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Faithfulness vs truncation: A prosodic account of children's disyllabic to pentasyllabic words

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Abstract

In the present study faithfulness and truncation in language acquisition are investigated. The data come from pictures naming and spontaneous speech produced by four Greek-speaking children aged 1;6.26 to 2;10.9 years old. Our hypotheses are based on words containing two to five syllables. From the beginning of the research only disyllabic words remain faithful to the number of syllables, while the remaining words are initially truncated and are gradually uttered more and more accurate as children's linguistic development proceeds. Words with faithfulness are not affected by the position of stress and type of rhythm. In truncations, the stressed syllable is maintained in the majority of cases. Generally, rhythm remains stable, even in tokens where the stressed syllable is omitted. Truncations also show that children construct their words from strong to weak elements, namely, from stressed syllable and strong foot to weak foot or syllable. Our analysis is couched in Optimality Theory framework (Prince & Smolensky, 1993), while for the different patterns observed in children's tokens we rely on Multiple Parallel Grammars model (Revithiadou & Tzakosta, 2004), where different rankings of the same constraints relative to prosody and structure of prosodic word can interpret the aforementioned observations.

Keywords: language acquisition, faithfulness and truncation in Greek, prosody, phonology, Optimality Theory

1. Introduction

A non-controversial hypothesis is that children tend to acquire unmarked structures before marked ones (e.g., Jakobson, 1968). For example, CV syllable is followed by CVC syllable, then CCVC and CCVCC structures arise if they are allowed by the target language (e.g., Lleó & Prinz, 1997). A well documented linguistic period of children is when they pass from monosyllabic productions to disyllabic ones creating this way *binary feet*, which constitute *minimal prosodic words* (see, Demuth, 1995, p. 14; Broselow, 2008, p. 122, among others). However, not enough discussions after the stabilization of words composed of binary feet are traced, that is, researches dealing with polysyllabic words in child speech, the handling of which seems to be a difficult task for children to overcome. This is the reason why in such kind of words several phonological processes emerge, such as the *deletion* or *addition* of syllables, the alternation of rhythm pattern, the *substitution* of segments. While these processes have been reported in studies by researchers, there is disagreement on the cause of their appearance. Some researchers argue that they take place in specific positions of words, which are considered perceptually prominent due to

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properties they bear, as pitch, amplitude, while others point out that they arise due to characteristics of the ambient language, such as its rhythm pattern (e.g., Demuth & Fee, 1995; Pater, 1997; Smith, 2002).

The present study addresses *truncation* in children's polysyllabic words from a prosodic point of view based on properties of its emergence as well as cases with *faithfulness*. We focus, in particular, on the following questions:

1. Regarding the number of syllables, which words are systematically uttered faithfully and which ones are usually deleted?
2. In which degree are these processes affected by the position of stress or type of rhythm?
3. In truncations, how many syllables are omitted and what type of syllables regarding their strength and position survive?
4. How many strategies are observed in children's omissions and how frequent are they? Further, do they present *variation* in their speech, namely, production of multiple outputs that correspond to one input.
5. How do the children of the present study construct polysyllabic words during their linguistic development?

The structure of the paper is divided as follows: next, literature review of polysyllabic words is presented. Section 2 includes the research methodology. Section 3 includes the findings of our study and discussion of data. Further, the analysis of the children's productions based on *Optimality Theory* (Prince & Smolensky, 1993) is shown. For the different patterns traced in children's *tokens* and for their variation, we adopt the *Multiple Parallel Grammars* model (Revithiadou & Tzakosta, 2004). In the last section, we conclude the paper with the main findings of this study and suggestions for future research.

1.1. Literature review

Most studies focus on the process of truncation in children's multisyllabic words. In some of them, children's utterances contain only one syllable (examples 1a - c).

	Adult's output	→ Child's output	Child: Age
(1)	a. [pɪˈænəʊ]	→ [pʊ] (piano)	Kyle: 1;2
		(English, Johnson et al., 1997, p. 336)	
	b. [ótobus]	→ [bú] (bus)	Or: 1;4 - 1;5
			(Hebrew, Adam, 2002, p. 65)
	c. [ˈɣa.ta]	→ [ˈɣa] (cat)	B2: 1;10
		(Greek, Revithiadou & Tzakosta, 2004, p. 380)	

In (1a), the segments surviving deletion are the first and last. This is in accordance with Slobin's (1973) proposal, who mentions that cross-linguistically children tend to pay more attention to elements located at edgemost syllables. In (1b), the final syllable is retained, while in (1c) the initial syllable, which is the stressed. Stressed syllables and those located in initial or final position in words are considered psycholinguistically prominent (e.g., Slobin, 1973; Nooteboom, 1981; Hawkins & Cutler, 1988; Pater, 1997; Beckman, 1997, 1998; Barnes, 2002; Smith, 2002; Zoll, 2004; Petrova et al., 2006; Tzakosta, 2007; Jurgec, 2010). In language acquisition, prominent positions block or resist phonological processes and, generally, present both positional and segmental faithfulness (see, Beckman, 1997; Zoll, 2004; Bat-El, 2014; Ben-David & Bat-El, 2017, among others). Stressed syllables' strength lies in their higher pitch, duration and loudness, while final syllables are also loud as well as more memorable and marked, especially, in sentence boundaries (e.g., Lehiste, 1970; Laver, 1994; Echols, 2001). Further, the latter undergo lengthening, which is exaggerated in infants' directed speech (Echols, 2001). So, in several studies the children omit weak syllables, such as unstressed and non-final, rather than stressed and final (e.g., Echols & Newport, 1992; Kehoe & Stoel-Gammon, 1997; Echols, 2001; Ben-David, 2012; Ben-David & Bat-El, 2017), as illustrated in the next examples (2a - d).

	Adult's output	→ Child's output	Child: Age
(2)	a. [iraisər]	→ [raisə] (eraser)	
		(English, Echols & Newport, 1992, p. 206)	
	b. [dáinosar]	→ [dáisar] (dinosaur)	Female: 1;10
		(English, Kehoe & Stoel-Gammon, 1997, p. 535)	
	c. [agalá]	→ [alá] (stroller)	DA: 1;1
	d. [télefon]	→ [téfo] (telephone)	DA: 1;1
			(Hebrew, Ben-David, 2012, p. 65)

In some languages, as Hebrew, when children begin to produce more and more syllables in multisyllabic words, these do not surface immediately with faithfulness but with *consonant harmony* (Bat-El, 2009), in which non-adjacent consonants agree to some or all *distinctive features* (cf., Pater & Werle, 2001, p. 119). This cost of faithfulness for the expansion of a word is viewed as a *trade off* (cf., Bat-El, 2009, p. 121). Since stress is mostly located in ultimate or penultimate in Hebrew, the first syllables uttered by children are the stressed and final resulting in the expansion of the prosodic word from right to left (Bat-El, 2009; Ben-David, 2012), as shown from example (3).

	Adult's Form	→ Child's Form
(3)	[tarneˈgolet]	→ [ˈgoget] > [ˈgolet] > [gaˈgolet] > [taˈgolet] (hen)
		(Hebrew, Bat-El, 2009, p. 121)

In Hungarian however, where primary stress is located in initial syllable, the opposite can happen as final syllables are omitted. In addition, they usually undergo deletion when an unstressed syllable precedes, while retained when they follow a stressed syllable (MacWhinney, 1985). This difference is possibly attributed to the fact that stress acts as signal, which facilitates children's attention to the next syllables (Du Preez, 1974).

In early stages of prosodic development, children's utterances are observed to conform to a specific size, such as binary foot (e.g., Fikkert, 1994; Demuth, 1995). Truncation at these periods serves as a strategy to fit productions of children to templates via the deletion of syllables located outside the aforementioned structure (Kappa, 2002; Taelman & Gillis, 2002; Ota, 2006). Indicative examples are provided next (4a - c).

