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PROCEEDINGS OF THE ICGL12
ΠΡΑΚΤΙΚΑ ΤΟΥ ICGL12

Thanasis Georgakopoulos, Theodossia-Soula Pavlidou, Miltos Pechlivanos, Artemis Alexiadou, Jannis Androutsopoulos, Alexis Kalokairinos, Stavros Skopeteas, Katerina Stathi (Eds.)

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για την τεράστια προσφορά τους στην ελληνική γλωσσολογία
και την αγάπη τους για την ελληνική γλώσσα

ΣΗΜΕΙΩΜΑ ΕΚΔΟΤΩΝ

Το 12ο Διεθνές Συνέδριο Ελληνικής Γλωσσολογίας (International Conference on Greek Linguistics/ICGL12) πραγματοποιήθηκε στο Κέντρο Νέου Ελληνισμού του Ελεύθερου Πανεπιστημίου του Βερολίνου (Centrum Modernes Griechenland, Freie Universität Berlin) στις 16-19 Σεπτεμβρίου 2015 με τη συμμετοχή περίπου τετρακοσίων συνέδρων απ᾽ όλον τον κόσμο.

Την Επιστημονική Επιτροπή του ICGL12 στελέχωσαν οι Θανάσης Γεωργακόπουλος, Θεοδοσία-Σούλα Παυλίδου, Μίλτος Πεχλιβάνος, Άρτεμις Αλεξιάδου, Δώρα Αλεξοπούλου, Γιάννης Ανδρουτσόπουλος, Αμαλία Αρβανίτη, Σταύρος Ασημακόπουλος, Αλεξάνδρα Γεωργακοπούλου, Κλεάνθης Γκρώμαν, Σαβίνα Ιατρίδου, Mark Janse, Brian Joseph, Αλέξης Καλοκαιρινός, Ναπολέων Κάτσος, Ευαγγελία Κορδώνη, Αμαλία Μόζερ, Ελένη Μπουτουλούση, Κική Νικηφορίδου, Αγγελική Ράλλη, Άννα Ρούσσου, Αθηνά Σιούπη, Σταύρος Σκοπετέας, Κατερίνα Στάθη, Μελίτα Σταύρου, Αρχόντω Τερζή, Νίνα Τοπιντζή, Ιάνθη Τσιμπλή και Σταυρούλα Τσιπλάκου.

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Οι δύο τόμοι των πρακτικών του συνεδρίου είναι προϊόν της εργασίας της Εκδοτικής Επιτροπής στην οποία συμμετείχαν οι Θανάσης Γεωργακόπουλος, Θεοδοσία-Σούλα Παυλίδου, Μίλτος Πεχλιβάνος, Άρτεμις Αλεξιάδου, Γιάννης Ανδρουτσόπουλος, Αλέξης Καλοκαιρινός, Σταύρος Σκοπετέας και Κατερίνα Στάθη.

Παρότι στο συνέδριο οι ανακοινώσεις είχαν ταξινομηθεί σύμφωνα με θεματικούς άξονες, τα κείμενα των ανακοινώσεων παρατίθενται σε αλφαβητική σειρά, σύμφωνα με το λατινικό αλφάβητο· εξαίρεση αποτελούν οι εναρκτήριες ομιλίες, οι οποίες βρίσκονται στην αρχή του πρώτου τόμου.

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MASTERING WORD-INITIAL SYLLABLE ONSETS BY CYPRIOT GREEK TODDLERS WITH AND WITHOUT EARLY LANGUAGE DELAY

