

Syllable omission in the acquisition of Spanish

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1 Introduction

Young children learning languages frequently omit weakly stressed syllables from both phrases and multisyllabic words. Such omissions have been observed in languages like English (Gerken 1990, 1991, 1994), Sesotho (Demuth, 1994, 1996a) and Dutch (Wijnen, Krikhaar, & den Os, 1994; Fikkert, 1994). But children do not consistently omit all weak syllables; rather weak syllables may or may not appear in certain contexts. Although there is considerable agreement among researchers that children's earliest productions of multisyllabic and multimorphemic forms are reduced in shape, there is no agreement regarding the source and nature of children's omissions. The perceptual approach claims that children's omissions of weak syllables are due to perceptual biases to perceive stressed syllables rather than weak ones, since stressed syllables are more acoustically salient (Gleitman & Wanner, 1982, Echols, 1990, Echols & Newport, 1992). In contrast, the production approach claims that children have fully syllabified representations of stored words but output constraints on prosodic representations restrict the form of children's productions (Gerken, 1991, 1993, 1994; Demuth 1994, 1996a; Demuth & Fee, 1995). This paper provides evidence that an abstract prosodic approach to these problems can account for children's syllable omissions in early Spanish acquisition. Specifically, it analyzes longitudinal data from a child learning Spanish, identifies specific patterns of syllable omission, and addresses the question of children's sensitivity to prosodic structure. The data are consistent with findings from other languages: On one hand, the source of variability in children's productions seems to be a production limitation rather than a perceptual one. On the other hand, developmental patterns of weak syllable reduction interact with the prosodic structure of Spanish. These patterns provide evidence of both child sensitivity to prosodic structures and the early existence of prosodic constraints on the realization of phonological structure.

2 Prosodic models of early word production

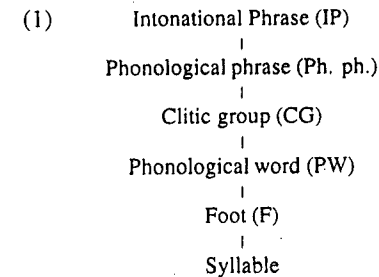
Since this paper concerns prosodic structure, an introduction to prosodic models of production is useful. There are two prosodic approaches. One proposes that children have a template for producing foot structure (Gerken, 1994). Children apply a Sw template to their intended words so that the strong syllables of words are mapped onto the strong position of the template. This model predicts that weak syllables that fit the template are more likely to be retained than syllables

that do not. One potential problem with this model is that it does not provide a developmental picture to explain how children move beyond this stage.

The other approach is the prosodic model of production (Demuth & Fee, 1995, Demuth 1995, 1996b). This model tries to explain the variability of weak syllable omissions. It proposes several stages of development which are characterized by gradually relaxing prosodic constraints. In contrast with the template account, this model predicts that only a limited amount of structure will be produced at a given stage of development. In any particular language, children's realization of prosodic structures will be constrained by principles of the foot and prosodic word structure in the language being learned.

2.1 Prosodic hierarchy

Both the prosodic model and the template approach assume that words and phrases are composed of hierarchically-ordered levels of prosodic structure which are represented in terms of the prosodic hierarchy (from Nespor and Vogel, 1986):



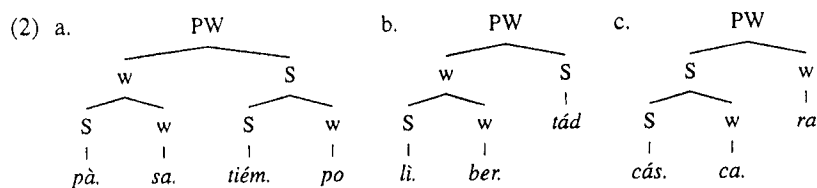
A **clitic** is a morpheme phonologically dependent on an adjacent host content word. A **clitic group** is a non-clitic element and all adjacent clitics sharing the same syntactic category. A **phonological phrase** is a clitic group which contains a lexical head (X) and all clitic groups on its nonrecursive side up to the clitic group that contains another head outside of the maximal projection of X. Heads are nouns, verbs, and adjectives. For example, *the student* and *who wins* constitute phonological phrases within the IP $[[the\ student]_{CG/P_{h,ph.}} [who\ wins]_{CG/P_{h,ph.}}]_{IP}$. Finally, in quantity sensitive languages such as Spanish, **feet** are composed of either heavy or light syllables. We find trochaic patterns such as $[\acute{L} L]_F$, $[H L]_F$, and $[H]_F$ and iambic patterns such as $[L H]_F$ and $[L \acute{L}]_F$ (e.g. *li.ber.tád*, 'freedom'; *[kan.tó]* 'he sang' (see Harris, 1983).