	Adult's Form	→ Child's Form	Child: Age
(4)	a. [xriˈsula]	→ [ˈsula] (Xrisoula, name)	Sofia: 2;9.15
			(Greek, Kappa, 2002, p. 20)
	b. [kaˈbɑutər]	→ [ˈbɑutə] (gnome)	Maa: 1;10.14
			(Dutch, Taelman & Gillis, 2002, p. 1)
	c. [omoi]	→ [moi] (heavy)	Ryo: 2;0.15
			(Japanese, Ota, 2006, p. 276)

Tokens such as (4a - c) represent the rhythm pattern of each language, as in *trochaic* a pretonic syllable has more chances to be deleted, while in *iambic* a posttonic one (Ota, 2006). However, exceptions are traced, where children's preferences are not affected by language-specific properties. In Hebrew, for instance, disyllabic words with iambic stress are uttered as monosyllabic for longer period than the corresponding with trochaic stress (examples 5a - b), despite iambic foot being more frequent in this language (Adam & Bat-El, 2008, 2009). In addition, at later stages when disyllabic words with trochaic stress are produced with faithfulness regarding the number of syllables (example 5c), the corresponding with iambic stress continue to be produced as monosyllabic (example 5d).

	Adult's Form	→ Child's Form	Child: Age
(5)	a. [sáfta]	→ [ta] (grandma)	Child: 1;2 - 1;3.5
	b. [todá]	→ [dá] (thanks)	Child: 1;2 - 1;3.5
	c. [túci]	→ [kúci] (parrot)	Child: 1;3.14 - 1;4.24
	d. [kapít]	→ [tík] (spoon)	Child: 1;3.14 - 1;4.24
			(Hebrew, Adam & Bat-El, 2008, p. 13)

This contrast lies in *markedness*. In other words, Hebrew-speaking children in initial developmental phases prefer trochaic feet, which are universally unmarked and gradually they change their preference to the systematic foot presented in the ambient language, namely, iambic (Adam & Bat-El, 2008, 2009).

In truncations, intra child and intra word variation is additionally found. In a survey examining a Dutch-speaking child (Taelman & Gillis, 2002), inconsistency in words with specific prosodic pattern is observed, as for instance, in trisyllabic words with ultimate stress (examples 6a - c).

	Adult's Form	→ Child's Form	Child: Age
(6)	a. [pɑpəˈɣɑj]	→ [pɑpəˈɣɑj] (parrot)	Maa: 1;10.10
	b. [ʃɔkoˈlɑt]	→ [lɛˈlɑt] (chocolate)	Maa: 1;10.10
	c. [teləˈfon]	→ [ˈfon] (telephone)	Maa: 1;10.10
			(Dutch, Taelman & Gillis, 2002, p. 2)

From the tokens (6a - c), it can be ascertained that trisyllabic words are truncated to monosyllabic, disyllabic or remain faithful to their syllable size. Further, the same word can be uttered in multiple different ways even in the same recording (examples 7a - c).

	Adult's Form		Child's Form	Child: Age
(7)	a. [ʃɔkoˈlɑt]	→	[ətəˈlat] (chocolate)	Maa: 1;10.10
	b. [ʃɔkoˈlɑt]	→	[lɛˈlɑt] (chocolate)	Maa: 1;10.10
	c. [ʃɔkoˈlɑt]	→	[ˈlɑt] (chocolate)	Maa: 1;10.10

(Dutch, Taelman & Gillis, 2002, p. 2)

Generally, the emergence of variation in the process of truncation is proposed to be either free or affected by the properties of the target language (Ota, 2006). Finally, input frequency is also suggested to play a decisive role in the degree of variation in truncations, as it may determine the size and shape of the words that will appear more frequently than others (Demuth & Johnson, 2003).

2. Methodology

2.1. Information of children's and way of their data collection

The process used for the data collection of all children is the same. Before its prosecution, all parents provided verbal and written consent. Children came in contact with the researcher before recordings in order for both sides to be familiarized with each other. The meetings usually took place between researcher and children in colorful and rooms full of toys or in the yard of kindergartens in order for them to feel comfortable and their productions to not come from haste or lack of concentration. Basic tool for the research is the professional tape recorder Marantz PMD661MKII, while the data were longitudinal and gathered via spontaneous speech and naming of pictures that were shown to children via a laptop. These pictures were drawn from another study in Greek child speech (Kappa & Paracheraki, 2014) with some modifications for the needs of the present one, which included everyday words, such as foods, plants, animals, professions, vehicles, buildings, household utensils. They were created in a way to give children the chance to utter all types of consonants, consonantal clusters and vowels in every position within a word (initial, medial, final stressed or unstressed syllable). The children's speech was recorded on a weekly basis. The duration of research lasted 15 months, while each recording ranged from 15 to 30 minutes for every child. We base our findings on four monolingual children with typical linguistic development and Standard Modern Greek as their mother tongue. Their age varies from 1;6.26 to 2;10.9 years old. In total, 35.677 tokens were gathered, from which 14.554 are included in the present study. Audacity software was used for the reproduction, processing and conversion of audio material into phonetic tokens, while Microsoft Office Word for the organization of the tokens. The transcription was done perceptually. For this reason, we include data with high certainty of children's utterances. For the phonetic rendering of words, the *International Phonetic Alphabet* is used.

2.2. *Data included and processing*

As far as children's linguistic development is concerned, it is divided in two developmental stages. In the initial stage, that is, till 2;0 years old children's productions are mostly unmarked and the majority of words contain two CVCV syllables. In the intermediate phase, namely, after 2;0 years old, more marked structures arise, such as consonantal clusters, consonants in coda position, consonants specified as fricative and liquid, trisyllabic and longer words, which have been proposed to mark the transition of the initial to the intermediate phase (see for Greek, Kappa, 2000, 2009; Tzakosta, 2003; Tzakosta & Kappa, 2008, among others). It should be clarified at this point the type of data included in this study. The children's tokens are examined from a prosodic point of view. So, only those presenting segmental faithfulness between input and output form have been taken into consideration. In addition, following the methodology of some researchers (e.g., Echols & Newport, 1992; Johnson et al., 1997; Ota, 2006), an output form is considered faithful if the number of its syllables matches the corresponding of adult's on a phoneme by phoneme basis and truncated if it contains fewer. Indicative examples are provided next (8a - f).

	Adult's Form		Child's Form	Child: Age
(8)	a. [ˈtu.to]	→	[ˈtu.to] (this)	C1[2]: 1;8.15
	b. [ˈba.la]	→	[ˈba] (ball)	C1: 1;8.16
	c. [a.ˈfto]	→	[ˈfto] (this)	C1: 1;10.10
	d. [a.ˈfto]	→	[ˈto] (this)	C1: 1;8.15
	e. [ˈpar.to]	→	[ˈpa.to] ((you) take (it))	C1: 1;10.5
	f. [ˈval.to]	→	[ˈbal.to] ((you) put (it))	C1: 2;6.24

Instances such as (8a - c) have been included, while (8d - f) have been excluded although they can be classified as truncated token (8d) and faithful ones (8e - f) regarding the number of syllables. However, in this study we want the tokens to preserve additionally the number of their segments along with their distinctive features and, generally, to take into account as simple as possible cases of faithfulness and truncation.

3. Findings and discussion

In both stages we proceed from general observations to specific ones. First, the data of the initial developmental stage are presented. All the children produce 1,808 tokens, which are classified as follows (table 1).

Table 1
Initial stage words

Child	2σ[3]		3σ		4σ	5σ
	P	D	P	D	D	D
C1	464 (96.7%)	16 (3.3%)	15 (4%)	363 (96%)	2 (100%)	
C2	128 (92.8%)	10 (7.2%)	3 (6.5%)	43 (93.5%)		

[2] C: child.
[3] 2σ: disyllabic words, 3σ: trisyllabic words and so on. P: preservation. D: deletion.

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C3	703 (97.5%)	18 (2.5%)	1 (4%)	24 (96%)	1 (100%)	3 (100%)
C4	12 (100%)		1 (50%)	1 (50%)		
Sum	1,307 (96.7%)	44 (3.3%)	20 (4.4%)	431 (95.6%)	3 (100%)	3 (100%)

To begin with, in all the children most words contain two syllables at this stage. Trisyllabic and longer words are rare with exception of C1 trisyllabic words. However, only disyllabic words remain almost always faithful, while trisyllabic and longer ones are systematically truncated. In the next table (2), they are divided based on the position of stress to see the degree of its effect in children utterances.