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Περίληψη

Η παρούσα έρευνα εξέτασε τη φωνολογική ανάπτυξη νηπίων με μητρική γλωσσική ποικιλία την κυπριακή ελληνική ως προς την πραγμάτωση της έμβασης συλλαβής στην αρχή της λέξης. Σκοπός ήταν η σύγκριση τυπικά αναπτυσσόμενων παιδιών και παιδιών με καθυστέρηση στην ομιλία. Τα αποτελέσματα έδειξαν πως η διαγραφή της αρχικής έμβασης της λέξης είναι ένα διαφοροποιητικό στοιχείο ανάμεσα στις δύο ομάδες, με τα τυπικά αναπτυσσόμενα νήπια να εγκαταλείπουν αυτή τη φωνολογική διεργασία πολύ νωρίς, ενώ τα παιδιά με καθυστέρηση ομιλίας να εμμένουν στη διαγραφή της αρχικής έμβασης και στη συνέχεια να την αναπληρώνουν με πλήρη προκαταβολική αφομοίωση της έμβασης της επόμενης συλλαβής.

Keywords: Cypriot Greek, late talkers, onset deletion, regressive assimilation, phonological development

1. Introduction

Research has demonstrated that Initial Consonant Deletion (ICD) is a phonological pattern observed in early child speech (Vihman 2014). Typically developing Finnish-speaking (Savinainen-Makkonen 2000) and Cypriot Greek-speaking toddlers show robust evidence of ICD followed by Regressive Assimilation (Petinou & Okalidou

2006). However, for English speaking children, ICD is considered atypical as compared to cross-linguistic data (Grunwell 1985).

Petinou & Okalidou (2006) reported that for Cypriot Greek-speaking children with early language delay, word-initial onsets pose a particular productive challenge that persists beyond a "developmental window" during which typically developing children overcome such phonological learning strategies/patterns. In particular, word-initial onsets appear to delete (e.g. /ˈmilo/ → [ˈilo], 'apple') the younger the children are. Also, initial onset deletion followed by regressive long distance full assimilation/harmony (henceforth, RAS) of word-initial onsets to the consonant of the following syllable (e.g. /ˈmilo/ → [ˈlilo]) is more perpetual and persistent in late talking children (Petinou & Spanoudis 2014; Petinou & Theodorou 2016).

The current study provides further data regarding this robust phonological process observed in the speech of Cypriot Greek (CG) speaking toddlers with late onset of expressive vocabulary compared with typically developing children. Apart from word-initial onset deletion, the current study examined also phonological process reported in Petinou and Okalidou (2006), namely the regressive long distance full assimilation (harmony) of word-initial onsets to the consonant of the following syllable: e.g. /ˈmilo/ → [ˈlilo].

In this study, the term "Initial Onset Deletion" (IOD) will be used in the place of ICD, as it better describes data found in our investigation, such as the following:

μήλον	[ˈmilon] → [ˈilo]	apple
στρατός	[ˈstɾatos] → [ˈato]	army
μπροστά	[mbɾoˈsta] → [oˈtʰːa]	ahead
τροχός	[tɾoˈxos] → [oˈso]	wheel
γράφεις	[ˈɣɾafis] → [ˈafis]	write-2SG
ππέφτει	[ˈpʰːefti] → [ˈetʰːi]	fall-3SG
καππέλλον	[kaˈpʰːelːon] → [ˈelːo]	hat

In these data, it is not merely the word-initial consonant that deletes, but the entire word-initial onset.

In the current study we argue that IOD is related to syllable structure preferences such as a "VCV" that determines the shape of early words. This template preference renders word initial onsets as "more vulnerable" to omission when the child tries to establish disyllabic target productions. Thus we hypothesise a word-medial ver-

sus word-initial advantage in terms of segmental realisation in typically developing (TD) toddlers. We further hypothesise better performance in TD group versus the late talker (LT) group given that word initial onsets already pose a challenge in the former group. That is, occurrence of IOD would be higher in LTs as opposed to TD population.

The linguistic variety investigated in this study is Cypriot Greek (CG), a variety of Modern Greek spoken by more than half a million people on the island of Cyprus and abroad. Cypriot Greek, like most of the Modern Greek varieties, exhibits a five vowel phonemes: /a e i o u/. Its consonantal phonetic inventory contains 31 singletons, most of which have geminate counterparts (Armosti 2011). All CG geminates can be found in word-medial position, usually intervocalically. Many geminates can also be encountered in word-initial position. However, word-initial geminates are found in fewer lexical items than word-medial geminates.

