymmetries of consonant clusters in Greek L1

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Abstract

The paper examines the realization of consonant clusters in prosodically faithful forms in Greek L1. Longitudinal naturalistic data reveal that children tend to simplify clusters to either the unmarked or to the initial member of the cluster. Apart from being simplified, clusters begin being faithfully realized by the age of 1;10. The aim here is to demonstrate that child language variation is not random but depends on phonological principles and is attributed to the activation of multiple parallel grammars during the acquisition process.

Key words: clusters, markedness, positional faithfulness, variation, multiple grammars

1. Introduction

Cross-linguistic research in phonological development has revealed that cluster simplification is governed by three fundamental repair mechanisms: *sonority* and the *Margin Hierarchy* (Prince & Smolensky 1993), *coalescence* and *epenthesis*. Such facts are supported by L1, L2 and SLI data (cf. Barlow 1997; Ohala 1998; Gierut 1999; Steele 2002; Gnanadesikan 2004, for English; Fikkert 1994, for Dutch; Lléo & Prinz 1996, for German and Spanish; Lukaszewicz 2000, for Polish). Representative examples of SLI child data are given in (1), where initial target clusters are simplified to the most unmarked member or to a substituting unmarked segment in case target clusters consisting of highly marked segments. The substituting segment may be the product of fusion and voicing (Subject 25, (1d)), fusion and stopping (Subject 13, (1b)), simplification and voicing (Subject 25, (1b)), simplification and stopping (Subject 13, (1c))[1].

	Subject 2 (3;6)	Subject 25 (4;10)	Subject 13 (4;08)
(1a)	**tw**in → [**t**in]	**q**ueen → [**t**in]	**br**other → [**b**ævo]
(1b)	**p**ray → [**p**et]	**sp**oon → [**b**un]	**fr**og → [**b**ogi]
(1c)	**b**low → [**b**o]	**sl**eep → [**s**ip]	**thr**ow → [**t**ou]
(1d)	**fl**y → [**f**u]	**sk**y → [**d**ai]	
(1e)	**gr**ow→ [**g**o]	**st**ove → [**d**ov]	

(examples from Barlow 1997)

More data reveal that the consonant closer to the vocalic nucleus may be preserved. In most of such examples, the first member is produced in case the second is a liquid

[1] The difference between the tokens (1b) and (1c) of subject 13 is that (1b) is the result of fusion between place of articulation of /f/ and voicing of /r/. In (1c), on the other hand, /r/ is the member of the cluster which is simplified. Such cases in intra-subject variation verify the activation of parallel grammars, a topic discussed in sections 2 and 3.

(Avivit 2001, for Hebrew; Rose 2000, for French)[2]. Other studies have demonstrated that positional faithfulness is involved in cluster reduction. Recent research in Greek L1 has demonstrated that the word-/cluster-initial segment is preserved irrespective of its degree of markedness (cf. Revithiadou & Tzakosta 2004), as exemplified in the data in (2).

(2a)	/**γl**i.κó/	→	[**γ**ó]	'sweet'	(D: 2;01.09)
(2b)	/**kr**a.tá.o/	→	[**k**á.o]	'hold.$_{1S}$'	(F: 1;11.15)
(2c)	/**fr**i.γa.nú.la/	→	[**f**ú.la]	'cracker.$_{DIM}$'	(D: 2;03.07)

Additionally, headedness seems to play an influential role. More specifically, Goad & Rose (2004) for English L1, and Steele (2002) for French L2 have shown that, in /s/ + sonorant clusters, /s/ is preserved because of its position as head of the cluster, while, in CL clusters, stops are preserved, because of their headedness status. /s/ clusters have a special place in the study of prosodic acquisition. It is represented as an *appendix/ adjunct* (Barlow 1997), or a *single unit*, with a representation analogous to affricates (Barlow 1997; Gierut 1999), or a *head in /s/ + sonorant* clusters (Goad & Rose 2004). In the first two cases /s/ is reduced, whereas in the latter /s/ is successfully realized.

