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Consonant Epenthesis in Greek Child Speech: A Phonological Perspective

Anastasios Poulidakis

University of Crete, School of Philosophy, Department of Philology, GREECE

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Abstract

In this paper a less well-studied process is discussed, namely, segmental insertion in child language. The main question of the study is why children use consonant epenthesis in their speech. Our assumptions are based on picture naming and spontaneous speech collected from four monolingual Greek-speaking children varying in age from 1;6.26 to 2;10.9. Their data reveal that it is a systematic process which helps them simplify their speech by forming unmarked structures (Oller, 1974). The position of the epenthetic segment as well as its quality are also examined. We observe that an epenthetic consonant is inserted at the left or right edge of the word in order for an unmarked CV syllable to emerge. In a few cases with cluster simplification, a consonant is inserted to the syllable that does not contain the cluster in order to maintain in number all the segments of the adult's form. Further, the epenthetic segment, which arises in one of the two edges of the word, constitutes a full copy of a consonant located at the other edge. This interaction seems to support the view that edgemost syllables are psycholinguistically prominent positions (e.g., Pater, 1997, Smith, 2002) and children tend to pay more attention to them (Slobin, 1973). For the analysis of children's tokens, Optimality Theory is adopted (Prince & Smolensky, 1993) and how this model can account for all the properties presented in consonant epenthesis is explained.

Keywords: language acquisition, consonant epenthesis in Greek, prominence of word edges, optimality theory.

1. Introduction

This research deals with *epenthesis* in child speech in order to investigate how it facilitates language acquisition. Epenthesis is considered the process in which one or more segments are inserted in a word in order to usually create an *unmarked* CV syllable (cf. Kappa 2002: 23-24, Tzakosta 2003: 259). The epenthetic segments can be a consonant, vowel, glide or a CV syllable (see Lombardi 2002; Demuth, Culbertson & Alter 2006, among others). Representative examples from adult and child speech follow (1-2).

1) [ˈla:dua] → [ˈla:duʲa] (in my hand) (Washo, Midtlyng, 2005: 60)

Adult's form → Child's form

2) [ˈnatin] → [ˈnatine][1] (here she is) (Greek, Tzakosta, 2003: 262)

[1] The brackets […] indicate the adult's and child's output respectively.

Correspondence: Anastasios Poulidakis, University of Crete, School of Philosophy, GREECE.
E-mail: philp0824@philology.uoc.gr.

In the first example the glide [j] is inserted in order to resolve hiatus, while in the second example a vowel [e] is added at the end of word in order for an open syllable to arise with the resyllabification of consonant [n] from coda to onset position. In the present study, data which show consonant epenthesis are examined. Some properties of epenthesis such as the quality and position of the epenthetic segment are additionally discussed. The remainder of the paper is organized as follows: in section 2 cross-linguistic research findings are presented. Section 3 includes the research methodology, while in section 4 the children's data are described in detail. In section 5 the analysis of data based on *Optimality Theory* (Prince & Smolensky 1993) is presented. Finally, in the last section we summarize the basic findings and in the end after the references, the tokens with consonant epenthesis drawn from each child for the needs of the study are cited in appendix.

- Children's insertion of consonantal segments seems to be reflected as epenthesis in preference to partial reduplication.
- Insertion takes place in words with consonantal clusters in order for unmarked CV syllables to emerge while maintaining in number the segments of the adult's form.
- The domain of epenthesis supports the primacy of the edgemost syllables in words.

2. Epenthesis in adult and child language

In the literature several reasons have been proposed for the function of epenthesis in adult or child language. Initially, it constitutes a common process in Creole languages which favor CV syllables (Alber & Plag 2001, Example 3).

3) English [smoʊk] → Saramaccan Creole English [sumuku] (smoke) (Alber & Plag, 2001: 812)

Epenthesis can also resolve consonant clusters that are not permitted from one language to another, as shown for instance in a study which investigates Farsi speakers learning English as L2 (Boudaoud & Cardoso 2009). In English [sC] clusters are allowed, while in Farsi they do not (Example 4)

4) English [stop] → Farsi [es.top] (stop) (Boudaoud & Cardoso, 2009: 1)

So, the insertion of vowel [e] creates an extra syllable which allows the resyllabification of consonant [s] to coda position breaking this way the illicit cluster [st] in Farsi. Depending on the position in which an epenthetic vowel is inserted, epenthesis can be divided into *anaptyxis* and *prothesis* (Abrahamsson, 1999: 474). The former emerges when a vowel splits up a cluster (Example 3), while the latter when a vowel precedes the cluster (Example 4). Loanwords are considered another environment where vowel epenthesis plays a crucial role by helping the borrowing language repair structures which come from other languages and are not permitted in it. In Japanese for instance, only a [nasal] consonant or the first half of a geminate is allowed in coda position (Itô & Mester 1995). So, this language inserts an epenthetic vowel to fix illegal codas in loanwords (Example 5).