2. Methodology

2.1. Participants

Participants included a total of 8 children. Four children (2 boys, 2 girls) were identified as late talkers (LTs) and four age-matched counterparts (2 boys, 2 girls) were identified with typical language skills (TDs). Age of intake was 24 months. The two groups were matched on the bases of gender, age and socioeconomic status (Cyprus Ministry of Internal Affairs, Department of Statistics and Research 2005). All children were recruited from a larger cohort of subjects participating in an on-going project on language development of Cypriot Greek pre-schoolers.

All participants had unremarkable developmental and medical history as reported on developmental questionnaires filled by each child's primary caregiver. Subjects came from monolingual CG speaking environments with mothers as the primary caregivers and passed audiometric pure tone screening test using a GSI-38 portable audiometer. They all had typical non-verbal abilities based on informal cognitive assessment in the form of checklist performed by a developmental psychologist as part of the cohort testing protocol.

2.2. Materials and Procedure

2.2.1. Subject criteria

Criteria for classification of a child as LT included the following: (a) an expressive vocabulary of less than 70 words based on the Cyprus Lexical List (CYLEX) (Petinou, Hadzigeorgiou & Minaidou 2001), a parent report vocabulary checklist and (b) the lack of two word combination at intake (at age 24 months). The CYLEX is a vocabulary list designed on the basis of the MacArthur Communicative Development Inventory (CDI) (Fenson et al. 1993). It consists of 650 words usually found in children's early words and includes content and function words, as well as 14 gestures that might be used by youngsters, and a section in which caregivers provided examples of phrases and short sentences used by their child. The semantic categories included the following classes: onomatopoetic words, animal sounds, animal names, clothes, actions, places, foods, toys, tools, colours, numbers, definite articles, prepositions, conjunctions and basic concepts.

The 70 word cut-off criterion was derived after z-score transformation of the raw number of words reported on CYLEX (expressive vocabulary) of a sample of 66 two-year-old CG-speaking children from the larger cohort, who at the time were participating in an on-going study examining early linguistic development of children in Cyprus. The 70 word cut-off point corresponded to the 10th percentile.

2.2.2. Data collection

Each child was assessed during four experimental sessions at 24, 28, 32 and 36 months of age. Language testing was administered by two speech language pathologists. Each session was recorded using a Marantz PMD-222 tape recorder and an Audio-Technico flat unidirectional microphone placed on the experimental table in front of the child.

Language measures included an adaptation of the Preschool Language Scale-3 (PLS-3) (Zimmerman, Steiner, & Pond 1999) used as the formal receptive and expressive language measure. Certain items from the PLS-3 were adapted to fit child language characteristics and parameters of CG. It should be noted that most of the adaptations were performed in the expressive domain of the test and included the linguistic parameters of phonology, plural inflections, definite and non-definite ar-

ticles, grammatical agreement and the correct use of clitics (Petinou, Constantinou & Kapsou 2011).

Mean Length of Utterance-Words (MLU-W) was calculated from a spontaneous language samples obtained during communicative interaction between the child and the experimenter or caregiver. All intelligible utterances were coded and measured for number of words.

Phonological skills were assessed through a spontaneous language sample collected during each experimental session. Furthermore, pictures depicting objects and actions were used to prompt the production of all possible singleton phonemes of CG in all word positions.

Recorded speech samples were phonetically transcribed using the International Phonetic Alphabet (IPA). Ill-recorded productions, such as productions overlapping with noise or with experimenter's own speech or softly-uttered or whispered utterances were excluded from the analysis. Broad phonetic transcriptions were performed for each recorded session including all consecutive different words or word-like targets produced by each child. Subsequently, speech samples were manually analysed to obtain the MLU-W elicited during the total sample. Independent phonetic analysis procedures were used in constructing each child's phonetic inventory by counting manually all phonemes produced by the child regardless of the correct/adult target (Stoel-Gammon & Dunn 1994).

