

The Relationship Between Word Prosodic Structure and Sentence Prosody

(Non)evidence from Brazilian Portuguese

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1. Introduction

In recent years a number of studies have addressed the acquisition of prosodic structure, in particular word stress (Fikkert 1994, Demuth 1996, Demuth and Fee 1995, Gerken 1994, Archibald 1995, Santos 2001, 2003, Grimm 2004, among others). The study of the acquisition of word stress has been subject to large debates. A number of researchers reported an early trochaic bias in the acquisition of particularly Germanic languages, both in perception (Jusczyk, Cutler and Redanz 1993) and in production (Allen and Hawkins 1978, 1980, Echols and Newport 1992, Gerken 1994, Fikkert 1994, among other). More recently many researchers have convincingly argued that this bias is not innate, but reflects language-specific knowledge (Vihman, DePaolis and Davis 1998, Santos 2001, 2003, 2006 among others). In our earlier work, we have compared word prosodic structure in the acquisition of Dutch and Brazilian Portuguese, where Dutch children have trochaic word patterns at a very early stage, while Brazilian Portuguese children seem to favor iambic word patterns (Fikkert and Santos 2005, Santos 2006).

One issue that has been raised in the literature on the acquisition of stress, but has not been discussed in much detail, is whether the acquisition of word stress is a process that is entirely a bottom up process, in the sense that the child's word template is being extended in the course of development, as proposed by Fikkert (1994), or whether top-down processes also influence the prosodic shape of early words, such as argued by Santos (2001, 2003) and Grimm (2006). In the latter view children start with larger prosodic units (utterances), which have their own intonation and intonational boundaries, which correlate with prosodic prominence. Santos and Grimm have hypothesized that the prosodic structure of words in isolation in fact reflects the prosodic structure of utterances, rather than word stress. If this is the case, the prosodic structure of words in utterances larger than a single word may be largely dependent on the prosodic structure of the utterance in which they occur.

In this paper we pursue the issue of whether the rhythmic structure of the utterance in which a word occurs could explain variation in the prosodic structure of the first words. In particular, we will address the question whether the iambic bias that has been reported in the acquisition of Brazilian Portuguese (Santos 2001, 2003, 2006, Bonilha 2005) could be due to prosodic context-effects in utterances.

The paper is organized as follows. Section 2 gives a global description of the prosodic structure of words in Brazilian Portuguese. Section 3 presents an overview of the studies on acquisition of primary word stress in Brazilian Portuguese. In

section 4 we formulate hypotheses that can be made if we assume top-down influences on word prosodic structure. In particular, we discuss predictions with respect to syllable deletion and insertion as a function of different rhythmic conditions in the utterance. Section 5 describes the methodology used in this study. Section 6 presents the results. Finally, section 7 presents some concluding remarks.

2. Word prosodic patterns in Brazilian Portuguese

In Brazilian Portuguese, word stress falls on one of the last three syllables of the word. The distribution of word prosodic patterns is different for nouns and verbs. According to Cintra (1997), in nouns, 18% has final stress (cf. 1a), 63% penultimate stress (cf. 1b), and 7% of the nouns have stress on the third syllable from the end (cf. 1c). Nouns, such as those in (2), which are often used in child-directed speech and hence are common in children's early vocabularies, almost always have final stress, as can be seen in the examples in (2a–c). On the other hand, nouns with a diminutive suffix, which also are very common in child language, change word stress to the penultimate syllable, as can be seen in (1d–f) and (2d–f).^{1,2}

- | | | | | | | | | |
|--------|------|---------|----------|---------|-----------|-------------|----------------|---------------|
| (1) a. | caFÉ | [ka fÉ] | “coffee” | d. | caféZInho | [kafÉ zi≠U] | “small coffee” | |
| | b. | CAsa | [kaza] | “house” | e. | caSInha | [ka zi≠a] | “small house” |
| | c. | Ônibus | [onibus] | “bus” | f. | onibuZInho | [onibu zi≠U] | “small bus” |
| | | | | | | | | |
| (2) a. | xiXI | [Si Si] | “pee” | d. | xixiZInho | [SiSi zi≠U] | “small pee” | |
| | b. | coCO | [ko ko] | “poo” | e. | cocoZInho | [koko zi≠U] | “small poo” |
| | c. | neNÊ | [ne ne] | “baby” | f. | neneZInho | [nene zi≠U] | “small baby” |