3 Prosodic properties of Spanish

3.1 Stress and foot structure

Spanish stress falls within the last three syllables of the word. Penultimate stress is the canonical one (90% of nouns, adverbs and adjectives).¹ Weight considerations only apply to non-verbs forms.

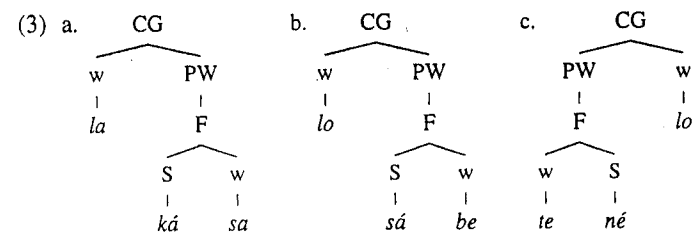
Foot trees in Spanish are usually trochaic or left-headed (e.g. [Š], [Šw]). **Word trees** are right-headed (e.g. [Šw Šw]). Here are some examples of foot and word structure corresponding to the English words 'pastime', 'freedom' and 'shell' respectively (Harris 1983):



Primary stress falls on the rightmost foot and secondary stress falls on strong syllables elsewhere. Syllables that are not part of the foot are incorporated at the level of the phonological word. **Weak syllables** in Spanish are defined by less amplitude (Navarro Tomás, 1950).

3.2 Clitic groups

In Spanish, direct/indirect object pronouns, prepositions, possessive pronouns, and articles can all be prosodic clitics. Negation can also be considered a prosodic clitic, but only when it is not emphasized (if it is stressed, it constitutes a stressed phonological word by itself). Consider the following examples of clitic groups in Spanish, where translations are 'the house', 'he knows it' and 'hold it' respectively. The stress pattern in (3c) is only found in the Argentinian dialect studied here:



3.3 Resyllabification and phonological phrases

The weak-strong patterns shown in (2) are only appropriate for words in isolation. Words within phonological phrases are usually resyllabified so that what appears as strong at the foot level may not be such at the phrasal level. That is, word final syllables can resyllabify with the initial syllable of the following word. For example, *à.ma.ri.llo* (SwSw, 'yellow') has secondary stress in the first syllable if it is pronounced in isolation. But in the phrase, *cuá(tro a)marillos* (Sww-Sw 'four yellow ones') where parentheses indicate the resyllabified syllable, the secondary stress of *à.ma.ri.llo* (SwSw) disappears. That is, resyllabification allows two adjacent vowels to syllabify into one, acquiring weak or strong stress depending on the distribution of stress within the phonological phrase. Roca (1986) has argued that primary stress is assigned lexically whereas secondary stress in Spanish is assigned postlexically. Finally, resyllabification can also apply across phrase boundaries (Navarro Tomás, 1950).

Phonological phrases exhibit two characteristics. First, phrasal stress falls on the stressed syllable of the last word of the phrase (Roca 1991) (e.g. [*el enamorado perdido*]_{Ph.Ph.}, 'the lost lover'). Second, a phonological phrase can result from a restructuring rule. Nespor and Vogel (1986) proposed that this rule is optional and only allows adjoining to a given phrase the non-branching phrase which is its first complement on its recursive side.² Consider, for example [*Los alumno(s) [han sali(do) [al patio]]*]_{Ph.Ph.}, 'The students have gone to the yard', where the second phrase undergoes the restructuring rule. All these phenomena must be taken into account when examining syllable omission in Spanish.