The central aim of this study is to examine the occurrence of consonant clusters in all word positions in stressed and unstressed syllables in Greek L1. For this reason, I draw on developmental data from four children (B.T., D., Me., B.M.) who range in age between 1;07 and 3;05. I investigate two-member */s/ + obstruent*, *obstruent + /s/,*[3] */obstruent + liquid/*, and */obstruent + obstruent/* clusters and focus on prosodically faithful forms of intermediate states of acquisition. In prosodically faithful forms, the realized words preserve the number of syllables of the target word. By intermediate states I refer to these phases of acquisition during which children do not produce only unmarked or only faithful forms. As will be exemplified, such developmental phases are characterized by unmarked forms, faithful forms, as well as forms which respect various phonological principles. As a result, a cluster may exhibit various production patterns even during the same developmental phase. These findings have important implications for a theory of learnability: child language variation presupposes the parallel activation of multiple grammars. Such grammars are not in conflict; they result in multiple surface realizations of the same target form. However, some of these grammars are theoretically more prominent than others, a fact supported by statistical tendencies in production.

A related goal is to provide evidence regarding the order of acquisition of the phonemic inventory of Greek. Simplification strategies demonstrate that certain segments are preferred over others. This entails that these segments are acquired and produced earlier and more frequently than others.

2. Phonological Development as activation of parallel grammars

Phonological development is seen as the linguistic process during which children gradually acquire and faithfully produce the ambient language. Children's linguistic progress has been interpreted by means of developmental stages during which learners exhibit uniformity in production. Phonological acquisition is considered to be completed in three to six developmental stages (cf. Fikkert 1994, for Dutch; Demuth &

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[2] Van der Pas (2004) offers an alternative account with an analysis favoring CONTIGUITY, according to which the cluster member adjacent to the nucleus is preserved irrespective of its featural composition.

[3] Here I do not consider affricates, even though the data provide some evidence that children treat affricates as clusters rather than complex segments. This is left out for future research.

Fee 1995, for English). Stages may be skipped in case children do not produce forms expected to emerge during specific stages (Demuth & Fee 1995).

Developmental stages are governed by production homogeneity and gradual faithfulness to the target language. Homogeneity and gradual faithfulness prevent variable forms and regressions to earlier states of phonological development from emerging. Nevertheless, Taelman (2004) and Tzakosta (2004) have reported extensive variation and regressions to earlier states of phonological acquisition for child Dutch and child Greek, respectively. This observation led Tzakosta (2004) to propose a revised model of acquisition, the *Multiple Parallel Grammars Model* (hereafter MPGM).

According to this model, acquisition is governed by a multitude of grammars that co-emerge and circumscribe child production. Multiple grammars constitute distinct developmental paths[4] that result in inter- and/or intra-child variation. Acquisition proceeds in three major phases: In the first phase, all markedness constraints are ranked above faithfulness constraints; as a result, only unmarked structures emerge in child speech. In the intermediate phase, constraint permutation results in the generation of multiple grammars -among which the target grammar- which are all available to the learner. During this second developmental phase, acquisition proceeds through filtering of unwanted grammars. Filtering is monitored by phonological principles of the ambient language, input frequency effects, as well as principles of UG. Unwanted grammars are excluded from the children's grammar inventory, either gradually or by means of regressions to earlier developmental states. In the latter case the child's linguistic capacity seems to return to earlier states. During the final developmental phase, children are considered to have reached and acquired the target grammar.

The MPGM is schematized in Figure 1. The three circles highlight the network of multiple grammars characteristic of the second major developmental phase. The central biggest circle includes the core grammars, i.e. the grammars, which are statistically more prevalent and, theoretically, more related to the target grammar. The peripheral circles include the grammars which are statistically and theoretically less prominent. Peripheral grammars are the first to be filtered out.