Verbs do not have a predominant pattern. Infinitives and the first and third person singular forms of the simple past tense have final stress (3a–c), while imperatives, gerunds, and the first and third person singular forms of the present tense have penultimate stress (4a–c):

- | | | | | | | |
|--------|-------|-----------|---------------|------|---------------------|--------------|
| (3) a. | faLAR | “to talk” | (4) a. | fale | “talk (imperative)” | |
| | b. | faLEI | “(I) talked” | b. | falo | “(I) talk” |
| | c. | faLOU | “(he) talked” | c. | fala | “(he) talks” |

It is worth mentioning that in Brazilian Portuguese the main acoustic correlate of primary stress is duration (e.g., Major 1985, Moraes 1987, Massini-Cagliari 1992).

¹ The discussion of whether in stress in words with a diminutive suffix is lexical or post-lexical is beyond the goal of this paper. We refer to Lee (1995) for a relevant discussion.

² Stressed syllables are indicated with capital letters.

3. The acquisition of Brazilian Word Stress

Claims on the acquisition of word prosodic patterns and word stress are often based on truncation patterns. Based on experimental evidence from truncation data, Rapp (1994) claims that Brazilian children display a trochaic pattern in the early words. This contrasts to a large number of studies on word stress acquisition in Brazilian Portuguese, which have reported an iambic bias at the early stages of the acquisition process (Santos 2001, 2003, 2006, Bonilha 2005, Baia to appear).

Rapp's claims were based on experimental data. She conducted an experiment that induced the deletion of weak syllables and found that children between 1;6 to 2;0 years old produced 51% of the words as trochees and only 38% as iambs, which led her to argue in favor of a trochaic bias. However, the experiment had more targets where the deletion of unstressed syllables resulted in trochees, than targets that would result in iambs. A reanalysis of her data presents a completely different picture: target iambs, such as *caFÉ* "coffee", are produced correctly in 87,2% of the cases, while for trochees, such as in *CAsa* "house" the percentage correctly produced forms was 82%. Target iambs were produced as monosyllables in 10,6%, while this was 10,2% for trochees. Finally, stress errors were rare: for target iambs the percentage of stress errors was 2,1%, while for target trochees it was 2,6%. From this reanalysis we can draw the conclusion that children do not treat iambs and trochees differently. In other words, these data do not show a bias for either a trochee or an iamb.

Based on analyses of spontaneous longitudinal data from Brazilian children Santos (2001, 2003, 2006), Fikkert and Santos (2005), Bonilha (2005), and Baia (to appear) argued that at the early stages these children showed a predominance of iambic word forms. They give different explanations for this finding. Santos (2001, 2003, following Scarpa 1999) argued that the predominance of iambic patterns reflects sentence prosody, rather than word prosody. In particular, based on the analysis of whole sentences, she claimed that children's iambic word patterns are the result of intonational prominence. This prominence falls at the right edge of an utterance boundary, and hence looks iambic.

Santos (2006), Fikkert and Santos (2005), Bonilha (2005), and Baia (to appear) looked at the prosodic structure of words out of context. Santos (2006) analyzed isolated words in the same corpus as presented here, analyzed them according to the same method as used in Fikkert (1994) and compared the results with those reported for Dutch in Fikkert (1994). Fikkert (1994) showed that Dutch children produce trochees correctly from a very early stage onwards; while iambs are truncated to monosyllables (WS >> S) and trisyllabic words with medial stress are truncated to trochees (WSW >> SW). In other words, the initial unstressed syllable often is not produced. On the other hand, monosyllables do sometimes have an inserted syllable to the right edge (S >> SW), giving rise to a trochaic pattern. The results of Santos' study show that Brazilian children correctly produce iambs until the age of 1;7, but they often truncate trochees to monosyllables (SW >> W). If they insert syllables these appear to the left edge of monosyllables and disyllabic trochees (S(W) >> WS(W)), while trisyllabic words with medial stress are truncated to iambs (WSW

>> WS). This pattern seems to be the exact opposite of that of the Dutch children. Whereas Dutch children seem to aim at producing trochees, Brazilian children aim at producing iambs. In short, there is no evidence for a universal trochaic bias.