Table 2
Initial stage words based on position of stress

Child	2σ S1[4]		2σ S2		3σ S1		3σ S2		3σ S3	4σ S3	5σ S3
	P	D	P	D	P	D	P	D	P	D	D
C1	142 (92.2%)	12 (7.8%)	322 (98.8%)	4 (1.2%)		11 (100%)	14 (3.8%)	352 (96.2%)	1 (100%)	2 (100%)	
C2	100 (95.2%)	5 (4.8%)	28 (84.8%)	5 (15.2%)	3 (60%)	2 (40%)		41 (100%)			
C3	449 (97.4%)	12 (2.6%)	254 (97.7%)	6 (2.3%)			1 (4%)	24 (96%)		1 (100%)	3 (100%)
C4	10 (100%)		2 (100%)				1 (50%)	1 (50%)			
Sum	701 (96%)	29 (4%)	606 (97.6%)	15 (2.4%)	3 (18.8%)	13 (81.2%)	16 (3.7%)	418 (96.3%)	1 (100%)	3 (100%)	3 (100%)

According to table (2), the rhythm does not seem to play any role. More specifically, disyllabic words with trochaic or iambic stress are equally preserved (examples 9a - h).

	Adult's Form	→ Child's Form	Child: Age
(9)	a. [ˈba.la]	→ [ˈba.la] (ball)	C1: 1;8.15
	b. [ˈba.ɲo]	→ [ˈba.ɲo] (bathroom)	C2: 1;10.24
	c. [ˈci.ta]	→ [ˈci.ta] ((you) look)	C3: 1;7.8
	d. [ˈpa.li]	→ [ˈpa.li] (again)	C4: 1;9.6
	e. [e.ˈðo]	→ [e.ˈðo] (here)	C1: 1;9.14
	f. [ma.ˈma]	→ [ma.ˈma] (mother)	C2: 1;10.5
	g. [pa.ˈpu]	→ [pa.ˈpu] (grandfather)	C3: 1;7.23
	h. [ba.ˈba]	→ [ba.ˈba] (father)	C4: 1;9.8

From the trisyllabic words, those with stress in second position are discussed, since we have enough data from three children (C1 - C3). They tend to leave one syllable unuttered in quite high degree (examples 10a - c).

	Adult's Form	→ Child's Form	Child: Age
(10)	a. [pa.ˈpa.ci]	→ [pa.ˈpa] (duck, diminutive)	C1: 1;8.15
	b. [pa.ˈpa.ci]	→ [pa.ˈpa] (duck, diminutive)	C2: 1;9.5

[4] S: stress. For example, 2σ S1 means a disyllabic word with stress in initial syllable as [ˈpa.li] (again). We count the position of syllables from left to right.

c. [pa.ˈpa.ci] → [pa.ˈpa] (duck, diminutive) C3: 1;7.14

So far, from the treatment of disyllabic and trisyllabic words, it is concluded that the children have established in their linguistic system the CVCV structure and they seem to be at the stage in which their tokens are considered minimal words composed of binary feet (Demuth, 1995; Broselow, 2008). Quadrisyllabic and pentasyllabic words are not discussed, since the data at this stage are few to deduce any generalizations. In the below table (3), truncated disyllabic and trisyllabic words are classified.

Table 3
Initial stage truncated words

Child	2σ S1			2σ S2			3σ S1		3σ S2			
	P1	P2	?[5]	P1	P2	?	P1,2	?	P1,2	P2,3	P3	?
C1	11 (91.7%)	1 (8.3%)			1 (25%)	3 (75%)	7 (63.6%)	4 (36.4%)	339 (96.3%)			13 (3.7%)
C2	5 (100%)				4 (80%)	1 (20%)		2 (100%)	30 (73.2%)	1 (2.4%)	2 (4.9%)	8 (19.5%)
C3	11 (91.7%)		1 (8.3%)	3 (50%)	2 (33.3%)	1 (16.7%)			20 (83.3%)			4 (16.7%)
C4												1 (100%)
Sum	27 (93.1%)	1 (3.4%)	1 (3.4%)	3 (20%)	7 (46.7%)	5 (33.3%)	7 (53.8%)	6 (46.2%)	389 (93.1%)	1 (0.2%)	2 (0.5%)	26 (6.2%)

We do not have a sufficient number of tokens in many categories of children in table (3). In disyllabic words with trochaic stress of C1 and C3, where a fair amount of tokens is observed, the stressed syllable is preserved in almost all truncations (examples 11a - d).

	Adult's Form	→ Child's Form	Child: Age
(11)	a. [ˈo.çi]	→ [ˈo] (no)	C1: 1;8.15
	b. [ˈtu.to]	→ [ˈtu] (this)	C1: 1;10.22
	c. [ˈba.la]	→ [ˈba] (ball)	C3: 1;7.7
	d. [ˈi.ne]	→ [ˈi] ((he / she / it) is)	C3: 1;9.3

The stressed syllable is preferred over the unstressed one, as it is considered strong and psycholinguistically prominent position for the reasons mentioned in previous section (e.g., Pater, 1997; Smith, 2002; Tzakosta, 2007). In addition, these few monosyllabic utterances are assumed to be relics from a previous stage of the children, which in the literature is called sub-minimal stage and includes only unmarked CV syllables (Demuth, 1995, p. 16). Most truncations in three children (C1 - C3) are ascertained in trisyllabic words with stress in second position (examples 12a - c).

	Adult's Form	→ Child's Form	Child: Age
(12)	a. [pa.{ˈpa.ci}[6]]	→ [pa.ˈpa] (duck, diminutive)	C1: 1;10.5

[5] ?: denotes cases, in which the position of produced syllables cannot be easily distinguished, as in tokens with two consecutive identical syllables (for example, [ma.ˈma] → [ma] (mother), [ˈko.ko.ɾas] → [ko] (rooster)).

b. [pa.{ˈpa.ci}] → [pa.ˈpa] (duck, diminutive) C2: 1;10.22
c. [pa.{ˈpa.ci}] → [pa.ˈpa] (duck, diminutive) C3: 1;9.16

In (12a - c), the stability of stress and deletion of the final syllable changes the trochaic foot into iambic. This is unexpected given that Greek is a trochaic language that builds its trochees from right to left (Tzakosta, 2002), while the trochaic rhythm constitutes the unmarked pattern of stress (Tzakosta, 1999). However, all the cases (389) traced at this stage constitute utterances of one word, namely, [pa.ˈpa.ci]. This word is proposed to have been stored in children's mental lexicon in a specific way so as to conform with their current grammar, in which three syllable words have not yet been established resulting in its regular emergence as [pa.ˈpa]. Thus, the rhythm is not clear if it affects truncations in the initial stage of the children, as we cannot reach to safe conclusions based on one word.

Moving on to the intermediate developmental phase, 12,746 tokens are listed, as illustrated in table (4).

Table 4
Intermediate stage words

Child	2σ		3σ		4σ		5σ	
	P	D	P	D	P	D	P	D
C1	1,973 (95.3%)	97 (4.7%)	453 (78.4%)	125 (21.6%)	70 (83.3%)	14 (16.7%)	12 (31.6%)	26 (68.4%)
C2	2,064 (92.8%)	161 (7.2%)	243 (66.6%)	122 (33.4%)	3 (16.7%)	15 (83.3%)		3 (100%)
C3	3,789 (95.4%)	183 (4.6%)	902 (94.8%)	49 (5.2%)	299 (89.5%)	35 (10.5%)	35 (46.7%)	40 (53.3%)
C4	1,531 (82.2%)	332 (17.8%)	135 (84.9%)	24 (15.1%)	4 (36.4%)	7 (63.6%)		
Sum	9,357 (92.4%)	773 (7.6%)	1,733 (84.4%)	320 (15.6%)	376 (84.1%)	71 (15.9%)	47 (40.5%)	69 (59.5%)

At first glance, all the children utter more words containing two to four syllables. Moreover, disyllabic words continue to remain faithful regarding their number of syllables in high rate. On the other hand, the handling of trisyllabic words changes here, as the children keep them intact most of the times. Two children (C1, C3) manage to preserve in the majority of cases even quadrisyllabic words. Concerning pentasyllabic words, almost all of them come from the same two children (C1, C3), who seem to need more time in order for structures of such length to be acquired. Next table (5a) provides in detail the treatment of disyllabic and trisyllabic words in relation to stress.