5) English [festival] → Japanese [fesɯtibarɯ] (festival) (Itô & Mester, 1995: 826)

In child speech vowel or consonant epenthesis is argued to take place in order for an unmarked CV syllable to arise (e.g., Stemberger, 1996, Kappa, 2002, Tzakosta, 2003), as illustrated in the following examples (6-8).

Adult's form	→ Child's form	Child: Age
6) [ˈbluza] 2002: 23)	→ [ˈbelula] (blouse)	Sof: 2;5.9[2] (Greek, Kappa,
7) [ˈistera] 2003: 262)	→ [ˈtitela] (later)	Dion: 2;2.12 (Greek, Tzakosta,
8) [ˈaloɣo] 2003: 262)	→ [ˈðiloɣo] (horse)	Mar: 2;8.22 (Greek, Tzakosta,

The inserted segment can be default (6), a *full* copy of a nearby segment (7) or to share some *distinctive features* with a nearby segment (8) (e.g., Kitto & Lacy, 1999, Tzakosta, 2003).

3. Research methodology

Before the meetings between researcher and children, all parents provided written and verbal consent. Children who were selected to participate in the research came in contact with the researcher in order for a relationship of trust and familiarity to be established between the two sides till the recordings begin. The data collection comes from four subjects, two twin and two non-twin monolingual children with typical linguistic development. Standard Modern Greek is considered as their mother tongue. The professional tape recorder Marantz PMD661MKII is the basic tool for the collection of children's data. In total 35.677 tokens transcribed from picture naming via a laptop and spontaneous child speech have been gathered. The pictures were drawn from research concerning child speech in Greek (Kappa & Paracheraki, 2014) with some modifications for the needs of the present study, which include everyday words, such as foods, animals, plants, professions, vehicles, buildings, household utensils. They were designed to give the children the opportunity to utter all types of consonants and clusters regarding their distinctive features in every position within a word (initial, middle, final stressed or unstressed syllable). The spontaneous speech resulted through various activities either inside kindergartens or in their courtyard, such as reading books, playing with bricks, balls, dolls, cars, painting with markers, fun in slide, swings, seesaw. Most of the recordings took place between researcher and children in rooms that were colorful and full of toys or in the yard of kindergartens in order for them to feel as comfortable as possible and not to be distracted so that their utterances do not come from lack of concentration or haste. Children's speech was recorded 1-2 times per week. The research lasted about 15 months, while the duration of each recording ranged from 15-30 minutes for each of the four children separately. The age of twin children is 1;8.15 to 2;10.9 years old, while of non-twin boy 1;7.5 to 2;7.18 and of non-twin girl 1;6.26 to 2;9.12. From the total tokens, we rely our assumptions on 40 that present consonant epenthesis. The reproduction, processing and conversion of audio material into phonetic tokens were done via Audacity software, while the recording and organization of tokens via Microsoft Office Word. Since we did not use any software for the phonetic analysis of children's tokens and the transcription was done by ear only, we include data in which we have a high degree of certainty of children's utterances. For the phonetic rendering of words, the *International Phonetic Alphabet* is used.

[2] The numbers indicate the child's years, months and days. E.g., 2;5.9 means that the child is two years, five months and nine days old.

4. Findings from Greek

Consonant epenthesis is observed in all four children in monosyllabic and disyllabic words. Indicative examples of the former are given next (9-24)[3].