4. Hypotheses

In this paper we investigate the role of sentence prosodic structure on the realization of word prosodic structure. From earlier research we know that stressed syllables are more prominent, and that children are more likely to pay attention to prominent syllables (e.g., Waterson 1971, Jusczyk, Cutler and Redanz 1993). Moreover, in general syllables at the end of intonational phrases are lengthened (Hayes 1995), whereas syllables at the beginning of phonological phrases are more carefully produced (Cho and Keating 2001). Furthermore, languages try to optimize the rhythmic structure of utterances (Nespor and Vogel 1986). Based on these insights, our hypothesis is that the position of the word in the utterance may influence the prosodic shape of children’s first words, which is an alternative account for syllable deletion and insertion in early child data.

In this paper we analyze children’s realization of the prosodic structure of target words in three contexts: First, words in one-word utterances, such as exemplified in (5); second, words at the edge of an intonational boundary, like in (6); and third, words that are not at an intonational boundary, as in (7):³

- | | | |
|-----|---|------------------|
| (5) | [ca VAl o] _{IP} | “horse” |
| (6) | [o ca VAl o] _{IP} | “the horse” |
| (7) | [o ca VAl o saiu] _{IP} | “the horse left” |

The first context is a neutral condition, in the sense that there can be no clashes or lapses in this context. However, in a one-word utterance, the word-initial syllable is also at the beginning of an intonational phrase, and hence, may be produced more correctly, while in this context the final syllable will be lengthened due to phrase-final lengthening.

The second context should allow us to see whether children take adjacent words, and in particular, adjacent syllables (weak or strong) into account. For instance, if a weak syllable of a word is preceded by a weak syllable in the preceding word, and hence is in a lapse context, this may more frequently lead to truncation of that syllable than in a neutral context.

Finally, the third context should allow us to investigate the influence of edges of intonational phrases. It allows us to test whether weak syllables are more often retained in phrase-initial or phrase-final position than elsewhere. To summarize, we will test the following contexts.

³ The relevant context is in bold.

First, contexts that favor the retention of unstressed syllables are given under (8a). These include contexts where a weak syllable at the edge of a word is preceded or followed by a strong syllable of another word. We do not expect children to add or delete syllables, as the resulting structure is rhythmically optimal. Examples are given in (9a). A similar prediction is made for the contexts given in (8b), where a strong syllable at the edge of a word is preceded or followed by a weak syllable of another word. Examples are given in (9b). Again, we do not expect children to add or delete syllables, as the resulting structure is already rhythmically optimal. On the other hand we predict weak syllables to be prone to deletion in the context where a weak syllable at the edge of a word is preceded or followed by a weak syllable of another word, as in (8c), and the examples in (9c). In these contexts there is a rhythmic lapse (two adjacent weak syllables).⁴ Finally, the insertion of an additional syllable is most likely to occur in the contexts given in (8d), in which the initial stressed syllable of a word is preceded by the stressed syllable of the preceding word, or the final stressed syllables of a word is followed by the stressed syllable of the next word. In these contexts there is a stress clash, and hence, we predict that these contexts are favorable for syllable insertion to undo the clash. Examples are given in (9d).

- (8) a. S – WS(W), where a WS(W)⁵ word is preceded by a strong syllable
 (W)SW – S, where a (W)SW pattern is followed by a strong syllable
 b. W – S(W), where a S(W) word is preceded by a weak syllable
 (W)S – W, where a (W)S word is followed by a weak syllable
 c. W – WS(W), where a WS(W) word is preceded by a weak syllable
 (W)SW – W, where a (W)SW word is followed by a weak syllable
 d. S – S(W), where a S(W) word is preceded by a strong syllable
 (W)S – S, where a (W)S word is followed by a strong syllable
- (9) a. TÁ feCHAdo “it’s closed”
 SAco FEIo “ugly bag”
 b. a CAsa “the house”
 caFÉ peQUEno “small coffee”
 c. a meNIIna “the girl”
 CAsa verMEIha “red house”
 d. TÁ FEIo “it’s ugly”
 caFÉ FORte “strong coffee”

⁴ In the context (W)SW-W there are two possible deletions: the deletion of the weak syllable of the target word (WSØ-W) and the deletion of the weak syllable of the adjacent word (WSW-Ø). However, sometimes the adjacent word is a monosyllabic word. Therefore, if children deleted that syllable, there would be no trace to postulate its existence. Therefore, we only consider cases where the deletion involved a syllable of the target word.