Table 5a
Intermediate stage disyllabic and trisyllabic words based on position of stress

Child	2σ S1		2σ S2		3σ S1		3σ S2		3σ S3	
	P	D	P	D	P	D	P	D	P	D
C1	1,258 (95.7%)	57 (4.3%)	715 (94.7%)	40 (5.3%)	172 (93.5%)	12 (6.5%)	264 (72.5%)	100 (27.5%)	17 (56.7%)	13 (43.3%)
C2	1,526 (96.6%)	53 (3.4%)	538 (83.3%)	108 (16.7%)	164 (87.2%)	24 (12.8%)	76 (44.2%)	96 (55.8%)	3 (60%)	2 (40%)

6 {...}: indicates the boundaries of binary foot. What we consider foot is explained in the truncations of trisyllabic and longer words in the intermediate phase.

C3	2,688 (96.4%)	99 (3.6%)	1,101 (92.9%)	84 (7.1%)	326 (96.7%)	11 (3.3%)	530 (94%)	34 (6%)	46 (92%)	4 (8%)
C4	1,022 (78%)	289 (22%)	509 (92.2%)	43 (7.8%)	68 (91.9%)	6 (8.1%)	67 (78.8%)	18 (21.2%)		
Sum	6,494 (92.9%)	498 (7.1%)	2,863 (91.2%)	275 (8.8%)	730 (93.2%)	53 (6.8%)	937 (79.1%)	248 (20.9%)	66 (77.6%)	19 (22.4%)

The position of stress and, generally, rhythm does not play any role, as disyllabic words with trochaic or iambic foot are equally preserved. Furthermore, when trisyllabic words begin to emerge more often in children's speech, then all their syllables are maintained irrespective of tonic pattern (examples 13a - l). Trisyllabic words with stressed syllable located in second position of C2 constitute the only exception (only 44.2% preservation), but they cannot override the generalizations deduced for two and three syllable words.

	Adult's Form	→ Child's Form	Child: Age
(13)	a. [ˈspi.ti]	→ [ˈspi.ti] (house)	C1: 2;4.8
	b. [ˈte.se.ɾa]	→ [ˈte.se.ɾa] (four)	C1: 2;7.7
	c. [vi.ˈvli.a]	→ [vi.ˈvli.a] (books)	C1: 2;8
	d. [bu.ˈfan]	→ [bu.ˈfan] (jacket)	C2: 2;7.7
	e. [ˈme.li.sa]	→ [ˈme.li.sa] (bee)	C2: 2;7.7
	f. [ka.na.ˈpes]	→ [ka.na.ˈpes] (couch)	C2: 2;4.17
	g. [ˈma.tça]	→ [ˈma.tça] (eyes)	C3: 2;3
	h. [ka.ˈɾo.t^{s}ça]	→ [ka.ˈɾo.t^{s}ça] (buggies)	C3: 2;3.9
	i. [ma.kri.ˈa]	→ [ma.kri.ˈa] (far)	C3: 2;7.4
	j. [e.ˈðo]	→ [e.ˈðo] (here)	C4: 2;3.15
	k. [ˈe.pe.se]	→ [ˈe.pe.se] ((he / she / it) fell)	C4: 2;5.8
	l. [pa.ˈta.tes]	→ [pa.ˈta.tes] (potatoes)	C4: 2;9.12

Quadrisyllabic and pentasyllabic words are represented below (table 5b).

Table 5b
Intermediate stage quadrisyllabic and pentasyllabic words based on position of stress

Child	4σ S2		4σ S3		4σ S4	5σ S3		5σ S4	
	P	D	P	D	D	P	D	P	D
C1	20 (87%)	3 (13%)	50 (82%)	11 (18%)		9 (50%)	9 (50%)	3 (15%)	17 (85%)
C2	2 (28.6%)	5 (71.4%)	1 (10%)	9 (90%)	1 (100%)		2 (100%)		1 (100%)
C3	79 (91.9%)	7 (8.1%)	220 (88.7%)	28 (11.3%)		30 (52.6%)	27 (47.4%)	5 (27.8%)	13 (72.2%)
C4			4 (40%)	6 (60%)	1 (100%)				
Sum	101 (87.1%)	15 (12.9%)	275 (83.6%)	54 (16.4%)	2 (100%)	39 (50.6%)	38 (49.4%)	8 (20.5%)	31 (79.5%)

According to table (5b), if the children produce quadrisyllabic words faithfully (C1, C3), then they do so regardless of stress being in second or third position. The same applies to the children who systematically omit syllables in quadrisyllabic words (C2). Pentasyllabic words do not differ, as they have not been established yet in the linguistic system of all the children, resulting in the omission of one or more syllables. Representative examples are provided below (14a - l).

	Adult's Form		Child's Form	Child: Age
(14)	a. [ti.ˈle.fo.no]	→	[ti.ˈle.fo.no] (telephone)	C1: 2;10.2
	b. [ar.ku.ˈða.ci]	→	[ar.ku.ˈða.ci] (bear, diminutive)	C1: 2;10.9
	c. [a.fto.ˈci.ni.to]	→	[a.fto.ˈci.ni.to] (car)	C1: 2;9.25
	d. [ko.ˈto.pu.lo]	→	[ko.ˈto.pu] (chicken)	C2: 2;6.12
	e. [ar.ku.ˈða.ci]	→	[ku.ˈða.ci] (bear, diminutive)	C2: 2;8.7
	f. [a.e.ɾo.ˈpla.no]	→	[ˈpla.no] (airplane)	C2: 2;8.7
	g. [ma.ˈze.vu.me]	→	[ma.ˈze.vu.me] ((we) clear up)	C3: 2;3.9
	h. [a.fto.ˈko.li.ta]	→	[a.fto.ˈko.li.ta] (stickers)	C3: 2;5.30
	i. [a.e.ɾo.ˈpla.no]	→	[ɾo.ˈpla.no] (airplane)	C3: 2;6.27
	j. [por.to.ˈka.li]	→	[ˈka.li] (orange)	C4: 2;2.16
	k. [ɣu.ɾu.ˈna.ca]	→	[ˈna.ca] (pigs, diminutive)	C4: 2;6.13
	l. [ar.ku.ˈða.ci]	→	[ku.ˈða.ci] (bear, diminutive)	C4: 2;6.20

At this point, the properties of truncations in the children's data are discussed beginning from disyllabic words (table 6a).

Table 6a
Intermediate stage truncated disyllabic words

Child	2σ S1		2σ S2		
	P1	P2	P1	P2	?
C1	41 (71.9%)	16 (28.1%)		40 (100%)	
C2	44 (83%)	9 (17%)		108 (100%)	
C3	52 (52.5%)	47 (47.5%)	6 (7.1%)	77 (91.7%)	1 (1.2%)
C4	276 (95.5%)	13 (4.5%)	1 (2.3%)	37 (86.1%)	5 (11.6%)
Sum	413 (82.9%)	85 (17.1%)	7 (2.5%)	262 (95.3%)	6 (2.2%)

In truncated disyllabic words, the children keep mostly the stressed syllable in both trochees and iambs, which is expected, since it is considered as strong and prominent position (e.g., Pater, 1997; Smith, 2002; Tzakosta, 2007). So, tokens as (15a - d) are more frequent than others, in which the unstressed syllable is preserved (15e - h).

	Adult's Form		Child's Form	Child: Age
(15)	a. [ˈspi.ti]	→	[ˈspi] (house)	C1: 2;7.7
	b. [ˈtri.a]	→	[ˈtri] (three)	C2: 2;7.7
	c. [a.ˈftos]	→	[ˈftos] (him)	C3: 2;3.21
	d. [e.ˈsi]	→	[ˈsi] (you)	C4: 2;4.28
	e. [ˈe.çi]	→	[çi] ((he / she / it) has)	C1: 2;5.1
	f. [ˈi.ða]	→	[ða] ((I) saw)	C2: 2;8.21

g. [kli.ˈði] → [kli] (key) C3: 2;6.13
h. [mo.ˈɾo] → [mo] (baby) C4: 2;4.28

The omissions of one or more syllables in trisyllabic words are represented next (table 6b).