4 The Study

The data presented in this paper are from one child learning Argentinian Spanish at home. The child has been audio recorded over a period of eight months since she was 1;8 years old. The first author (also a native speaker of Argentinian Spanish) visited her at home and played with her during the recording process. The data were phonemically transcribed by the author and include all understandable utterances. Data from the eight month period were clustered into four groups for analysis. This is because in many cases there were few utterances of a given relevant prosodic category. The distribution of data collection, sessions over time, the number of utterances, and MLU are shown in the Table 1.

Age	No. of sessions	No. of utterances	MLU
1;8/1,9	3	67	1.72
1;10/1;11	4	109	1.88
2/2;1	3	226	2.32
2;2/2;3	2	128	3.06

Table 1: Age, Sessions, No. of utterances, and MLU

For coding, the identification of the prosodic structure in question follows the patterns outlined in the introduction for foot and word-trees in Spanish. Phrases were coded according to Nespov and Vogel's definitions (section 2.1), and the restructuring rule was applied whenever possible. Finally, the prosodic structure of the target forms and child productions within phrases have been given according to the usual Spanish resyllabification rules, since child productions have also been observed to be resyllabified in most cases, reproducing in this way the adult language. Consider, for example, the child production [no.tá], whose target is /*(no es).tá*/ 'it is not there'. Despite the fact that some segmental information is missing and the number of syllables in the adult and child utterances is the same, no syllable omission was considered to occur.

The data were classified into several prosodic categories: Minimal words or two syllable productions (e.g., *kasa*, 'home'), Phonological words (larger than two syllables, e.g. *konexo*, 'rabbit'), Clitic groups (e.g., *dame*, 'give me'), and Phonological phrases (e.g., *falta esto*, 'this is needed'). Child productions were sorted into *reduced* or *non-reduced* forms. This means that the *reduced* forms contain some syllable omission whereas the *non-reduced* forms are equal to the target in number of syllables. Finally, the most frequent patterns of syllable reduction were identified.

5 Results

5.1 Syllable omissions

Bisyllabic words (minimal words) were never reduced in the period studied. This indicates that the child has already passed the subminimal word stage attested in other languages (Demuth & Fee, 1995). However, phonological words larger than a bisyllabic foot were reduced during the first two months of recording, with syllable omission diminishing over time. In contrast, the percentage of syllable omissions within clitic groups and phonological phrases is considerably smaller than those in phonological words during the first six months of the study. Table 2 shows the percentage of syllable reductions in non-minimal phonological words vs. that in clitic groups and phonological phrases. Syllable omissions in each category are compared in Figure 1.

Age	Phonological Words		Clitic Groups and Ph. phrases	
	Omissions	Total cases	Omissions	Total cases
1;8/1;9	61.5%	13	25.5%	37
1;10/1;11	54.4%	22	24%	54
2/2;1	41.5%	58	15%	141
2;2/2;3	15%	13	16%	98

Table 2: Percentage of syllable omissions in non-minimal Phonological words, Clitic groups and Phonological phrases.

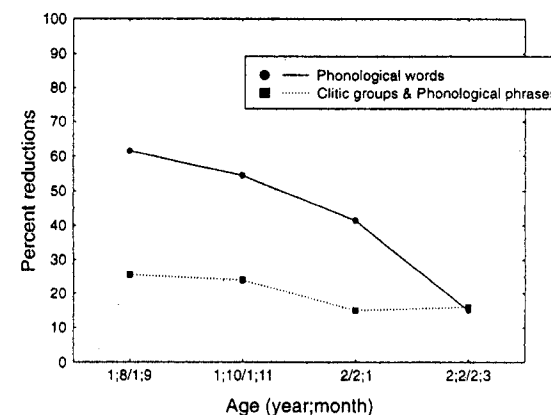


Figure 1: Syllable omissions in Phonological words vs. Clitic groups and Phonological phrases.