⁵ Parentheses indicate optionality. In the contexts described here, this indicates that the target word can either be bisyllabic or trisyllabic. A similar situation holds for the context.

5. Methodology

The corpus that forms the basis for our investigation is part of the *Projeto de Aquisição da Linguagem* of the Universidade Estadual de Campinas (Lemos 1995) and the *Projeto de Aquisição do Ritmo* of the Universidade de São Paulo (Santos 2005). Our corpus consists of production data from two Brazilian children, from 1;4 to 2;0 years of age. Both children come from the state of São Paulo. Spontaneous interactions of the children with their parents were audio-recorded on a monthly basis in half-hour sessions. The data were phonetically transcribed by the first author and later double-checked by other trained native speakers. Only data for which full agreement between the transcribers was reached are taken into consideration here. We selected words that appeared minimally eight times, so that the same words may be analyzed in different contexts.

The following prosodic word patterns were attested:

- | | | | |
|---------|-------------------------|--------|----------|
| (10) a. | SW (trochee) | GAtó | “cat” |
| b. | WS (iamb) | caFÉ | “coffee” |
| c. | WSW | meNIna | “girl” |
| d. | S (strong monosyllable) | pé | “foot” |

The word pattern in (10a) and (10b) are particularly important to analyze, because these could be target to truncation (SW, WS >> S), or stress errors (SW >> WS, or vice-versa). The insertion of syllables is also possible (SW >> WSW; WS >> WSW). A trisyllabic word with medial stress (as in (10c)) could be truncated either to a trochee (WSW >> SW) or to an iamb (WSW >> WS). Finally, a monosyllabic word, such as in (10d) could be changed to a trochee or an iamb, depending on the position of the inserted syllable (S >> SW; S >> WS). In (11) possible realizations of different target prosodic patterns are illustrated.

- | | | | |
|---------|--------|----|---|
| (11) a. | CArro | >> | [^l ka.u] ~ [ka] ~ [ka ^l ka] “car” |
| b. | miGUEL | >> | [mi ^l ge] ~ [ge] ~ [^l mige] <i>proper name</i> |
| c. | meNIno | >> | [mi ^l ni] ~ [^l ninu] “boy” |
| d. | PÉ | >> | [p ^l] ~ [a ^l p ^l] “foot” |

In total, there were 1332 tokens taken into account. Two types of words were left out of the analysis. First, the reduplicative ‘familiar’ words, such as those in (2a–c), which invariably have final stress, and second, words with a diminutive suffix, which invariably have penultimate stress.

The words were classified according to the context in which they appear (see also (8)): whether the word forms a one-word utterance, whether the word occurs at an intonational boundary, and whether adjacent syllables were strong or weak. In

Table 1 an example for each of these contexts is provided to illustrate the way in which a word can be classified:⁶

	Target word /ka. ¹ va.lu/ “horse”	No. of adjacent syllables	Left syllable	Right syllable	IP boundary
a.	[<u>ta</u> . <u>ka</u> . ¹ <u>ka</u> . ¹ la. ¹ tej]	2	W	S	no
b.	[ka. ¹ la. ¹ le]	0	∅	∅	yes (RL)
c.	[ka ka]	0	∅	∅	yes (RL)

Table 1: Classification of the target words

6. Results

Below we present the results for the individual contexts as sketched in (8) above. We discuss the contexts, which are most susceptible to change, because the target word either forms a lapse (section 6.1) or a clash (section 6.2) with the adjacent syllables. In 6.3 the situation in which target words and surrounding syllables form optimal rhythmical patterns (8ab). In this context target words should be least prone to change. Finally, in 6.4 we present the results for targets that are at initial or final intonational boundaries.