2.2.3. Transcription reliability

Approximately 10% of recorded samples were randomly selected for the purposes of transcription reliability. The samples were phonetically transcribed by the second author and were checked against comparable coding from an independent transcriber (a speech language-pathologist trained in phonetic transcription) who was unfamiliar with the purpose of the investigation. Reliability on the relevant phonetic categories was based on the number of agreements divided by agreements plus disagreements after the two transcribers had jointly listened to the tapes and had compared their transcriptions with regard to place and manner of articulation. Inter-rater transcription reliability was 90% for manner and 84% for place of articulation.

2.3. Data Analysis

2.3.1. Measurements

The measurements taken for the current study were the percentage of words exhibiting (i) IOD, (ii) RAS, and (iii) Correct word-initial onset production; the remaining percentage after deducting (i)–(iii) from 100% was labelled as "Other onset substitutions".

2.3.2. Method of statistical analysis

Two mixed-design ANOVAs were conducted with the percentage of (i) IOD and (ii) RAS used as the depended variable. In both tests the independent variables were (i) Group (TD, LT) as a between-subject variable and (ii) Age (24, 28, 32, 36 months) as a within-subject variable. In order for the data to meet the normality requirements of the ANOVA tests, they were first transformed using the arcsine transformation.

In addition, correlation analyses were performed between IOD, RAS, Correct word-initial onset production, Other onset substitutions and Age for both groups (TD, LT).

3. Results

The total number of glossable productions (i.e. words whose meaning could be identified) was 1445 for TDs and 655 for LTs (on average, 331.25 and 133.75 words per child respectively). The breakdown of the number of glossable productions as a function of Group, Age and type of word-initial onset realisation are presented in Table 1.

Group	**Age**	**IOD**	**RAS**	**Correct onset production**	**Other substitution**
TD	24	7.25 (4.03)	3.25 (2.63)	40 (12.25)	19 (5.35)
	28	8 (2.45)	1 (1.41)	90 (20.99)	19.25 (5.91)
	32	2 (2.83)	0.25 (0.5)	66.75 (36.34)	8.5 (6.61)
	36	1.25 (1.5)	0 (0)	60.5 (38.87)	4.25 (3.1)

LT	24	12.33 (1.15)	0.33 (0.58)	5.67 (0.58)	0.33 (0.58)
	28	13 (8.68)	3.5 (3)	7.5 (3.7)	2.75 (2.75)
	32	14.25 (13.18)	8.75 (5.19)	10.25 (2.63)	7.75 (5.19)
	36	11 (9.06)	12 (1.63)	19.5 (6.61)	9.5 (3.11)

Table 1 | Mean number (and standard deviation) of glossable productions as function of Group, Age and type of word-initial onset realisation

3.1. Correlation analyses

As shown in Table 2, both IOD and RAS significantly decreased with age. Correct word-initial onset production was strongly positively correlated with Age. IOD showed positive correlation with RAS and negative with correct onset production.

	RAS	**Correct onset production**	**Other substitution**	**Age**
IOD	**ρ = .568, p = .011**	**ρ = -.633, p = .004**	ρ = .378, p = .075	**ρ = -.562, p = .012**
RAS		**ρ = -.701, p < .0005**	**ρ = -.732, p = .001**	**ρ = -.722, p = .001**
Correct onset production			**ρ = -.915, p < .0005**	**ρ = .764, p < .0005**
Other substitution				**ρ = -.691, p = .002**

Table 2 | Spearman Correlation results for the TD group (significant correlations are shown in bold type face)

As shown in Figure 1 next page, LTs exhibited high rates of IOD only at the 24-months age stage and dropped substantially at older stages.