Table 6b
Intermediate stage truncated trisyllabic words

Child	3σ S1						3σ S2						3σ S3			
	P1,2	P2,3	P1,3	P1	P3	?	P1,2	P2,3	P1,3	P1	P2	?	P1,2	P2,3	P1,3	P3
C1	8 (66.7%)	1 (8.3%)		2 (16.7%)	1 (8.3%)		82 (82%)	15 (15%)	1 (1%)			2 (2%)			12 (92.3%)	1 (7.7%)
C2	14 (58.3%)	2 (8.3%)	7 (29.2%)		1 (4.2%)		30 (31.3%)	49 (51%)	12 (12.5%)	1 (1%)	3 (3.1%)	1 (1%)			2 (100%)	
C3	4 (36.4%)			6 (54.5%)		1 (9.1%)	12 (35.3%)	13 (38.2%)		8 (23.5%)		1 (3%)	2 (50%)	2 (50%)		
C4	3 (50%)		1 (16.7%)	2 (33.3%)			6 (33.3%)	10 (55.5%)	1 (5.6%)	1 (5.6%)						
Sum	29 (54.7%)	3 (5.6%)	8 (15.1%)	10 (18.9%)	2 (3.8%)	1 (1.9%)	130 (52.4%)	87 (35.1%)	14 (5.7%)	10 (4%)	3 (1.2%)	4 (1.6%)	2 (10.5%)	2 (10.5%)	14 (73.7%)	1 (5.3%)

First, in each category of trisyllabic words the stressed syllable in the majority of cases is included in the truncated outputs. Another observation is that the children omit usually one syllable rather than two, thereby creating a binary foot (examples 16a - j).

	Adult's Form		Child's Form	Child: Age
(16)	a. [{ˈpro.va.}to]	→	[ˈpro.va] (sheep)	C1: 2;9.18
	b. [{ˈci.tri.}ni]	→	[ˈci.tri] (yellow, feminine)	C2: 2;4.29
	c. [{ˈe.fi.}je]	→	[ˈe.fi] ((he / she / it) left)	C3: 2;2.26
	d. [{ˈa.lo.}ɣo]	→	[ˈa.lo] (horse)	C4: 2;7.6
	e. [ʎo.{ˈda.ɾi}]	→	[ˈda.ɾi] (lion)	C1: 2;5.6
	f. [vi.{ˈvli.o}]	→	[ˈvli.o] (book)	C2: 2;7.7
	g. [fi.{ˈsa.i}]	→	[ˈsa.i] ((he / she / it) blows)	C3: 2;7.11
	h. [tra.{ˈpe.zi}]	→	[ˈpe.zi] (table)	C4: 2;9.12
	i. [ma.{la.ˈko}]	→	[la.ˈko] (soft, neutral)	C3: 2;2.3
	j. [a.{pa.ˈlo}]	→	[pa.ˈlo] (soft, neutral)	C3: 2;2.3

According to Hayes (1982), the foot can contain up to two syllables, while Selkirk (1981) claims that it contains up to three. In the present study, we adopt the former view assuming that if the foot includes three syllables, then children's trisyllabic words should bear higher percentages of preservation, especially in early stage, since they have the tendency to use strategies in order for feet to be created rather than to alter them. Further, the foot that contains only one syllable is called *degenerate* (Kappa, to appear, p. 166). Returning to children's trisyllabic words, they do not always delete the unstressed syllable located outside of the strong foot. However, what is most important for them is the preservation of the rhythm pattern. This position is observed in tokens where a syllable traced inside the strong foot is omitted (examples 17a - h). It should be noted though that cases with deletion of a syllable within the strong foot are few.

	Adult's Form		Child's Form	Child: Age
(17)	a. [{ˈko.ci.}no]	→	[ˈko.no] (red, neutral)	C2: 2;7.7
	b. [{ˈa.lo.}ɣo]	→	[ˈa.ɣo] (horse)	C4: 2;3.20
	c. [{ˈe.xu.}me]	→	[ˈxu.me] ((we) have)	C1: 2;10.2
	d. [{ˈxa.la.}se]	→	[ˈla.se] ((it) broke)	C2: 2;9.18
	e. [ko.{ˈli.so}]	→	[ˈko.so] ((I to) stick (it))	C1: 2;9.25
	f. [vi.{ˈvli.o}]	→	[ˈvi.o] (book)	C4: 2;3.20
	g. [ko.{pe.ˈʎa}]	→	[ko.ˈpe] (lass)	C3: 2;5.30
	h. [a.{le.ˈpu}]	→	[a.ˈle] (fox)	C3: 2;7.18

The rhythm remains the same either from the stability of stress (examples 17a - b) or from its movement to a nearby syllable that will not change it (examples 17c - h). The only exception to this generalization is observed in trisyllabic words with stress in second position of C1, where its stability turns trochees into iambs (examples 18a - c). Despite these cases being the majority in this specific child (82 tokens, 82%), they cannot override the general pattern ascertained in the handling of trisyllabic words in the intermediate developmental phase of all the children.

	Adult's Form		Child's Form	Child: Age
(18)	a. [ɾo.{ˈlo.i}]	→	[ɾo.ˈlo] (clock)	C1: 2;5.1
	b. [a.{ˈma.ksi}]	→	[a.ˈma] (car)	C1: 2;8.14
	c. [vi.{ˈvli.o}]	→	[vi.ˈvli] (book)	C1: 2;9.25

Finally, a few monosyllabic tokens continue to appear, which is a reminder that they count as relics of a previous stage, where the children's utterances contain only CV syllables (examples 19a - d).

	Adult's Form		Child's Form	Child: Age
(19)	a. [ˈʝi.ɣa.das]	→	[ˈʝi] (giant)	C1: 2;8.28
	b. [a.ˈxla.ði]	→	[ˈxla] (pear)	C2: 2;7.23
	c. [ˈbe.nu.ne]	→	[ˈbe] ((they) go in)	C3: 2;4.28
	d. [ˈko.ci.no]	→	[ˈko] (red, neutral)	C4: 2;7.13

Another category of truncated words examined in children's speech is quadrisyllabic. Those with stress in fourth position are not included in the discussion, since we have only two tokens (table 6c).

Table 6c
Intermediate stage truncated quadrisyllabic words

Child	4σ S2								4σ S3							
	P1,2,3	P1,2,4	P1,3,4	P2,3,4	P1,2	P2,3	P3,4	P2	P1,2,3	P1,3,4	P2,3,4	P1,2	P1,4	P3,4	P1	?
C1	2 (66.7%)	1 (33.3%)							9 (81.8%)	1 (9.1%)				1 (9.1%)		
C2	2 (40%)	1 (20%)				2 (40%)			1 (11.1%)		1 (11.1%)	1 (11.1%)	1 (11.1%)	5 (55.6%)		
C3	2 (28.5%)		1 (14.3%)	1 (14.3%)	1 (14.3%)		1 (14.3%)	1 (14.3%)	7 (25%)		12 (42.9%)	3 (10.7%)		1 (3.6%)	2 (7.1%)	3 (10.7%)
C4									1 (16.6%)	1 (16.6%)	1 (16.6%)			3 (50%)		

Sum	6 (40%)	2 (13.3%)	1 (6.6%)	1 (6.6%)	1 (6.6%)	2 (13.3%)	1 (6.6%)	1 (6.6%)	18 (33.3%)	2 (3.7%)	14 (25.9%)	4 (7.4%)	1 (1.9%)	10 (18.5%)	2 (3.7%)	3 (5.6%)

Before the examination of the relevant tokens, it should be mentioned here how feet in quadrisyllabic words with stress in antepenultimate are constructed. For this reason, we adopt the proposal of *Extrametricality* (Hayes, 1981, p. 118), which is used for the preservation of binary foot as basic structure and the handling of stress in antepenultimate words. Based on extrametricality, the edgemost syllables of such words are not visible in the metrical rules of language and as a result they do not count in the building of foot. As far as truncated quadrisyllabic words are concerned, their properties are similar to those of trisyllabic words. In particular, the syllables occupying the strong foot are uttered most of the times, while an extrametrical syllable is usually deleted (examples 20a - c).