6.1 Adjacent weak syllables (W – W) – Contexts with a lapse

In Table 2 below we have given the raw numbers of instances where a weak syllable is deleted or maintained. This is graphically represented in Graph 1. However, one should bear in mind that the percentages are indicative of the development only, as the numbers at early stages of development are usually too low to justify the use percentages.⁷ The table and graph show the results for the context in which a lapse occurs, at respectively the left (W – WS(W)) and the right ((W)SW – W) edge of the target word. Deletion at the left edge results in a trochee or a monosyllable (W – ∅ S(W)). As can be seen, deletion at the left edge was more common around the age of 1;6 and 1;7, but in the majority of the cases the children produced the weak syllable. On the other hand, deletion of weak syllables at the right boundary would result in iambs or monosyllables ((W)S∅ – W). As can be seen, deletion was rare, and only appeared after 1;9. An example of a target word in a lapse context at the left boundary is presented in (12).

(12) [ta ka | kala |tej] W – WSW caVAlo “horse” R. 1;6

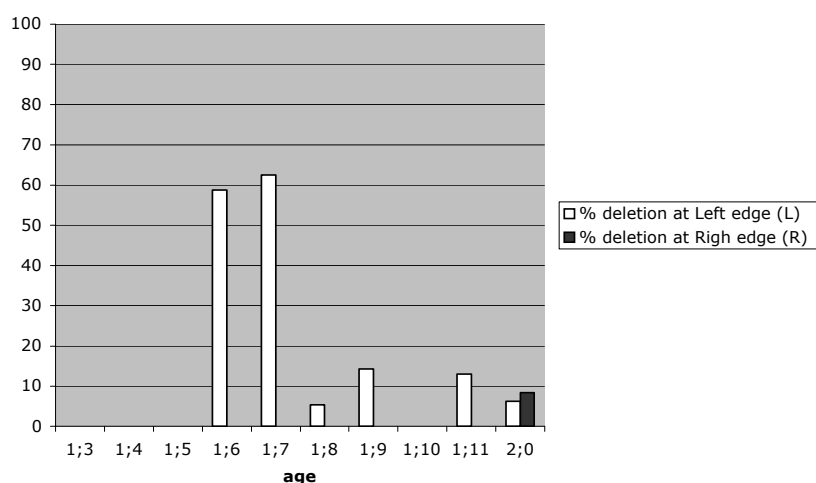
⁶ When there are adjacent syllables or words, the target word is underlined, as in (a).

⁷ A “*” marks cases, in which the number is too low to give percentages.

Age	1;3	1;4	1;5	1;6	1;7	1;8	1;9	1;10	1;11	2;0
Syllable deletion L	0	0	2*	10	5	1	1*	0	3	1
Maintenance L	0	5*	0	7	3	18	6*	0	20	15
% del L				58,8	62,5	5,3			13	6,3
Syllable deletion R	0	0	0	0	0	0	1*	1*	1*	1
Maintenance R	0	0	0	1*	0	2*	4*	1*	6*	11
% del R										8,3

Table 2: Raw numbers of instances of weak syllable deletion and maintenance of weak syllables at the L(ef) or R(ight) word boundary, given per month

Adjacent weak syllable at left/right word boundary



Graph 1: Adjacent weak syllables at the left and right boundary of a WS(W) target

6.2 Adjacent strong syllables (S – S) – Contexts with a clash

Table 3 and Graph 2 show the resulting patterns in the context in which the strong syllable of the target is adjacent to another strong syllable at respectively the left (S – S(W)) and right edge of the target word ((W)S – S). An example of such a context is given in (13). In this context, the insertion of a syllable would create an iamb (S – wS), whereas the insertion at the right boundary would create a trochee (Sw – S).