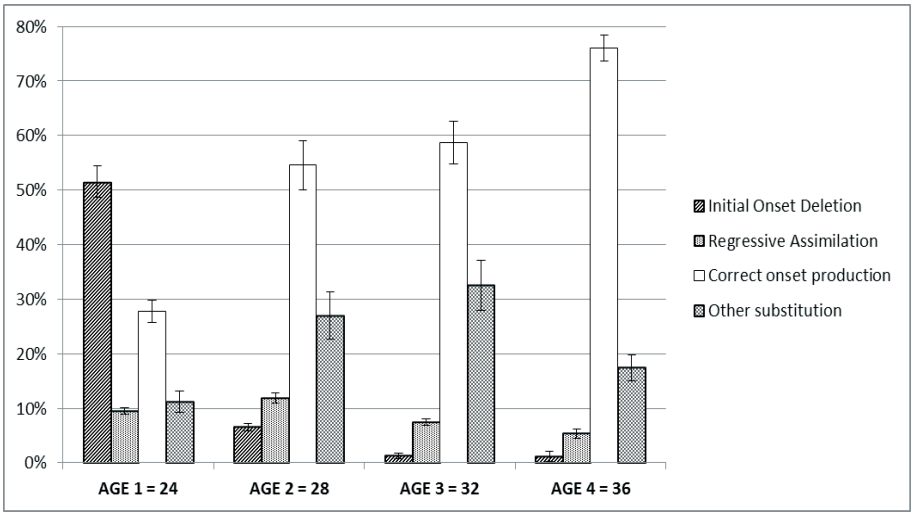

Figure 1 | Results for the TD group as a function of age

Regarding the LT group, as shown in Table 3, IOD significantly decreased with age, while RAS significantly decrease. IOD and RAS exhibited a strong negative correlation. Correct word-initial onset production showed no correlation with Age.

	RAS	**Correct onset production**	**Other substitution**	**Age**
IOD	**ρ = -.703, p = .002**	**ρ = -.468, p = .039**	**ρ = -.868, p < .0005**	**ρ = -.695, p = .002**
RAS		ρ = -.050, p = .430	**ρ = .495, p = .030**	**ρ = .680, p = .003**
Correct onset production			ρ = .239, p = .196	ρ = .135, p = .316
Other substitution				**ρ = .645, p = .005**

Table 3 | Spearman Correlation results for the LT group (significant correlations are shown in bold type face)

As shown in Figure 2, IOD steadily dropped as age increased, while RAS steadily increased. Correct word-initial onset production remained in the area of 26% – 38% throughout.

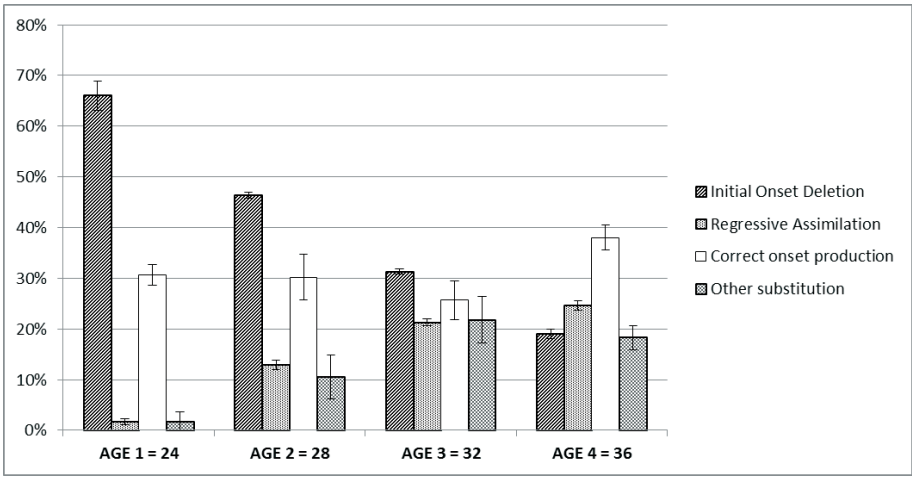

Figure 2 | Results for the LT group as a function of age

3.2. Comparisons between groups

The ANOVA test for IOD indicated a significant main effect of Group, $F(1, 3.021) = 64.798$, $p = .004$, but not in the case of Age, $F(3, 3) = 7.434$, $p = .067$. The Group × Age interaction was not significant, $F(3, 23) = 0.872$, $p = .470$. Planned contrasts showed that on average LTs used IOD 14% more than TDs, $F(1, 23) = 30.750$, $p < .0005$.