Adult's form	→ Child's form	Child: Age
9) [ˈði.o]	→ [ˈði.ðo] (two)	boy (twin): 2;4.20
10) [ˈce.i]	→ [ˈce.ci] ((he / she / it) burns)	boy (twin): 2;5.13
11) [a.ˈftu]	→ [ta.ˈtu] (his)	boy (twin): 2;6.12
12) [a.ˈfto]	→ [ta.ˈto] (this)	boy (twin): 2;6.19
13) [ˈi.se]	→ [ˈsi.se] ((you) are)	girl (twin): 2;4.24
14) [ˈi.ne]	→ [ˈni.ne] ((he / she / it) is)	girl (twin): 2;8.21
15) [ˈi.ne]	→ [ˈni.ne] ((he / she / it) is)	girl (twin): 2;9.18
16) [ˈi.ne]	→ [ˈni.ne] ((he / she / it) is) (m[4])	girl (twin): 2;10.2
17) [ˈa.lo]	→ [ˈla.lo] (other)	boy (non twin): 1;7.7
18) [a.ˈfto]	→ [ta.ˈto] (this)	boy (non twin): 1;7.16
19) [ˈa.lo]	→ [ˈla.lo] (other)	boy (non twin): 1;8.6
20) [ˈa.lo]	→ [ˈla.lo] (other)	boy (non twin): 1;9.11
21) [a.ˈfto]	→ [ta.ˈto] (this)	girl (non twin): 2;3.8
22) [a.ˈfto]	→ [ta.ˈto] (this)	girl (non twin): 2;5.8
23) [ˈi.ne]	→ [ˈni.ne] ((he / she / it) is)	girl (non twin): 2;5.22
24) [ˈi.ne]	→ [ˈni.ne] ((he / she / it) is)	girl (non twin): 2;6.13

Before discussing the properties of children's tokens, it should be clarified at this point whether their examples constitute consonant epenthesis or *partial reduplication*. Partial reduplication is considered the production of two partially identical syllables and involves *consonant* or *vowel harmony* (cf. Klein, 2005: 71, examples 25-26).

Adult's form	→ Child's form	
25) [ˈgɪæmpə]	→ [mima] (grandpa)	(English, Klein, 2005: 71)
26) [buk]	→ [buku] (book)	(English, Klein, 2005: 71)

However, even though both reduplication and consonant harmony involve melody copy (Goad unpublished results), we follow in the current study the view which mentions that reduplication takes place at the upper levels of the prosodic hierarchy, namely, the syllable and *foot*, while consonant harmony at the lower levels, that is, the segment and distinctive feature (Tzakosta, 2007). Thus, we assume that in children's tokens the process of consonant epenthesis is applied rather than reduplication, since in almost all of them the sequence of vowels differs.

[3] In the examples the age begins from the smallest to the biggest per child.

[4] (m) = mimicry. Mimicry is considered the direct utterance of a token by the child faithfully or with different distinctive features immediately after the utterance of the same token by the adult. The strategy of mimicry from child constitutes a learning process. In other words, the child hears the token, processes it and utters it after having heard it again by itself. The process of information's transfer between adult and child we assume that it contributes to the in depth understanding of the information. So, data that are uttered as mimicry have been included in the present study.

Returning to children's examples (9-24), a consonant is inserted in order for an unmarked CV syllable to emerge and agree with researchers' views, who point out that this is the main reason for the use of epenthesis in child speech (e.g., Stemberger, 1996; Kappa, 2002; Tzakosta, 2003). In some tokens with cluster simplification, it additionally maintains in number the segments of the adult's form. So, it seems to constitute also a strategy of preserving the same length between adult's and child's form. Regarding the properties of epenthesis, the inserted consonant is observed in one of the two edges of the word and simultaneously constitutes a full copy of the consonant located at the other edge. This interaction between consonants at the edges of word seems to support their specification as psycholinguistically prominent positions (see Pater, 1997; Smith; 2002, among others) and that edgemost syllables attract children's attention more than others (Slobin 1973). In terms of stress, it does not play any role, since the participating consonants can equally occur in stressed or unstressed syllable. The features of epenthesis traced in disyllabic words are also observed in trisyllabic words (examples 27-34).

Adult's form	→ Child's form	Child: Age
27) [ˈA.ɟe.lo]	→ [ˈLa.ɟe.lo] (Agelo, name)	girl (twin): 2;8
28) [e.ˈci.nos]	→ [ne.ˈci.nos] (that)	girl (twin): 2;8.14
29) [ˈe.la.to]	→ [ˈte.la.to] (fir)	girl (twin): 2;8.21
30) [ˈe.xu.ne?]	→ [ˈne.xu.ne?] ((do they) have?) (m)	boy (non twin): 2;2.24
31) [Ma.ˈɾi.a]	→ [Ma.ˈɾi.ma] (Maria, name)	girl (non twin): 2;3.20
32) [ˈe.pe.se]	→ [ˈse.pe.se] ((he / she / it) fell)	girl (non twin): 2;5.3
33) [ˈe.pe.se]	→ [ˈse.pe.se] ((he / she / it) fell)	girl (non twin): 2;5.3
34) [pe.ˈta.i]	→ [pe.ˈta.pi] ((he / she / it) flies)	girl (non twin): 2;6.8

These tokens strengthen the hypothesis of the primacy of the edges, since the consonant of the intervening syllable, which can be stressed or unstressed, does not affect the way consonant epenthesis is applied. Generally, intervening consonants in processes such as consonant harmony are characterized as *transparent* (e.g., Rose & Walker, 2004: 484), namely, they do not act as blockers or have any effect to the participating segments.