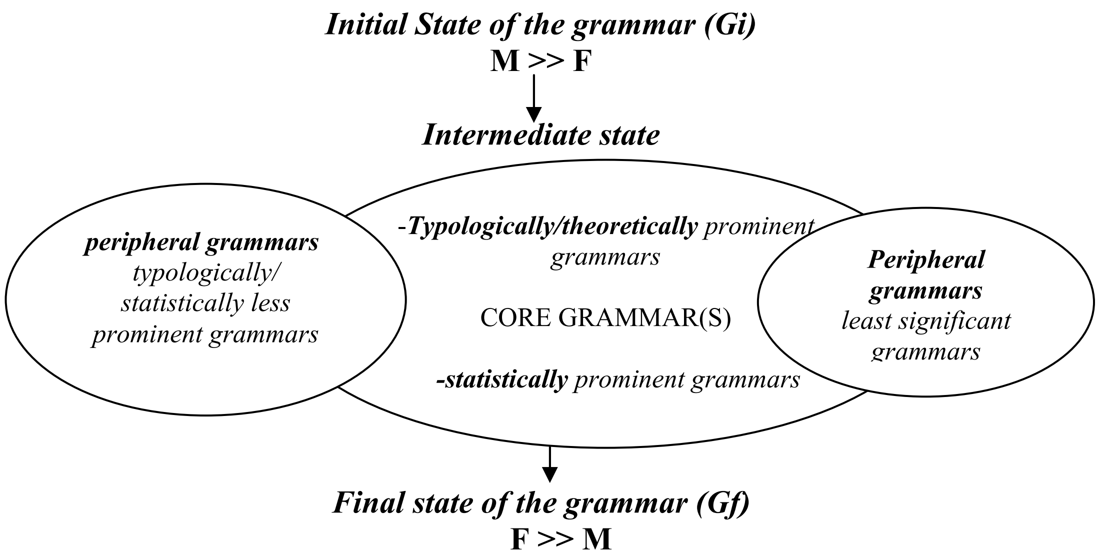

Figure 1. The Multiple Parallel Grammars Model

[4] Developmental paths are discussed from a different viewpoint in Levelt & van de Vijver (2004).

3. Realization of consonant clusters in Greek child speech

Research in child Greek has revealed that consonant clusters are basically reduced to the most unmarked member of the cluster (cf. Kappa 2002). Kappa (2002) has further argued that homorganic clusters (for example, /pm/, /tl/, /tn, /sl/) do not surface. The data presented here further show that epenthesis, fusion and the combined effects of stopping and markedness scales rule child production.

3.1 /obstruent + liquid/ and /obstruent + obstruent/ clusters

In /stop + liquid/ clusters, simplification, epenthesis, and sonority apply in segmental combinations that emerge both in word-initial ((3a)-(3c)) and word-medial position ((3d)-(3g)), in stressed ((3a), (3c) and (3e)) and unstressed syllables ((3b), (3d), (3f)-(3g)). In (3c) the target cluster /kl/ surfaces as /t/, namely, the realized form is the product of bidirectional assimilation (i.e. fusion) and the produced segment gets its manner of articulation by the leftmost member of the cluster, while borrows its place of articulation from the rightmost segment. Notice that, in cases like the one reported in (3g), it is probable that a target word surfaces in variable/multiple forms.

(3a)	/**tr**é.no/ →	[**t**é.no]	'train'	(B:1;10)
(3b)	/**kl**i.δjá/ →	[**k∂.l**i.δjá]	'keys'	(Me: 2;03.14)
(3c)	/**kl**é.i/ →	[**t**é.i]	'cry.$_{\text{PRES.3S}}$'	(B.M.: 1;09.22)
(3d)	/δé.**dr**a/ →	[dé.**d**a]	'tress'	(B:1;10)
(3e)	/o.**br**é.la/ →	[o.**b**é.la]	'umbrella'	(D: 2;03.21)
(3f)	/ka.ré.**kl**a/→	[ka.lé.**k∂.l**a]	'chairs'	(Me: 1;08.31)
(3g)	/ma.**kr**i.á/ →	[ma.**k∂.l**i.á]	'far.$_{\text{ADV}}$'	(B.M.: 2;08.26)

Variable production patterns conform to distinct developmental paths. In other words, every repair strategy corresponds to different constraint hierarchies. The relevant constraints are provided in (4).