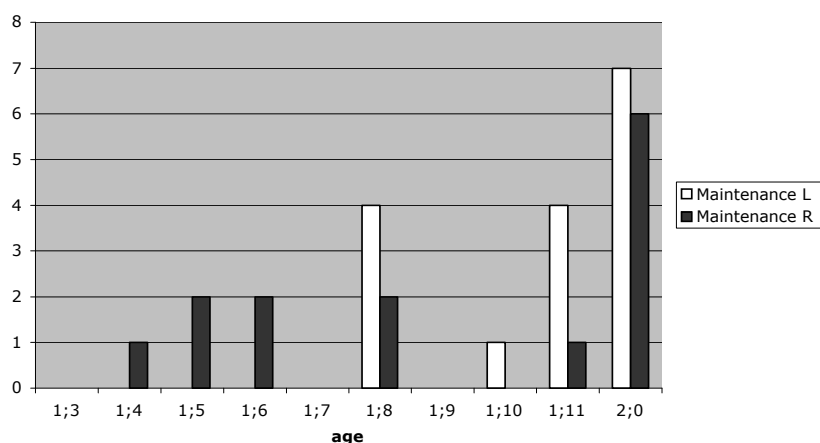
(13) [ka | i. | **bi**Su] S – SW caIR BIcho “fell animal” L.2;0

(14) [avopoesaki] S – SW eu **VOU** POR “I’m gonna R.2;0
Esse aQUI put this one here”

Age	1;3	1;4	1;5	1;6	1;7	1;8	1;9	1;10	1;11	2;0
Syllable insertion L	0	0	0	0	0	0	0	0	0	0
Maintenance L	0	0	0	0	0	4	0	1	4	7
Syllable insertion R	0	0	0	0	0	0	0	0	0	0
Maintenance R	0	1	2	2	0	2	0	0	1	6

Table 3: Raw numbers of instances of syllable insertion and maintenance of clash situation at the L(ef) and R(ight) word boundary, given per month

Adjacent strong syllable at left/right word boundary



Graph 2: Adjacent strong syllables at the left/right boundary of a S(W) / (W)S target

6.3 Adjacent syllables in rhythmically optimal contexts

Target word can also appear in various contexts that are rhythmically optimal because strong and weak syllables alternate. Table 4 and graphs 3 show the result in the context where a strong syllable precedes a target word that starts with a weak syllable (S – WS(W)), and the context where a strong syllable follows a target word that ends with a weak syllable (SW – S). If children would delete or insert a syllable, they would create a lapse (S – wWS(W)) or a clash (S – \emptyset S(W)). As we can see below, this never happens. Children did not delete or insert syllables, as shown in (15), except in three instances, one of which is shown in (16).

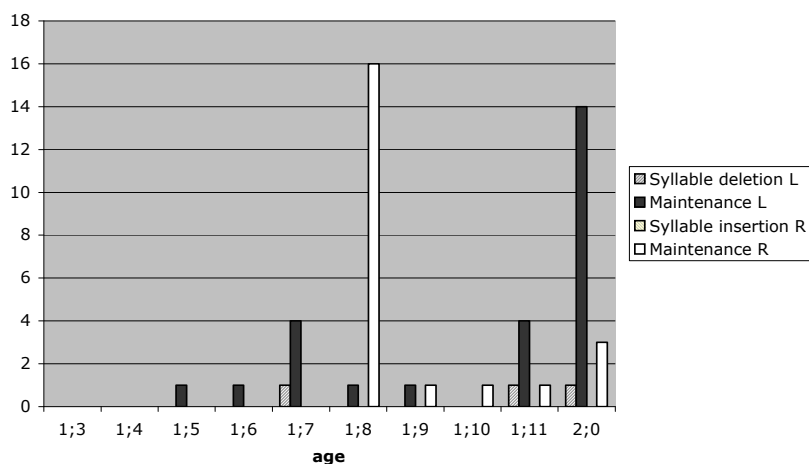
(15) [pEgaeli] PEga Ele “Get him!” R.2;0

(16) [esitadaj] esse esTÁ doDÓi “This is hurting” L.1;11

Age	1;3	1;4	1;5	1;6	1;7	1;8	1;9	1;10	1;11	2;0
Syllable deletion L	0	0	0	0	1*	0	0	0	1*	1
Maintenance L	0	0	1*	1*	4*	1*	1*	0	4*	14
Syllable deletion R	0	0	0	0	0	0	0	0	0	0
Maintenance R	0	0	0	0	0	16	1*	1*	1*	3*