5. Data analysis based on Optimality Theory

In Optimality Theory (Prince & Smolensky, 1993) a set of universal and violable constraints ranked in a language specific way is provided by *Universal Grammar*. Language acquisition in Optimality Theory proceeds via constraint demotion and more specifically, in the initial stages where the structures uttered by children are unmarked, *markedness* constraints dominate *faithfulness* constraints, while in the final stage faithfulness constraints dominate markedness, as in adult's grammar (e.g., Demuth, 1995; Gnanadesikan, 2004).

CV syllables in children's words are ensured by the markedness constraint Onset, which requires all syllables to have consonants in onset positions (Prince & Smolensky, 1993: 191). In some cases, CV syllables are achieved with consonant epenthesis and simplification of clusters. For these tokens the markedness constraint *COMPLEX is also adopted, which prohibits consonant clusters (Demuth 1995: 19). For the properties of the epenthetic consonant, the markedness constraint AGREE is used, which requires *agreement* between consonants to all their distinctive features (Lombardi, 1999: 272). The proposal of agreement allows copying from distance due to not being bound by the *Strict Locality* requirement that governs feature *spreading* (cf. Hansson, 2010: 25). In order to fit with our data, we modify AGREE to OnsetEdges-AGREE, which demands agreement between the consonants located to the onsets of the edgemost syllables. We consider that this constraint drives the distinctive features of the epenthetic consonant and

the *domain* of epenthesis. The faithfulness constraints MAXIMALITY-IO and DEPENDENCY-IO are also adopted, which require every segment of the input to have a correspondent in the output and to not insert any segments to the output that do not appear in the input respectively (McCarthy & Prince, 1995: 264). The ranking leading to consonant epenthesis in children's tokens is Onset >> *COMPLEX >> MAX-IO >> OnsetEdges-AGREE >> DEP-IO. Disyllabic words are presented first in the following table (1).

Table 1. Consonant epenthesis in disyllabic words

[ˈce.i][5]	Onset	*COMPLEX	MAX-IO	OnsetEdges-AGREE	DEP-IO
☞ [ˈce.ci]					*
[ˈce.ti]				*!	*
[ˈce]			*!		
[ˈce.i]	*!				
[a.ˈfto]	Onset	*COMPLEX	MAX-IO	OnsetEdges-AGREE	DEP-IO
☞ [ta.ˈto]					*
[ka.ˈto]				*!	*
[ˈto]			*!*		
[ta.ˈfto]		*!		*	*
[a.ˈfto]	*!	*			

The adult's outputs [ˈce.i] and [a.ˈfto] are rejected due to an open syllable at initial or final position violating fatally this way the higher ranked constraint. The second one penalizes outputs with clusters ([ta.ˈfto], [a.ˈfto]), while the third ensures that epenthesis is preferred over other processes such as deletion in order for CV syllables to arise ([ˈce], [ˈto]). OnsetEdges-AGREE disallows epentheses with partial copy between the edgemost syllables. So, it prohibits outputs as [ˈce.ti], [ka.ˈto], [ta.ˈfto]. As optimal the tokens [ˈce.ci] and [ta.ˈto] are selected that violate due to insertion the constraint DEP-IO, which is though the lower ranked. The same ranking applies to all the other disyllabic words with or without consonants cluster as well as to trisyllabic words (Table 2).

Table 2. Consonant epenthesis in trisyllabic words

[ˈe.pe.se]	Onset	*COMPLEX	MAX-IO	OnsetEdges-AGREE	DEP-IO
☞ [ˈse.pe.se]					*
[ˈte.pe.se]				*!	*
[ˈpe.se]			*!	*	
[ˈe.pe.se]	*!				
[pe.ˈta.i]	Onset	*COMPLEX	MAX-IO	OnsetEdges-AGREE	DEP-IO
☞ [pe.ˈta.pi]					*
[pe.ˈta.ti]				*!	*
[pe.ˈta]			*!	*	
[pe.ˈta.i]	*!				