5.1.1 Discussion

Note that syllables in lexical items (phonological words) are omitted more frequently than syllables in clitic groups and phonological phrases containing several morphemes. A possible explanation of these data in accord with the findings shown later, is the following. In phonological words, preserved syllables are included in the highly frequent trochaic feet of Spanish and omitted syllables are outside this trochaic foot. On the other hand, clitics are adjoined to the clitic group node independently of the phonological word foot structure. In addition, (weak) syllables of words occurring inside phonological phrases are often resyllabified (incorporated into trochaic patterns), and therefore, not omitted. Given this, syllable omission in isolated phonological words is more likely to occur.

Note also that since the child behaves differently with respect to distinct prosodic structures, she must be aware of these two different levels of prosodic structure, that is, she is sensitive to the distinction between phonological words and higher level prosodic categories. That children make a distinction between phonological phrases and phonological words in their speech planning has also been found for English speaking children in Gerken (1993). That is, the difference observed in phonological words and clitic groups/phonological phrases can be attributed to an early awareness of different levels of prosodic structures (see below for more evidence).³

5.2 Omission pattern: SwSw targets

There are several patterns of omission in the data. The most frequent is SwSw targets that are reduced into wSw. This is unexpected because, according to the predictions of the template model, a syllable which is the head of the trochaic foot would be preserved. However, this syllable does not bear the main word or phrasal stress because word stress must fall on one of the word's last three syllables (section 3.1) and phrasal stress falls on the last stressed syllable of the last word (section 3.3). Thus, this syllable can only bear a secondary phrasal stress. We discuss explanations for this pattern of syllable omission later in this section.

Syllable omission in SwSw targets is found in both phonological words and clitic groups during the first four months, then omissions show a decrease at age 2;2/2;3. The data indicate that there is a gradual mastering of this pattern through time, though at different points for clitic groups/phonological phrases and phonological words. Table 3 and Figure 2 contrast syllable omissions in phonological words with that in clitic groups and phonological phrases. Tables 4, 5 and 6 give representative examples of these patterns of omission.

Age	Phonological words		Clitic groups & Ph. phrases	
	% Omissions	Total cases	% Omissions	Total cases
1;8/9	75%	4	78%	9
1;10/11	66%	3	78%	9
2;0/1	77%	13	29%	34
2;2/3	0%	2	18%	27

Table 3: Syllable reduction: SwSw → wSw

Child	Target	Translation	Age
a. [ka.lé.ra]	/ès.ka.lé.ra/	'scale'	1;8-2
b. [bo.lí.to]	/àr.bo.lí.to/	'little tree'	1;10/2/2;1
c. [ma.rí.fo]	/à.ma.rí.fo/	'yellow'	2;1
d. [be.lí.ta]	/à.bue.lí.ta/	'little grandma'	2;1

Table 4: SwSw → wSw in Phonological words

Child	Target	Translation	Age
a. [a ká.sa]	/à la ká.sa/	'to the house'	1;8
b. [bul.bé.la]	/dè.bol.bé.la/	'give it back'	1;8
c. [e.mé.ka]	/là mu.ñé.ka/	'the doll'	1;9
d. [a.mué.ka]	/là mu.ñé.ka/	'the doll'	1;9
e. [e ká.sa]	/èn la ká.sa/	'in the house'	2

Table 5: SwSw → wSw in Clitic groups

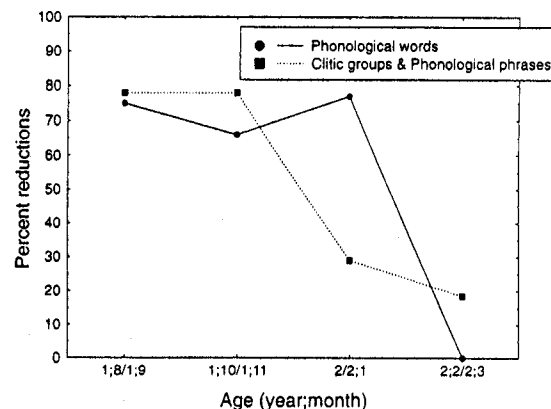
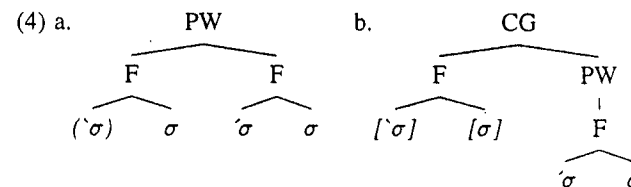