	Adult's Form		→ Child's Form	Child: Age
(20)	a. [te.{ˈli.o.}san]	→	[te.{ˈli.o}] ((they) were finished)	C1: 2;8.14
	b. [ti.{ˈle.fo.}no]	→	[ˈle.fo] (telephone)	C2: 2;10.9
	c. [a.{ˈni.ɣu.}ne]	→	[{ˈni.ɣu.}ne] ((they) are opening)	C3: 2;5.30

The same holds for quadrisyllabic words with penultimate stress where extrametricality is not applied. So, strong foot is preserved and syllables within the weak foot or the entire weak foot are usually omitted (examples 21a - c).

	Adult's Form		→ Child's Form	Child: Age
(21)	a. [{I.o.}{ˈa.na}]	→	[I.{ˈa.na}] (Ioanna, name)	C1: 2;6.12
	b. [{pe.ta.}{ˈlu.ða}]	→	[ˈlu.ða] (butterfly)	C2: 2;9.25
	c. [{pi.θi.}{ˈka.ci}]	→	[θi.{ˈka.ci}] (ape, diminutive)	C3: 2;2.3

The rhythm constitutes one more common feature between three and four syllable words, which remains stable in tokens where the unuttered syllable is located inside the strong foot (examples 22a - g).

	Adult's Form		→ Child's Form	Child: Age
(22)	a. [e.{ˈle.fa.}das]	→	[e.{ˈle.das}] (elephant)	C1: 2;5.6
	b. [e.{ˈle.fa.}das]	→	[e.{ˈle.das}] (elephant)	C2: 2;9.25
	c. [{la.ɣu.}{ˈða.ci}]	→	[ˈla.ci] (hare, diminutive)	C2: 2;5.1
	d. [e.{ˈle.fa.}das]	→	[{ˈe.fa.}das] (elephant)	C3: 2;3
	e. [kro.{ˈko.ði.}los]	→	[ˈði.los] (crocodile)	C3: 2;7.4
	f. [{a.ne.}{ˈve.ni}]	→	[ˈa.ne] ((he / she / it) goes up)	C4: 2;3.16
	g. [{xa.la.}{ˈsme.no}]	→	[ˈxa.la] (broken, neutral)	C4: 2;7.11

Once again this kind of instances appear less often, but they show the importance of keeping intact the rhythm even if in some cases the stress needs to be transferred at distance, namely, two syllables away so as to match with the corresponding adult's tokens (examples 22c, f - g). The last category of children's polysyllabic words is illustrated in table (6d).

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Table 6d
Intermediate stage truncated pentasyllabic words

Child	5σ S3									5σ S4				
	P1,2,3,4	P1,2,3,5	P2,3,4,5	P1,2,3	P2,3,4	P3,4,5	P1,4	P2,3	P3,4	P1,2,4,5	P1,3,4,5	P2,3,4,5	P3,4,5	P4,5
C1		1 (11.1%)				6 (66.7%)		2 (22.2%)		9 (52.9%)	7 (41.2%)			1 (5.9%)
C2		1 (50%)					1 (50%)							1 (100%)
C3	1 (3.7%)		4 (14.8%)	1 (3.7%)	1 (3.7%)	18 (66.7%)		1 (3.7%)	1 (3.7%)		5 (38.4%)	3 (23.1%)	4 (30.8%)	1 (7.7%)
Sum	1 (2.6%)	2 (5.3%)	4 (10.6%)	1 (2.6%)	1 (2.6%)	24 (63.2%)	1 (2.6%)	3 (7.9%)	1 (2.6%)	9 (29%)	12 (38.7%)	3 (9.7%)	4 (12.9%)	3 (9.7%)

Pentasyllabic words appear only in three children's tokens (C1 - C3). The stressed syllable is always preserved except for one token, while the strong foot is usually produced accurately regardless of the number of omitted syllables (examples 23a - e).

	Adult's Form	→	Child's Form	Child: Age
(23)	a. [{a.fto.}{ˈci.ni.}to]	→	[{ˈci.ni.}to] (car)	C1: 2;4.3
	b. [A.{na.sta.}{ˈsi.a}]	→	[{A.sta.}{ˈsi.a}] (Anastasia, name)	C1: 2;6.24
	c. [a.{e.ɾo.}{ˈpla.no}]	→	[ˈpla.no] (airplane)	C2: 2;8.7
	d. [a.{e.ɾo.}{ˈpla.no}]	→	[ɾo.{ˈpla.no}] (airplane)	C3: 2;5.4
	e. [a.{e.ɾo.}{ˈpla.no}]	→	[{e.ɾo.}{ˈpla.no}] (airplane)	C3: 2;6.6

Further, the rhythm is trochaic in all pentasyllabic words and it is maintained even if a syllable traced inside the strong foot is deleted. For its preservation the stress remains stable or moves to a specific position in order for a trochee to be created (examples 24a - c).

	Adult's Form	→	Child's Form	Child: Age
(24)	a. [{a.fto.}{ˈci.ni.}to]	→	[{a.fto.}{ˈci.to}] (car)	C1: 2;9.25
	b. [{a.fto.}{ˈko.li.}ta]	→	[{a.fto.}{ˈko.ta}] (stickers)	C2: 2;9.25
	c. [{ɾa.ði.}{ˈo.fo.}no]	→	[ˈɾa.fo] (radio)	C2: 2;10.2

The construction of polysyllabic words is another issue that can be investigated based on children's truncations. The direction of their words' building differs from other languages, as for example in Hebrew, where the construction is accomplished to one direction, in particular, from right to left. This happens due to the fact that Hebrew-speaking children begin to utter the stressed or final syllable in words and since stress is usually located in ultimate or penultimate, the two rightmost syllables emerge first (Bat-El, 2009; Ben-David, 2012). All the children of the present study begin first with the production of the stressed syllable followed by the stabilization of the strong foot. After the establishment of the strong foot to a high degree, the remaining syllables of the word are acquired, which can be extrametrical or located in weak feet. As a result, the expansion of a prosodic word can be leftwards, rightwards or bidirectional if the stress is traced in the latter case in antepenultimate. Indicative examples of the children's most common path for the expansion of their words are cited below (25a - f)[7].

	Adult's Form	→ Child's Form
(25)	a. [{ˈji.ɣa.}das]	→ [ˈji] > [ˈji.ɣa] > [{ˈji.ɣa.}das] (giant)
	b. [a.{ˈxla.ði}]	→ [ˈxla] > [ˈxla.ði] > [a.{ˈxla.ði}] (pear)
	c. [{ar.ku.}{ˈða.ci}]	→ [ˈða.ci] > [ku.{ˈða.ci}] > [{ar.ku.}{ˈða.ci}] (bear, diminutive)
	d. [ti.{ˈle.fo.}no]	→ [ˈle.fo] > [ti.{ˈle.fo}] / [{ˈle.fo.}no] > [ti.{ˈle.fo.}no] (telephone)
	e. [{a.fto.}{ˈci.ni.}to]	→ [ˈci.ni] > [{ˈci.ni.}to] > [fto.{ˈci.ni.}to] / [a.{ˈci.ni.}to] > [{a.fto.}{ˈci.ni.}to] (car)
	f. [a.{e.ɾo.}{ˈpla.no}]	→ [ˈpla.no] > [ɾo.{ˈpla.no}] > [{a.ɾo.}{ˈpla.no}] / [{e.ɾo.}{ˈpla.no}] > [a.{e.ɾo.}{ˈpla.no}] (airplane)

It should be noted at this point that these instances concern the development of prosodic words only from a prosodic perspective. The full path of acquisition of the word [a.{e.ɾo.}{ˈpla.no}], for example, is [ˈpa.no] > [ˈpla.no] > [lo.{ˈpla.no}] >[{a.lo.}{ˈpla.no}] / [{e.lo.}{ˈpla.no}] > [{a.ɾo.}{ˈpla.no}] / [{e.ɾo.}{ˈpla.no}] > [a.{e.ɾo.}{ˈpla.no}]. The paths of words' construction including additionally segmental substitutions are not discussed further since they are beyond the scope of the present research.