The only difference traced in trisyllabic words is that the consonant of the intervening syllable does not participate in epenthesis, which is ensured by the OnsetEdges-AGREE constraint and there is no need to modify it or to add a new one.

[5] The adult's output is taken as input, namely, the linguistic stimuli that the child hears and receives from its parents.

6. Conclusion

In sum, a constraint-based approach is taken in this study that explains the use of consonant epenthesis in child speech as well as its properties, which can be captured in the same ranking. The results show that it constitutes a simplification strategy which helps children accomplish unmarked CV syllables and, in some cases, to keep the same length of adult's words. The domain of its application seems to be very specific and to support the primacy of the edgemost syllables, while the epenthetic segment bears the same distinctive features of the consonant it copies. The aforementioned features are found in disyllabic words with or without consonant clusters as well as in trisyllabic words. Finally, stress is irrelevant when the process of consonant epenthesis is applied.

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Appendix

Twin children - Boy

	Adult's Form	Child's Form	Age	Translation
1	ˈði.o	ði.ðo	2;4.20	two
2	ˈce.i	ˈce.ci	2;5.13	(he / she / it) burns
3	a.ˈftu	ta.ˈtu	2;6.12	his
4	a.ˈfto	ta.ˈto	2;6.19	this

Twin children - Girl

	Adult's Form	Child's Form	Age	Translation
1	ˈŋa.u	ˈma.mu	2;4.22	meow
2	ˈi.se	ˈsi.se	2;4.24	(you) are
3	ˈA.ɟe.lo	ˈLa.ɟe.lo	2;8	Agelo
4	e.ˈci.nos	ne.ˈci.nos	2;8.14	that
5	ˈi.ne	ˈni.ne	2;8.21	(he / she / it) is
6	ˈe.la.to	ˈte.la.to	2;8.21	fir
7	ˈe.la.to	ˈte.la.to	2;8.21	fir
8	ˈi.ne	ˈni.ne	2;8.28	(he / she / it) is
9	ˈi.ne	ˈni.ne	2;9.18	(he / she / it) is
10	ˈi.ne	ˈni.ne	2;9.18	(he / she / it) is
11	ˈi.ne	ˈni.ne	2;9.18	(he / she / it) is
12	ˈi.ne	ˈni.ne	2;9.18	(he / she / it) is
13	ˈi.ne	ˈni.ne	2;9.18	(he / she / it) is
14	ˈi.ne	ˈni.ne	2;10.2	(he / she / it) is
15	ˈi.ne	ˈni.ne	2;10.2	(he / she / it) is
16	ˈi.ne	ˈni.ne	2;10.2	(he / she / it) is
17	ˈi.ne	ˈni.ne (m)	2;10.2	(he / she / it) is

Non twin children - Boy

	Adult's Form	Child's Form	Age	Translation
1	ˈa.lo	ˈla.lo	1;7.7	other
2	ˈa.lo	ˈla.lo	1;7.7	other
3	ˈa.lo	ˈla.lo	1;7.7	other
4	ˈa.lo	ˈla.lo	1;7.7	other
5	ˈa.lo	ˈla.lo	1;7.14	other
6	a.ˈfto	ta.ˈto	1;7.16	other
7	ˈa.lo	ˈla.lo	1;8.6	other
8	ˈa.lo	ˈla.lo	1;9.11	other

9	ˈa.lo	ˈla.lo	1;9.11	other
10	ˈa.lo	ˈla.lo	1;9.16	other
11	ˈe.xu.ne?	ˈne.xu.ne? (m)	2;2.24	(do they) have?

Non twin children - Girl

	Adult's Form	Child's Form	Age	Translation
1	a.ˈfto	ta.ˈto	2;3.8	this
2	Ma.ˈɾi.a	Ma.ˈɾi.ma	2;3.20	Maria
3	ˈe.pe.se	ˈse.pe.se	2;5.3	(he / she / it) fell
4	ˈe.pe.se	ˈse.pe.se	2;5.3	(he / she / it) fell
5	a.ˈfto	ta.ˈto	2;5.8	this
6	ˈi.ne	ˈni.ne	2;5.22	(he / she / it) is
7	pe.ˈta.i	pe.ˈta.pi	2;6.8	(he / she / it) flies
8	ˈi.ne	ˈni.ne	2;6.13	(he / she / it) is