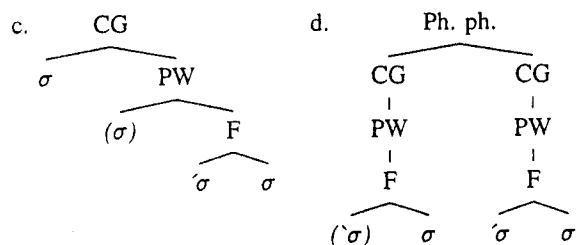
Figure 2: Syllable reduction: SwSw → wSw

Child	Target	Translation	Age
a. [na.má.ka]	/ù.na a.má.ca/	'one hammock' ⁴	1;8/10/11
b. [...na.mó.to]	/ùn.a mó.to/	'one motorbike'	1;9
c. [e. nó.no]	/á.se nó.no/	'he sleeps'	1;10

Table 6: SwSw → wSw in Phonological phrases

The generalization that emerges from the data is that there is a constraint that limits productions to two feet during the first four months. However, if we look closer to the type of structures involved in each case, a more complex picture appears (parentheses indicate the syllables that are omitted; brackets indicate that one syllable or the other (but not both) is omitted):





The structures in (4) show that there are constraints on the complexity of the prosodic structures the child can produce. In clitic groups such as (4b), two clitics cannot co-occur within a clitic group (e.g. Table 5: cases a. and e.), although the segmental information is sometimes ambiguous regarding which clitic is deleted. In phonological words such as (4a) and in phonological phrases such as (4d) which contain two bisyllabic words, two fully stressed feet are reduced to one stressed foot and another unary one (e.g. Tables 4 and 6), (see below for evidence of foot representation). Finally, in (4c), an unfooted syllable at the level of the phonological word is omitted even though syllables adjoined to the higher clitic group are retained (e.g. Table 5: b⁵, c, and d). Thus, there seems to be a constraint against phonological words and clitic groups being produced as two full feet.

Three facts support the presence of a unary foot in the structures in (4): First, the child seems to be aware of the segmental information being omitted, as can be seen in syllable merge phenomena (Table 5: cases c, d and others such as [a.mt.fo] for /à.ma.rt.fo/, 'yellow') and the variation in productions of either the first or the second syllables of a word as in /a.ma.rt.fo/ vs. [ma.rt.fo] for the target /à.ma.rt.fo/, 'yellow'. Second, feet such as those in (4d) are fully pronounced when produced in isolation (e.g. [ú.na], 'one' in cases a and b, Table 6). Finally, cases (4a) and (4c) show a different treatment of unfooted syllables and unary feet. The child realizes that the omitted syllable in (4a) belongs to foot structure while the extra word-level syllable in (4c) does not, and so it is omitted. Given this evidence, it is reasonable to assume that unary foot representations in (4a), (4b) and (4d) are available for the child.

5.2.1 Discussion

Production Constraints: Given the structures produced between 1;8 and 1;11 years old, the observed limitation can be explained in terms of a production constraint on prosodic complexity as follows: only one clitic or unary foot can branch off the higher node as sister of the stressed foot. The prosodic material outside of stressed feet can only be a clitic or a unary foot attached to the higher level of structure. For example, target words with the prosodic structure in (4c) undergo syllable omission because only clitics can appear at the higher level as sister of the stressed foot. The unfooted syllable of the phonological word cannot

be incorporated into the child's limited prosodic representation. The structure in (4a) also exhibits prosodic constraints: a phonological word can only be composed of one binary foot and one unary foot. Cases (4b) and (4d) are similarly explained.

Prosodic constraints apply to the child's well-formed underlying lexical representations generating outputs of similar prosodic complexity. The fact that these forms cannot be expressed in numerical terms (e.g. three syllable utterances as maximum) suggests that the constraints must be constraints on the complexity of prosodic output forms rather than memory or perceptual limitations. That these are production constraints is supported by the fact that the child often has full segmental and syllabic representations. This is shown in syllable merge type of phenomena and alternating productions of syllables.