3.1. Analysis

In Optimality Theory (Prince & Smolensky, 1993), Universal Grammar includes a set of constraints that are cross-linguistically universal and in conflict. However, their ranking for the selection of optimal output depends on the respective language. In language acquisition, this theory is viewed as constraint demotion. In the initial stages of children's linguistic development, where their structures are simple and unmarked, *markedness* constraints dominate *faithfulness* constraints. In the intermediate phase, some markedness constraints dominate faithfulness ones, while in the final developmental stage, the faithfulness constraints dominate markedness, as in adult's grammar (e.g., Demuth, 1995; Kappa, 2002; Gnanadesikan, 2004). For the variation presented in children's polysyllabic words, we adopt the Multiple Parallel Grammars model (Revithiadou & Tzakosta, 2004), according to which the children in the intermediate phase employ *parallel* grammars next to the *core*, that is, different ranking of constraints, which assist them to reach the target grammar. Parallel grammars are considered *learning paths* (Levelt & Vijver, 2004, p. 205), which help children in order for the transition of their early grammar to the final to be accomplished. They are weaker and not as stable as the core grammar. As a result, they disappear quicker than the dominant one. Finally, the different rankings that arise after the conflict of markedness and faithfulness constraints

[7] The full path of quadrisyllabic and pentasyllabic words' building is based on two children (C1, C3), since we have a fair amount of data that present full faithfulness only from them (see table 4, p. 9). However, in pentasyllabic words of those children the path that leads to the full realization of adult's form is observed in a limited number of words.

constitute the paraller grammars that are integrated in the linguistic sytem of the child (Revithiadou & Tzakosta, 2004).

In the early developmental stage, two strategies are employed by the children of the present study. In the most systematic, they utter disyllabic words faithfully, while in rare cases they are truncated with only the stressed syllable to emerge. The following constraints have been adopted to adequately analyze and interpret the aforementioned language acquisition patterns of Greek children.

Markedness constraints (Demuth, 1995, p. 16)
Prosodic Word = σ: the prosodic word equals a syllable.
Prosodic Word = FOOT BINARY: the prosodic word equals a binary foot.

Faithfulness constraints
FAITH (STRESS): the stressed syllable is preserved (Pater, 1997, p. 222 - 223).
MAXIMALITY-IO: demands input segments to have output correspondents (McCarthy & Prince, 1995, p. 264)[8].
In the below table (7a), the core grammar is represented, while in (7b) the *hybrid* one.

Table 7a
Disyllabic words with faithfulness

[ˈba.ɲo][9]	FAITH (STR)	MAX-IO	PW = FT-BIN	PW = σ
☞ [ˈba.ɲo]				*
[ˈba]		*!	*	
[ɲo]	*!	*	*	
[pa.ˈpu]	FAITH (STR)	MAX-IO	PW = FT-BIN	PW = σ
☞ [pa.ˈpu]				*
[ˈpu]		*!	*	
[pa]	*!	*	*	

Table 7b
Truncated monosyllabic words

[ˈo.çi]	FAITH (STR)	PW = σ	PW = FT-BIN	MAX-IO
☞ [ˈo]			*	*
[ˈo.çi]		*!		
[çi]	*!		*	*
[e.ˈðo]	FAITH (STR)	PW = σ	PW = FT-BIN	MAX-IO
☞ [ˈðo]			*	*
[e.ˈðo]		*!		
[e]	*!		*	*

[8] Following Pater's (1997, p. 209) suggestion, for simplicity, this constraint is violated here in terms of the number of deleted syllables and not segments.
[9] As input, we consider the adult's output, namely, the stimuli the child hears from its parents.

Since the children rarely omit the stressed syllables, FAITH (STR) will always be the highest ranked. The hierarchy of the remaining constraints depends on the children's preferences for disyllabic words. So, in (7a) the optimal outputs [ˈba.ɲo] and [pa.ˈpu] presenting full faithfulness satisfy all the faithfulness constraints, which are higher ranked and violate only the lower ranked markedness constraints. On the other hand, the outputs [ˈo] and [ˈðo] in (7b) are selected as optimal due to the preservation of the stressed syllable, which is ensured by FAITH (STR) and due to the satisfaction of PW = σ, which is promoted for these cases. By the time the result has been decided by the second highest constraint, the ranking of the last two is irrelevant, something illustrated from the dashed lines, which indicate that they are equal. Here, the core grammar (table 7a) reflects the grammar of adults. However, since the children have not fully acquired the target language, their grammar has not the stability that characterizes the corresponding of adults. So, new structures and constraints can constantly be added, while those already acquired can be modified.

The four constraints used so far can also account for disyllabic words with faithfulness or truncation appearing in the intermediate phase. One additional feature observed in the treatment of trisyllabic and longer words of all the children is the maintenance of the rhythm. For this reason, FAITH (RHYTHM) is added, which for the needs of the present research has been modified to a faithfulness constraint from the markedness RHYTHMTYPE-TROCHEE / IAMB (Alderete, 1999, p. 38, 40). Next, the core grammar along with the hybrids are illustrated in tables. All the children most times produce all syllables in trisyllabic words and the same applies to quadrisyllabic words for two out of four children (table 8a).

Table 8a

Trisyllabic and quadrisyllabic words with faithfulness

[ˈte.se.ɾa]	FAITH (RHY)	FAITH (STR)	MAX-IO	PW = FT-BIN	PW = σ
☞ [ˈte.se.ɾa]				*	**
[ˈte]			*!*	*	
[ˈse.ɾa]		*!	*		*
[se.ˈɾa]	*!	*	*		*
[ma.kri.ˈa]	FAITH (RHY)	FAITH (STR)	MAX-IO	PW = FT-BIN	PW = σ
☞ [ma.kri.ˈa]				*	**
[ˈa]			*!*	*	
[ma.ˈkri]		*!	*		*
[ˈma.kri]	*!	*	*		*
[te.ˈli.o.san]	FAITH (RHY)	FAITH (STR)	MAX-IO	PW = FT-BIN	PW = σ
☞ [te.ˈli.o.san]				**	***
[ˈli.o]			*!*		*
[ˈte.o.san]		*!	*	*	**
[te.ˈli]	*!		**		*
[pe.ta.ˈlu.ða]	FAITH (RHY)	FAITH (STR)	MAX-IO	PW = FT-BIN	PW = σ
☞ [pe.ta.ˈlu.ða]				**	***

[ˈlu.ða]			*!*		*
[ˈpe.ða]		*!	**		*
[ta.ˈlu]	*!		**		*

The optimal outputs ([ˈte.se.ɾa], [ma.kri.ˈa], [te.ˈli.o.san], [pe.ta.ˈlu.ða]) satisfy all the faithfulness constraints, the higher ranking of which ensures that outputs with alternation of rhythm ([se.ˈɾa], [ˈma.kri], [te.ˈli], [ta.ˈlu]), deletion of the stressed syllable ([ˈse.ɾa], [ma.ˈkri], [ˈte.o.san], [ˈpe.ða]) as well as deletion of one or more syllables ([ˈte], [ˈa], [ˈli.o], [ˈlu.ða]) are rejected. The importance of keeping the rhythm intact is also shown from truncated trisyllabic and quadrisyllabic words. The children seem first to try to preserve it at any cost in words and then to establish new positions so as to accommodate all the syllables that adult's outputs contain. This preservation takes place with the promotion of PW = FT-BIN over MAX-IO and sometimes over FAITH (STR). In addition, the truncated words of children at this point include usually two or three syllables, especially, in quadrisyllabic and longer words. So, we create the constraint PW = 3σ. The difference between truncated polysyllabic words containing the stressed syllable and those that omit it is illustrated in tables (8b - c, d - e).