(4) Constraints (adjusted)

- ***COMPLEX**: CV syllables are preferred.
- **M**: Avoid sonorous segments in onset position.
- **DEP**: No insertion.
- **IDENT**: Be faithful to the featural composition of the target segment.
- **#C/.C**: Retain the initial segment of a word/ syllable.
- **CONTIGUITY**: Retain the member of the cluster which is adjacent to the nucleus.
- **IDENT (MANNER$_1$&PLACE$_2$)/(MANNER$_2$&PLACE$_1$)**: Retain either manner or place of articulation of each member of the cluster.
- **AGREE-MANNER/ PLACE**: agree in manner and/or place of articulation.

Permutation of eleven constraints generates 39,916,800 grammars! As a result, children are exposed to a large number of grammars in the sense that these grammars constitute the set of possible developmental paths. Nevertheless, children seem to adopt only three out of the pool of grammars for the set of examples given in (3), that is, one which conforms to cluster simplification, one which corresponds to insertion and one which provides forms which respect both insertion and markedness. Even though the example in (3c) is the product of fusion, I consider that it stems from grammars (5a) and (5d), because the realized segment is the unmarked coronal /t/. OT allows two or more possible grammars to be responsible for the production of one and the same output. However, this is not a drawback for the theory, because the grammar which is less related to the target grammar will, eventually, be abandoned due to linguistic cues available to the learner. According to the MPGM, the grammars in (5) are, compared to other grammars, typologically more related to the target grammar and statistically more prevalent.

(5a) *COMPLEX>> M, #C >> … >> F (deletion/markedness/positional faithfulness)
(5b) *COMPLEX >> F(IDENT), DEP >> … F (insertion)
(5c) *COMPLEX >> M, DEP >> … >> F (insertion and markedness)
(5d) *COMPLEX >> IDENT (MANNER$_1$&PLACE$_2$) >>M >> … >> F (fusion)

The picture is more or less the same regarding /fricative + liquid/ clusters in word-initial and word-medial position, in stressed and unstressed syllables. In the examples in (6), /fricative + liquid/ clusters undergo simplification ((6a)-(6d), (6g)), fusion (6f) and epenthesis (6e)[5]. It is worth noting that, as shown in the examples in (3), stress does not seem to play a crucial role in the acquisition of clusters, although prominent positions, i.e. stressed and edgemost syllables resist repair strategies. In other words, clusters of stressed syllables are not realized earlier than those in unstressed syllables.

(6a)	/frú.ta/	→ [fú.ta]	'fruits'	(BT:1;10)
(6b)	/**fr**i.γa.niá/	→ [**f**i.γa.niá]	'biscotte'	(D: 2;06.29)
(6c)	/**vr**é.çi/	→ [**v**é.çi]	'rain.$_{PRES.3S}$'	(B.M.: 1;11.08)
(6d)	/**xr**ó.ma/	→ [**x**ó.ma]	'color'	(B.M.: 2;03.04)
(6e)	/**γr**í.γo.ra/	→ [**γ∂.l**í.γo.la]	'fast.$_{ADV}$'	(B.M.: 2;03.04)
(6f)	/tsí.**xl**a/	→ [tí.**θ**a]	'gum'	(B.T.: 2;01.05)
(6g)	/má.**vr**os/	→ [má.**v**o]	'black.$_{ADJ.MASC.SG}$'	(D: 2;02.24)

The examples in (6) correspond to the grammars in (5) and (7). (7) addresses only a small subset of the Greek child data, where the more marked but adjacent to the vocalic nucleus segment is preserved.

(7) *COMPLEX >> CONTIGUITY >> … >> F (adjacent segments are preserved)

In the category of /obstruent + obstruent/ clusters, no data of /stop + fricative/ clusters emerge in either word-initial, or word-medial position, unless the second member of the cluster is an /s/. This is attributed to the fact that /stop + fricative/ clusters are not frequently attested in adult speech either. Representative examples of /fricative + stop/ clusters are presented in (8). In these examples segmental deletion, epenthesis and positional faithfulness are also satisfied. Consequently, the same grammars as those in (5) and (7) apply.