Prosodic Sensitivity: Evidence supporting the relevance of different levels of prosodic structure are found in the data. For example, cases such as those represented in (4c) suggest that the child is aware of the distinction between clitic groups and phonological words. She prefers, in this structure, to omit the unfooted syllable of a phonological word but not the clitic attached to a higher level of prosodic structure. In addition, the child treats differently unfooted syllables and unary feet of a phonological word. (4a) shows that the second syllable of a foot is retained, whereas in (4c) the unfooted syllable of the phonological word is omitted.

Development: Note that the production of more complex prosodic patterns occurs at higher levels of prosodic structure (clitic groups/phonological phrases) rather than the lower level of phonological words. We take this to mean that the phrase level of representation is reached later for isolated words in the child productions, i.e., these words are stored and produced as isolated phonological words, not as part of larger phonological phrases. This could be accounted for the later appearance of secondary stress in phonological words. (Recall, as indicated in section 3, that Spanish assigns secondary stress at the level of the phonological phrase.) Thus, the fact that SwSw lexical items (phonological words) are reduced to wSw until quite late (2;2;1 years old), past the time when clitic groups and phrases are not, suggests that secondary stressed syllables are still stored and produced as weak syllables.

Other facts also support this view. First, words usually appear within larger phrases in adult speech (phonological phrases of one word are rare) and the child's parsing process proceeds top down, i.e., from phrases to words (Juszyk and Nelson, 1995, Gerken, 1993), so that secondary stress in isolated phonological words may take longer to be learned. In addition, the secondary stress of isolated words may not be present in larger phrases due to resyllabification (cf. section 3.3). Thus, phonological words may be stored as they are heard within larger phonological phrases, i.e., with weak syllables (wwSw) instead of secondary strong ones. As a result, prosodic constraints apply to phonological words until later because a canonical Sw foot cannot be represented in this position until secondary stress is realized. Given this, two foot clitic groups/phonological phrases can be produced whereas two foot phonological words take longer to appear.

6 Conclusions

In this study we examined the early utterances of one Spanish-speaking child and found that several facts point to early sensitivity to prosodic structure. First, the patterns of syllable omission depend on the complexity of prosodic structures at a given stage of development. Second, the child seems to be aware of the distinction between single lexical items (phonological words) and more complex clitic groups and phonological phrases. Overall, phonological words are reduced more than clitic groups and phonological phrases (sec. 3.1), and weak syllables within a phonological word are omitted in favor of clitics (sec. 3.2.). Finally, the prosodic development of clitic groups and phonological phrases differs from that of phonological words, indicating the child is aware of those prosodic distinctions.

The data support a prosodic model of production rather than a perceptual or the template account. On one hand, the prosodic development and the type of syllable omissions involved show that higher level production constraints limit the shape of early words. On the other hand, the child's performance is not determined by matching productions to strong-weak templates. In the reduction pattern SwSw → wSw, the target form in fact matches a two foot trochaic template. In contrast, we have demonstrated how the properties of Spanish phrase-level prosody (resyllabification) as well as the child's later realization of secondary stress on words pronounced in isolation can account for these otherwise surprising facts. The prosodic model of production therefore provides a framework for understanding the variability in syllable omission in early Spanish.

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Endnotes

- * Many thanks to Sofia's parents who patiently collaborated with this research.
1. For stress restrictions on the last-three syllables see Harris (1983).
 2. "A nonbranching phrase Y which is the first complement of another phrase X in its recursive side is joined into the phrase Y that contains X." (Nespor and Vogel, 1986 p. 173).
 3. Note that syllables from phonological words within phrases are not omitted as often as they are when pronounced in isolation. Our claim is that omissions have more to do with the prosodic structure involved than with other factors.
 4. *ú.na* 'one' is treated here as a numeral adjective and a phonological word. However, no difference has been observed in the treatment of this adjective and the determiner *ú.na/o* 'a'.
 5. Note that example b has the clitic to the right.