Table 4: Raw numbers of instances of syllable deletion and maintenance of a rhythmically optimal situation at the L(ef) (S – WS) and R(ight) (SW – S) word boundary, given per month

Deletion and maintenance in rhythmically optimal contexts



Graph 3: Adjacent strong syllable at the left boundary of a target starting with a weak syllable and the right boundary of a target ending with a weak boundary

6.3 Intonational phrase boundaries

Finally, in this section children's production of the target words at intonational boundaries are presented. First, we present the results of syllable deletion when the target word was at the beginning or at the end of an utterance containing more than one word. Then, the results for words that were produced in isolation – therefore, presenting intonational boundaries on both sides – are discussed.

6.3.1 Intonational phrase at one side of the word

Table 5 and Graph 4 show the result for the context in which the initial weak syllable of target words is at the beginning of the utterances (left edge), and hence at the beginning of the intonational phrase. Deletion in this context would create

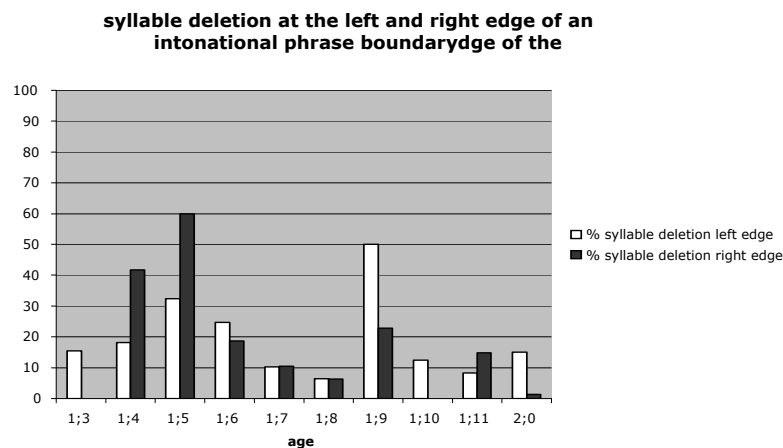
monosyllables ($_{IP}[WS \gg _{IP}[S]$) or trochees ($_{IP}[WSW \gg _{IP}[SW]$). As we can see from Table 5 and Graph 4, from the onset of speech children more often maintained the weak initial syllables than that they deleted those syllables. Some examples are given in (17) and (18).

Graph 4 also depicts the resulting production forms for target words with a weak final syllable at the end of the intonational phrase. In this context deletion would result in monosyllables ($(SW)_{IP} \gg S_{IP}$) or iambs ($(WSW)_{IP} \gg WS_{IP}$). As can be seen below, until 1;5 there was almost an equal proportion of deletion and maintenance of final weak syllables. After 1;6, the final weak syllable is more often kept than deleted. Some examples are given in (19) and (20).

- (17) [abila] aBRIR lá “open it there” R. 2;0
 (18) [kOlati] saCOla aQUI “bag here” R. 1;6
 (19) [adelabOla] caDÊ a BOla “where’s the ball?” R. 1;6
 (20) [abo] a BOla “the ball” R. 1;7

Age	1;3	1;4	1;5	1;6	1;7	1;8	1;9	1;10	1;11	2;0
Syllable deletion L IP	2	6	12	18	6	3	18	1	3	8
Maintenance L IP	11	27	25	55	52	43	18	7	33	45
Syllable deletion R IP	6*	25	24	17	4	5	21	0	7	1
Maintenance R IP	1*	35	16	74	34	73	71	5*	40	78

Table 5: Raw numbers of instances of syllable deletion and maintenance at the L(ef) (S – WS) and R(ight) (SW – S) edge of an intonational phrase boundary