(8a)	/xté.na/	→ [té.na]	'brush'	(B.T.: 1;11.10)
(8b)	/**ft**e.rá/	→ [**f**e.lá]	'wings'	(D:2;02.24)
(8c)	/**xt**i.pá.i/	→ [**γ∂.t**i.bá.i]	'hurt.$_{PRES.3S}$'	(Me: 2;00.26)

[5] There is only one example in the data in which the consonant closer to the vocalic nucleus is retained (/**vl**é.pun/ → [**l**é.pun] 'see.$_{PRES.3P}$' (BT.1;11.29)).

(8d) /o.**xt**ó/ → [o.**t**ó] ‘eight’ (B.M.: 2;06.19)
(8e) /pé.**ft**i/ → [bé.**f**i], [pé.**f**ə.**t**i] ‘fall.$_{\text{PRES.3S}}$’ (B.M.: 2;07.09)

In /fricative + fricative/ clusters various patterns emerge. To be more specific, in the examples presented in (9a) and (9b), it is either the labial fricative or the velar fricative that surface. The velar /γ/ appears later than /v/ in the speech of D, giving some indications that labial fricatives may be acquired before velar fricatives. However, both fricatives appear during the same session in the speech of B.M. (9c), providing evidence for the activation of multiple parallel grammars. The emergence of /vγ/ in word medial position is not elucidating; in medial stressed syllables, /v/ survives (9d), while in unstressed syllables it is not produced. /stop + stop/ clusters, on the other hand, appear rarely in the data; this is unexpected, given that stops are considered to be more unmarked and appear more often in child speech. Lack of /stop + stop/ clusters is attributed to input frequency effects[6]. The examples in (9) conform to the grammars in (5) and (7).

(9a) /vγá.lo/ → [γá.lo] ‘take out.$_{\text{SUBJV.1S}}$’ (D: 2;03.14)
(9b) /**vγ**á.lo/ → [**v**á.lo] ‘take out.$_{\text{SUBJV.1S}}$’ (D: 2;06.29, 2;07.06)
(9c) /**vγ**á.lo/ → [**γ**á.lo], [**v**á.lo] ‘take out.$_{\text{SUBJV.1S}}$’ (B.M.: 2;03.19)
(9d) /a.**vγ**ó/ → [a.**v**ó] ‘egg’ (B.T.: 1;10)
(9e) /é.**vγ**a.le/ → [é.**γ**a.le] ‘take out.$_{\text{PAST.3S}}$’ (B.M.: 2;02.12)

3.2. /s/ + obstruent clusters

/s/ is considered to be extrametrical in word-initial position in Greek adult speech (Malikouti-Drachman 1984). Here, this view is challenged by the proposed argumentation, namely, that the acquisition of /sC/ clusters is related to the acquisition of /s/ in other positions in the word. Word-initially, /s/ is always deleted ((10a)-(10c)). In the first token of (10c), the realized segment is the product of the fused /s/ and /k/.

(10a) /**sp**í.ti/ → [**p**í.ti], [**b**í.ti] ‘house’ (BT:1;10)
(10b) /**st**e.fa.ná.ci/ → [**t**e.fa.ná.ci] ‘crown.$_{\text{DIM}}$’ (Me: 1;08.31)
(10c) /**sk**ar.fa.ló.no/→ [**x**a.fa.ló.no], [**k**a.fa.ló.no] ‘climb’ (B.M.:2;05.07)

In word-medial position, findings are equivalent; /s/ is always reduced, irrespective of the degree of markedness of the realized segment, as shown in (11).

(11a) /pi.**st**ó.li/ → [te.**t**ó.li], [be.**t**ó.li] ‘gun’ (D: 2;01)
(11b) /δa.ská.la/ → [le.ká.la] ‘teacher’ (D: 2;02)
(11c) /é.**sc**i.se/ → [é.**c**i.te] ‘tear.$_{\text{PAST.3S}}$’ (Me: 1;08.31)

/s/+fricative clusters appear rarely in the data, but their frequency of emergence is equivalent to that of the data in (10) and (11). In other words, /s/ + fricative clusters emerging in both word-initial and word-medial position are reduced to the fricative member ((12a), (12b)) or to a more unmarked segment (12c). The examples in (11) and (12) conform to the grammars provided in (5) and (7).