Table 8b

Truncated disyllabic words including stressed syllable

[ˈʝi.ɣa.das]	FAITH (RHY)	FAITH (STR)	PW = FT-BIN	PW = 3σ	MAX-IO	PW = σ
☞ [ˈʝi.das]				*	*	*
[ˈʝi.ɣa.das]			*!			**
[ˈɣa.das]		*!		*	*	*
[ɣa.ˈdas]	*!	*		*	*	*
[ma.la.ˈko]	FAITH (RHY)	FAITH (STR)	PW = FT-BIN	PW = 3σ	MAX-IO	PW = σ
☞ [la.ˈko]				*	*	*
[ma.la.ˈko]			*!			**
[ma.ˈla]		*!		*	*	*
[ˈma.la]	*!	*		*	*	*
[pe.ta.ˈlu.ða]	FAITH (RHY)	FAITH (STR)	PW = FT-BIN	PW = 3σ	MAX-IO	PW = σ
☞ [ˈlu.ða]				*	**	*
[pe.ta.ˈlu.ða]			*!*	*		***
[ˈpe.ða]		*!		*	**	*
[ta.ˈlu]	*!			*	**	*
[ti.ˈle.fo.no]	FAITH (RHY)	FAITH (STR)	PW = FT-BIN	PW = 3σ	MAX-IO	PW = σ
☞ [ˈle.fo]				*	**	*
[ti.ˈle.fo.no]			*!*	*		***
[ˈti.fo]		*!		*	**	*
[ti.ˈle]	*!			*	**	*

Table 8c
Truncated trisyllabic words including stressed syllable

[e.ˈle.fa.das]	FAITH (RHY)	FAITH (STR)	PW = 3σ	PW = FT-BIN	MAX-IO	PW = σ
☞ [ˈle.fa.das]				*	*	**
[e.ˈle.fa.das]			*!	**		***
[ˈe.fa.das]		*!		*	*	**
[e.fa.ˈdas]	*!	*		*	*	**
[a.fto.ˈci.ni.to]	FAITH (RHY)	FAITH (STR)	PW = 3σ	PW = FT-BIN	MAX-IO	PW = σ
☞ [ˈci.ni.to]				*	**	**
[a.fto.ˈci.ni.to]			*!*	***		****
[fto.ˈni.to]		*!		*	**	**
[a.fto.ˈci]	*!			*	**	**

Table 8d
Truncated disyllabic words with deletion of primary stressed syllable

[pa.ˈta.tes]	FAITH (RHY)	PW = FT-BIN	FAITH (STR)	PW = 3σ	MAX-IO	PW = σ
☞ [ˈpa.tes]			*	*	*	*
[pa.ˈta.tes]		*!				**
[pa.ˈtes]	*!		*	*	*	*
[a.ne.ˈve.ni]	FAITH (RHY)	PW = FT-BIN	FAITH (STR)	PW = 3σ	MAX-IO	PW = σ
☞ [ˈa.ne]			*	*	**	*
[a.ne.ˈve.ni]		*!*		*		***
[a.ˈne]	*!		*	*	**	*

Table 8e
Truncated trisyllabic words with deletion of primary stressed syllable

[e.ˈle.fa.das]	FAITH (RHY)	PW = 3σ	FAITH (STR)	PW = FT-BIN	MAX-IO	PW = σ
☞ [ˈe.fa.das]			*	*	*	**
[e.ˈle.fa.das]		*!		**		***
[e.fa.ˈdas]	*!		*	*	*	**

In the tables (8a - e), we can see how the reranking of the same constraints can lead to each possible output uttered by the children. This is particularly shown from multiple utterances of the same word. For example, [pe.ta.ˈlu.ða] bears different ranking when it is produced with full faithfulness (table 8a) and when only the strong foot is uttered (table 8b). The same applies to tokens that are systematically truncated, as [e.ˈle.fa.das], where the hierarchy of constraints differs when the stressed syllable emerges in the child's output (table 8c) and when it does not (8e). In trisyllabic and quadrisyllabic words, the grammar that leads to faithfulness is core for two out of four children (C1, C3, table 8a), while the grammar containing syllables' truncation, especially, in quadrisyllabic words is considered core for the other two children (C2, C4, tables 8b - c). The grammar that does not include the stressed syllable (tables 8d - e) is quite rare for all the children. The same holds for the grammar, in which monosyllabic productions arise that correspond to disyllabic and longer words (table 7b). The last two hybrid grammars become more and more infrequent with children's linguistic progression and we assume that they will be the first to fade away. Finally, the Multiple Parallel Grammars model is mentioned to be problematic for variation due to the unlimited number of parallel grammars a subject can have (e.g., Reynolds, 1994; Guy, 1997). However, the parallel grammars in child speech are proposed to facilitate the linguistic development by providing many alternative paths for the acquisition of target language, which is children's final aim (Revithiadou & Tzakosta, 2004).

4. Conclusions

A constraint-based account is used in order for the processes of faithfulness and truncation in children's polysyllabic words with segmental faithfulness to be examined. Based on their data, two stages of linguistic development are distinguished. In the early stage, only disyllabic words are produced with all their syllables, while trisyllabic and longer are truncated. In the intermediate stage, disyllabic and trisyllabic words are retained, while the same applies to quadrisyllabic words for two out of four children. As far as properties of these two processes are concerned, if the children utter some categories of words mostly faithfully, then they do so irrespective of rhythm and position of stress. The rhythm and stressed syllable are also preserved in truncations almost always. The maintenance of the former is additionally revealed from rare cases where the stressed syllable is deleted and stress moves only to nearby or non-adjacent syllables that will not change rhythm. The frequency of omitted syllables at specific positions provides indications for the building of polysyllabic words. The unuttered syllables are usually extrametrical or located in weak feet. So, when the children have stabilized the position of strong elements in prosodic words, such as the stressed syllable and stressed foot, then they focus on the production of the remaining part of prosodic words, such as extrametrical syllables or degenerate and weak feet. For the analysis of the children's tokens, the Optimality Theory is used (Prince & Smolensky, 1993) and, more specifically, for their variation the Multiple Parallel Grammar model is adopted (Revithiadou & Tzakosta, 2004). Four patterns are observed based on the two acquisition stages of the children. In the core grammar, which constitutes the one presenting faithfulness and concerns disyllabic words in the early stage and disyllabic to even quadrisyllabic words for some children in the intermediate stage, all faithfulness constraints related to stress, rhythm and number of syllables dominate markedness (FAITH (RHY) >> FAITH (STR) >> MAX-IO >> PW = 3σ, PW = FT-BIN, PW = σ). In two children in quadrisyllabic words and in all of them in pentasyllabic the grammar of faithfulness turns into hybrid, since they are systematically produced with two or three syllables. This way, some markedness constraints dominate faithfulness (FAITH (RHY) >> FAITH (STR) >> PW = 3σ / PW = FT-BIN >> MAX-IO, PW = σ). It should be noted here that this specific grammar of truncation constitutes core till the children reach their final acquisition stage, where the grammar of faithfulness will be core again. Further, two more hybrid grammars are ascertained in all the children that become more and more rare with the progression of their linguistic development. These two will be the first to fade entirely from their linguistic system. The first includes monosyllabic productions of CV form that are considered relics from a previous sub-minimal stage (Demuth, 1995, p. 16) and their ranking bears the form FAITH (RHY) >> FAITH (STR) >> PW = σ >> MAX-IO, PW = 3σ / PW = FT-BIN. The second includes cases with deletion of the stressed syllable, which however does not affect the type of rhythm (FAITH (RHY) >> PW = 3σ / PW = FT-BIN >> FAITH (STR), MAX-IO, PW = σ). Finally, the present study investigated multisyllabic words only from a prosodic point of view. For this reason, we suggest for future research the examination of polysyllabic words also from a segmental perspective so as to observe whether children exhibit the same strategies and whether their rates match or differ significantly when segmental faithfulness is additionally involved. Furthermore, the generalizations related to prosody and building of polysyllabic words concern only the children of the present study. A research with more subjects is needed so as to show us whether these generalizations apply in Greek-speaking children generally as well as cross-linguistically.

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