Graph 4: Weak syllable deletion at the edges of intonational boundaries

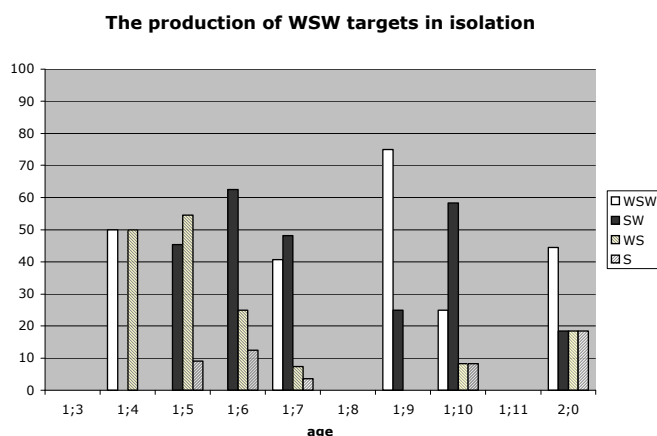
6.3.2 Targets in one-word utterances

Table 6 and Graph 5 show the results of a sub-group of the data analyzed in graph 4: WSW target words that are produced in isolation, and therefore have an IP boundary at both the right and the left edge of the word. Although this group is not large, it is of interest as here, deletion at the left boundary would create trochees ($[WSW]_{IP} \gg [SW]_{IP}$), and deletion at the right boundary iambs ($[WSW]_{IP} \gg [WS]_{IP}$). Of course, children could in principle also delete both weak syllables and produce a monosyllable: $[WSW]_{IP} \gg [S]_{IP}$. As we can see in Graph 5, until 1;5 children more often deleted the final weak syllable, thereby producing iambs, than the initial weak syllable (as also shown by Santos 2006, and Fikkert and Santos 2005). However, from 1;6 onwards trochees outnumbered iambs, until at 1;7 WSW productions appeared in the children's output. There were only a few cases in which both weak syllables were deleted. Examples are given in (21)–(24).

- (21) [ˈsa] saCOla “bag” R. 1;6
 (22) [kaˈwa] caVAlo “horse” R. 1;6
 (23) [ˈkOla] saCOla “bag” R. 1;7
 (24) [miˈniːna] meNIːna “girl” R. 2;0

Age	1;3	1;4	1;5	1;6	1;7	1;8	1;9	1;10	1;11	2;0
WSW	0	5	0	0	11	0	6	6	1*	12
SW	1*	0	5	5	13	2*	2	14	0	5
WS	6*	5	6	2	2	0	0	2	0	5
S	0	0	1	1	1	0	0	2	0	5

Table 6: Raw numbers of instances of realization of WSW target, in isolation



Graph 5: Targets with both weak initial and final syllables at IP boundaries

7. Conclusion

The data presented in this paper show that in contexts that would be rhythmically improved by either syllable deletion or insertion, children do not use this strategy systematically. Deletion is not very common in either context. Insertion of a syllable is very rare. In section 3 we raised the hypothesis that the shape of early words could be influenced by the context in which these words appear. We based our hypothesis on the fact that (a) children pay attention to the salient characteristics of the utterances (strong syllables are more prominent than weak ones, lengthened syllables are more prominent than syllables that do not undergo final lengthening), and (b) the assumption that children will optimise the rhythmic structure of an utterance (and hence avoid producing lapses and clashes). Many studies (for example, Cutler and Butterfield 1990, 1992; Cutler and Norris 1988, Mehler, Dommergues, Frauenfelder and Segui 1981, and Otake, Hatano, Cutler and Mehler 1993, among others) have pointed out that adults use strategies based on the rhythmic properties of their native language to segment speech. Other studies have shown that from an early developmental point, children can distinguish rhythmic classes (see Nazzi, Bertoni and Mehler 1998, among others) and discriminate words based on word stress (see Sansavini et al 1997, among others).

From the results in this we can conclude that the context in which target words appear does not influence the prosodic shape of early word production by children acquiring Brazilian Portuguese. The words in two and multiword utterances show the same pattern as those in isolation. They are either produced correctly, or favor iambic patterns. Of course, one-word utterances outnumber the two- and multiword utterances, but the hypothesis that word stress should in fact be interpreted as sentence stress is not confirmed by our analyses. Hence, it seems that for sentence prosody a different strategy is used, which is independent from the acquisition of word stress. We therefore argue that the word prosodic patterns are not based on sentence stress, but reflect children's knowledge of the stress patterns of words.

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