Post hoc Tuckey tests[1] revealed that for the TD group there was no statistical difference between any two age stages in IOD rates at $\alpha = .05$. In the case of the LT group, Games-Howell tests showed that the only significant difference ($p = .012$) was between the 36-month and the 24-month stage, with the former exhibiting 47% higher rates of IOD.

In the case of RAS, the ANOVA test indicated no significant main effect of neither Group, $F(1, 3.002) = 3.735$, $p = .149$, nor Age, $F(3, 3) = 0.162$, $p = .915$. The Group × Age interaction was significant, $F(3, 23) = 9.960$, $p < .0005$. Simple main effects analysis yielded significant effects of Age for both the TD, $F(3, 12) = 6.480$, $p = .007$, and the LT group, $F(3, 11) = 5.143$, $p = .018$.

1 If Levene's test for equality of error variances yielded a significant result, the Games-Howell tests were used; in the case of a non-significant result, the Tuckey tests were used.

Post hoc Games-Howell tests revealed that for the TD group there was no statistical difference between any two age stages in RAS rates at $\alpha = .05$. In the case of the LT group, Tuckey tests showed that the only significant differences were between the 24-months stage the two oldest stages (with 32-months: $p = .036$; with 36-months: $p = .019$).

As shown in Table 4, IOD was the process which clearly distinguished between the two groups, with LTs exhibiting significantly higher rates of IOD than TDs at all four age stages. Regarding RAS, the two groups were different from each other only at the last two age stages, with LTs having significantly higher rates of RAS than TDs.

Age	**IOD**		**RAS**	
24	LT>TD	$\mathbf{F(1, 5) = 124.996, p < .0005}$	LT≥TD	$F(1, 5) = 2.267$, $p = .192$
28	LT>TD	$\mathbf{F(1, 6) = 14.633, p = .009}$	LT≥TD	$F(1, 6) = 3.938$, $p = .094$
32	LT>TD	$\mathbf{F(1, 6) = 6.349, p = .045}$	LT>TD	**F(1, 6) = 33.794, p = .001**
36	LT>TD	$\mathbf{F(1, 6) = 12.691, p = .012}$	LT>TD	**F(1, 6) = 136.581, p < .0005**

Table 4 | Comparisons between LTs and TDs at each age stage

4. Discussion

The results of this study revealed important differences between the TD and LT groups, especially with regard to the IOD process, which exhibited higher rates for LTs compared with TDs at all age stages. While IOD is used at high rates for TDs at age 24, its percentage drastically drops at age 28 and remains very low throughout. In contrast, for LTs, the use of IOD starts high as well (but crucially, significantly higher than TDs) at age 24 and reduces gradually until age 36.

Differences between the two groups are observed with regard to the RAS process as well, especially at ages 32 and 36, at which RAS percentages remain low for TDs but (continue) to increase for LTs. It appears that while RAS rates decrease with age for

TDs, they increase for LTs. One of the strongest negative correlations observed was that between IOD and RAS in the case of the LT group, which suggests an antagonistic relationship between these two processes. In other words, it appears that LTs initially favour IOD, which later gives way to RAS.

Contrary to LTs, TDs present, as predicted, more "mature" phonological outcomes evident as early as 28 months, a stage at which a leap in correct onset production is observed and after which a continuous increase in correct onset production is observed. LTs on the other hand, do not appear to make any significant progress in correct onset production at any age.

