

# **Influence of Prosody on the Production of Determiners and Adjectives in Two-year-old Children's Sentences**

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## **1. Research questions**

This paper focuses on the influence of prosody on determiner production in two-year-old children. More specifically, we address the following question: how does the presence of a bisyllabic noun or a prenominal adjective affect the production of the determiner in French child language?

## **2. Introduction**

We know that one- and two-year-old children omit unstressed syllables. In their 2004 study, Kirk and Seidl show that the truncation of unstressed syllables is not perceptually-based. Children look longer at a target when they hear the complete form of the word than when they hear a truncated form of the word. This shows that they have a lexical representation of the omitted syllables in their lexicon. The phenomenon finds an explanation in production based-accounts of syllable truncation.

There are two different types of production accounts of syllable truncation. According to the first one, production is constrained by the child's articulators; according to the second one, production is constrained by the child's grammar. Kirk and Seidl point out that evidence from crosslinguistic research suggests that problems with the production of initial unstressed syllables in English may be due to grammatical constraints. Crosslinguistic research demonstrates that young children learning to speak Spanish produce words containing unstressed initial syllables approximately 6 months before children learning English or Dutch. This is probably due to the higher frequency of prosodic words of this weak-strong shape in Spanish than in either English or Dutch. It seems unlikely that Spanish-speaking children have a more advanced control over their articulators than their English- and Dutch-speaking peers (Demuth 2001). A more likely explanation for the later acquisition of initial unstressed syllables in English and in Dutch is that prosodic development is shaped by the structure of the ambient language.

A number of studies show that omission of unstressed syllables in multisyllabic words depends on the stress pattern of the language (among others Demuth, 1996; Lléo, 2006; Prieto, 2006). In English, Spanish, and Dutch, trochaic (strong-weak) feet are dominant. Two and three-year-old English-speaking children tend to produce the first syllable of the word "zebra", but they tend to omit it in "giraffe" and "banana" (example 1), where it doesn't fit the trochaic pattern of the language.



|     |   |   |
|-----|---|---|
| (4) | <b>No focal stress on V:</b>  | Object article production<br>(within subject condition) |
|     | a. [[he] KISSED the] <sub>PW</sub> [DOG] <sub>PW</sub> ] <sub>PhP</sub>                   | 68%   |
|     | * S            w            S-(w)   |   |
|     | <b>Focal stress on V:</b>   |   |
|     | b. [[he] KISSED] <sub>PW</sub> ] <sub>PhP</sub> [[the DOG] <sub>PW</sub> ] <sub>PhP</sub> | 58%   |
|     | * S-(w)                    * S-(w)  |   |

Gerken finally examines contexts where an adjective intervenes between the determiner and the noun, as in (5c), and compares them to a monosyllabic (5a) and to a bisyllabic condition (5b). She argues that an object NP containing more than one prosodic word must form its own phonological phrase. This prevents attachment of the determiner to the foot headed by the verb. Indeed, there is less determiner production in the condition with an adjective.

|     |   |                           |
|-----|---|---------------------------|
| (5) |   | Object article production |
|     | a. [[He KISSED the] <sub>PW</sub> PIG] <sub>PW</sub> ] <sub>PhP</sub>   | 59%                       |
|     | * S            w            S-(w)   |                           |
|     | b. [[He KISSED the] <sub>PW</sub> BABy] <sub>PW</sub> ] <sub>PhP</sub>  | 61%                       |
|     | * S            w            S-w   |                           |
|     | c. [[He KISSED] <sub>PW</sub> ] <sub>PhP</sub> [[the BROWN] <sub>PW</sub> PIG] <sub>PW</sub> ] <sub>PhP</sub> | 33%                       |
|     | * S-(w)                    * S-(w)            S-(w)   |                           |

### 3. The present study

In the present study, we are interested in determiner omission in French. French is stress-final (Paradis, Petitclerc & Genesee, 1997). It has been argued by Goad and Buckley (2006) that French has iambic, weak-strong, feet and that children’s productions are guided by this pattern (also Demuth & Johnson, 2003). They tend to produce the initial syllable in words like in “merci” that are wS but to omit it in wwS words like “difficile” (example 6).