[6] However, statistics on input frequency effects are not provided in this study.

(12a)	/**sx**o.lí.o/	→ [**ç**o.lí.o], [**x**o.lí.o]	'school'	(D: 2;03.14)
(12b)	/á.**sç**i.mes/	→ [á.**ç**i.mes]	'ugly.$_{FEM.PL}$'	(D: 2.03.21)[7]
(12c)	/pa.**sx**a.lí.tses/	→ [pa.**k**a.lí.teθ]	'ladybugs'	(Me: 1;11.13)

3.3 obstruent + /s/ clusters

In obstruent + /s/ clusters, /s/ usually undergoes reduction (13a, b) if fusion does not apply ((13c)-(13e)). The fact that /s/ is reduced irrespective of its position in the cluster weakens the argumentation for /s/ extrasyllabicity in initial position. In other words, if /s/ were extrasyllabic, it would be deleted only in initial position and not in all cluster positions. However, given that /s/ is deleted across-the-board, other factors must impose its reduction, namely, sonority and relative markedness. Not only is /s/ deleted in word-initial or medial position, but also in stressed and unstressed syllables.

(13a)	/**ps**i.lá/	→ [**p**i.lá],[**ç**i.lá],[**pç**i.lá]	'high.$_{ADV}$'	(D: 2;04.17)
(13b)	/**ps**é.ma/	→ [**p**é.ma]	'lie'	(B.M.: 1;11.01)
(13c)	/fí.la.**ks**e/	→ [fí.la.**t**e]	'save.$_{IMP.2S}$'	(B.T.: 1;11.10)
(13d)	/pé.**ks**u.me/	→ [pé.**θ**u.ne]	'play.$_{PRES.1P}$'	(D: 2;01.16)
(13e)	/kó.**ps**is/	→ [kó.**f**i]	'cut.$_{SUBJ.2S}$'	(D: 2;03)

3.4. Faithful productions

In the final state of phonological development, children are expected to have acquired the target grammar. In the data in (14), two-member clusters start being faithfully realized regarding the number of the produced segments. Nevertheless, substitution patterns tend to emerge, providing evidence for the order of acquisition of the phonemic inventory of Greek; more specifically, variable forms tend to agree in manner of articulation, particularly stopping, and place of articulation, namely coronality. The data in (14) correspond to the grammars in (15). Findings from faithful productions come to support the conclusions reached for simplified forms; preserved segments tend to respect markedness in place and/or manner of articulation. It is worth noting that segmental acquisition is highly related to frequency rates in the ambient language. Subtler distinctions, for example, the dynamic interaction between consonant clusters and their relevance to other phonological phenomena, like consonant harmony, need to be examined, in order to reach a definite answer as to how the phonemic inventory of Greek is acquired.

(14a)	/a.**ft**ó/	→ [a.**pt**ó],[a.**ft**ó]	'this.$_{DEM.PRO}$'	(B: 1;11.27)
(14b)	/**sx**o.lí.o/	→ [**θx**o.lí.o]	'school'	(D: 2;07.06)
(14c)	/o.**br**é.la/	→ [ku.**bl**é.la]	'umbrella'	(Me: 1;11.22)
(14d)	/pá.**sx**a/	→ [pá.**θk**a]	'Easter'	(B.M.: 2;09.25)

(15a) AGREE-MANNER, AGREE-PLACE >> F >> *COMPLEX
(15b) M, F >> *COMPLEX
(15c) F >> M, *COMPLEX

[7] I consider the adult surface form to be the input to child speech. Consequently, the form in slanted lines represents the adult form. /á.sçi.mes/, rather than /á.sxi.mes/, is the form produced by adults.

4. Discussion and topics for further research

Even though the discussed data do not allow me to reach any conclusive results regarding the acquisition of the phonological system of Greek L1, some general remarks can be made. To be more specific, the data highlight that children primarily simplify target clusters to the least sonorous segment or to the initial segment due to positional faithfulness effects. However, apart from being simplified, clusters begin being faithfully realized by the age of 1;10. Table 1 exhibits the percentages of faithful and simplified productions of target clusters. Simplified forms provide a much higher percentage compared to faithful forms. Note that Table 1 gives the total percentages only. Closer examination of the data will reveal how acquisition proceeds within the speech of each child during equal time intervals of their development.