It therefore becomes apparent that word-initial position presents a *robust phonological challenge* for children with late language onset. Their main strategy to produce words which begin with an onset is by deleting it, i.e. by using the "initial onset deletion" process. Even though IOD is observed in the case of the TD group also, it is however only briefly used at the age of 24 to give way to correct word-initial onset production at age 28 onwards. Contrary to TDs, LTs arguably remain longer at that stage at which IOD is highly used: after the age of 24, albeit decreasing, the rates of IOD are robust even until the age of 36 months. One other crucial difference between the two groups is that while for TDs the IOD strategy is substituted early by correct onset production, for LTs the strategy that replaces IOD is to copy the following onset, i.e. to use "regressive assimilation". In other words, word-initial onsets remain a challenge for LTs even until the age of 36 months, as RAS increases, while correct onset production shows no significant change.

A possible explanation for the reasons behind the robust use of IOD by both TDs (at early age) and LTs (more pervasively) is that CG-speaking toddlers may make use of a "VCV" word template at early stages of phonology acquisition. This template does not favour word-initial onsets, which leads to their deletion, as shown in Figure 3. This template may be the result of the fact CG exhibits word-medial geminates, which may draw the toddlers' attention towards word-medial consonants and away from word-initial ones[2] (Petinou & Okalidou 2006; Petinou et al. 2011). TDs may restore

2 No data on child-directed speech currently exist for Cypriot Greek, hence no calculations can be made on the amount of geminate occurrences at word-initial vs word-medial position. However, in the *Syntychies* dictionary of contemporary Cypriot Greek (Katsoyannou et al., 2013), it is found that 19% of disyllabic and trisyllabic words exhibit a geminate in the second syllable as opposed to 8% which exhibit a word-initial geminate. It could be the case that word-medial geminates exhibit higher percentages in child-directed speech, as many "motherese" words follow a (C)VC:V pattern – something though that awaits empirical verification.

early enough the prosodic position of that word-initial onset missing from the "VCV" template and fill it with the correct melodic content. LTs on the other hand may show a delay in restoring the missing prosodic position, but even when they do restore it, they fill it with melodic material from the word-medial onset, which —due to the preference for the "VCV" template— already have mastered. In other words, they may slowly restore the prosodic position by reducing IOD, but they still do not correctly fill the melodic material, as they copy it from the established word-medial position (i.e. using RAS).

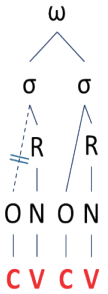

Figure 3 | The VCV template.

In conclusion, these findings are of importance, as these developmental phonological patterns of LTs in the form of IOD and RAS can be used as clinical markers in identifying language profiles in this population as early as 28 months —an age at which the LTs clearly start to exhibit different patterns from TDs.

5. Implications for further research

The issue of phonological processes use in child speech goes beyond the level of phonological development and speech intelligibility: it becomes especially relevant for the linguistically precocious child at the level of lexical access and lexical organisation. Phonemes are the "building blocks" for expressive vocabulary development, something that suggests that phonological development goes hand in hand with lexical development.

Furthermore, a large body of evidence attesting that development, lexical organisation and processing capacity of language are linked with phonological ability (Beckman & Edwards 2000; Coady & Aslin 2003; Edwards, Beckman & Munson 2004; Gerken, Murphy & Aslin 1995; Menn 1978; Schwartz & Leonard 1984; Storkel 2001; Storkel & Rogers 2000). Word position of a phoneme, phonological density, phonotactic probabilities might assist lexical organisation and lexical access (cf. "Cohort models": Marslen-Wislon 1987; and "Good Start Model": Gow & Gordon 1993).

The next step of this finding regarding the robust presence of deletion of word initial onsets and its evolution into regressive assimilation is to examine perceptual skills on expressive constraints and their relationship to lexical access and organisation with the hypothesis that "ill formed" word initial onsets might impede lexical access. It is possible that SLI children who present with such patterns when given particular focused speech training might show improvement in lexical access and phonological representations skills.

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