Table 1. Attempted clusters

Faithful production	1071	32.2%
Simplified forms	2252	67.8%
Total	*3323*	*100%*

CL clusters are the first to be faithfully realized, with /stop + liquid/ clusters emerging before /fricative + liquid/ ones. Cs and sC clusters follow, while segmental combinations, which agree in place and/or manner of articulation, exhibit low results and are included in the ‘rest’ category, as shown in Table 2.

Table 2. Cluster faithful productions

Stop + L	255	24%
Fric + L	107	10%
Stop + /s/	93	9%
/s/ + stop	32	3%
Rest	584	54%
Total	*1071*	*100%*

A plausible scenario for the frequent emergence of CL clusters in child speech is that faithful clusters need to significantly differ in sonority. As a result, /stop + fricative/ and fricative + /s/ clusters do not exhibit any tokens in word initial or word medial position in the data, while /stop + stop/ clusters do not emerge in word-initial position.

However, as Table 3 demonstrates, CL clusters exhibit the highest percentages in simplification strategies, with /s/ + stop and stop + /s/ following them. The fact that CL provide high percentages of faithful as well as reduced forms entails that children target such clusters because they are exposed to them more frequently. In other words, high frequency of CL clusters in adult Greek drives high production rates of such forms[8].

[8] For detailed statistical results on the frequency of input clusters see Tzakosta (in prep.).

Table 3. Cluster simplifications

Stop + L	586	26%
/s/ + stop	561	25%
Fric + L	422	19%
Stop + /s/	353	16%
Fric + Fric	162	7%
Fric + stop	136	6%
/s/ + Fric	30	1%
Stop + stop	1	0%
Fric + stop	1	0%
Total	*2252*	*100%*

A related question is in which position clusters are acquired first. Lléo & Prinz (1996) and Kirk & Demuth (2003) for German and English, respectively, argue that coda clusters are acquired before onset clusters due to phonological structure, morphology, and frequency effects. Table 4 shows that simplified clusters exhibit equal frequency rates in child Greek in both initial and medial syllables.

Table 4. Simplified clusters

Word-initial	1129	50.1%
Word-medial	1123	49.9%
Total	*2252*	*100%*

Another issue of the present study relates to the representation of /s/ clusters. In these clusters, /s/ is preserved due to either markedness or syllabification effects. More specifically, /s/ is deleted if it is more marked compared to the second member of the cluster or because it is syllabified as a coda word medially. This is further supported by data where word medial coda segments are either deleted or undergo metathesis. /s/ + obstruent clusters are never faithfully produced in the corpus of the data, although it is attempted when part of three-member clusters.

Moreover, it is interesting to test the extent to which stress influences cluster preservation. The presented data do not provide much insight regarding faithful cluster production in stressed syllables. As shown in the examples in (3) and (13), clusters undergo repair strategies, irrespective of their position in the word, initial or medial, stressed or unstressed syllables. Put differently, prominent positions do not influence cluster preservation.

Multiple output forms underline the fact that variation is systematic in child speech. Statistical tendencies demonstrate that variation is not random but depends on phonological principles, UG principles and input frequency effects. In other words, variation is not unconstrained; it is predicted by phonological principles holding crosslinguistically, such as unmarkedness. The current study further supports Tzakosta's (2004) argumentation according to which statistical tendencies depend on typological predictions, except for input frequency. For example, unmarked forms, or forms which respect faithfulness to specific positions/edges tend to surface more frequently. The MPGM proposes that variation is attributed to the parallel activation of multiple grammars during the acquisition process, which, in OT terms, is the result of constraint permutation (Tzakosta 2004). Multiple grammars succeed in providing a unified analysis of inter-/intra-child and adult language variation, something not clearly captured by other theoretical models. A theoretical prediction of the present study is that the model suggested for the acquisition of clusters in Greek L1 should be theoretically adequate to explain the acquisition of clusters in Greek L2.

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