|     |                            |
|-----|----------------------------|
| (6) | merCI            diffiCILE |
|     | w---S            * w--S    |

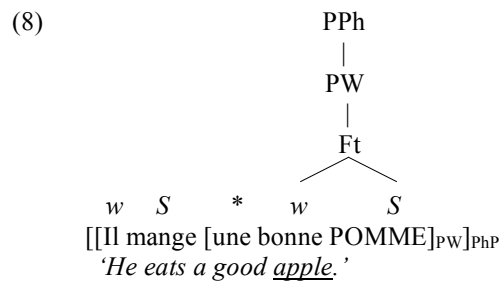
(Goad & Buckley, 2006)

We used Gerken’s methodology to determine how the iambic structure of French may explain determiner omission in sentences with monosyllabic nouns, bisyllabic nouns, and monosyllabic nouns preceded by a monosyllabic adjective.

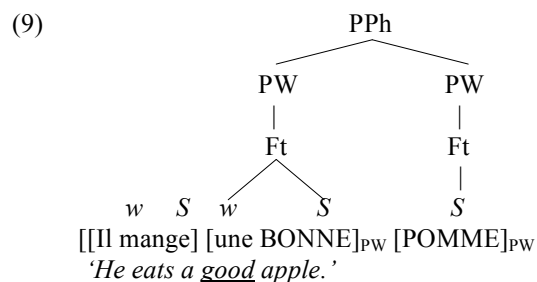
If prosodic structure develops gradually, and if the production of French-speaking children is segmented in iambic feet, we predict that determiners preceding a monosyllabic word will tend to be pronounced (7a), while determiners preceding a bisyllabic noun will tend to be omitted because they are not integrated into an iambic foot (7b).

- (7) a. [[Il mange] [une pomme.]<sub>PW</sub>]<sub>PPh</sub>  
           w S       w S  
           ‘He eats an apple.’  
 b. [[Il mange] [une banane.]<sub>PW</sub>]<sub>PPh</sub>  
           w S       \* w S  
           ‘He eats a banana.’

Consider now the case of the prenominal monosyllabic adjective. Here, there are two possibilities. If the prenominal adjective is unstressed, it should combine with the noun in a prosodic foot, as in (8). In that case, the determiner should tend to be omitted, just as with a binominal noun. This is coherent with the hypothesis defended by Lamarche (1991) that prenominal adjectives attach directly to the N node, forming a type of compound with the noun.



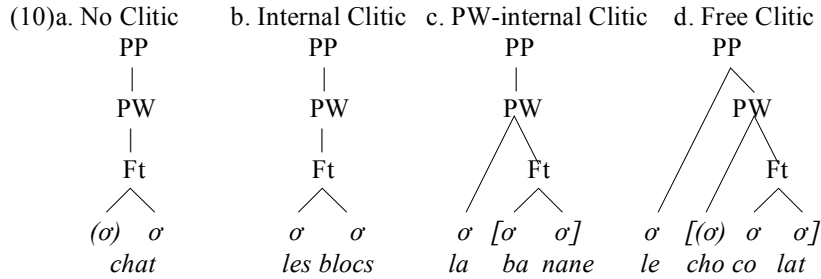
The adjective may also receive independent stress, as in the alternative structure in (9). In that case, the determiner should be able to form an iambic foot with the adjective. If so, we should find the same ratio of determiner omission as with a monosyllabic noun.



Taken together, the two structures lead us to expect as many or fewer determiner omissions in the adjective condition than in the bisyllabic noun condition.

The previous hypotheses assumed that the children are at a stage of development where their prosodic structure is limited to the construction of binary feet. However, Tremblay and Demuth (2007) argued that there is a progression in the locus of attachment of determiners within the prosodic

structure. After a first stage in which there is no determiner (10a), determiners evolve from being prosodically licenced as part of a binary foot (10b), to being cliticized to the prosodic word (10c), to being free clitics, attached to the prosodic phrase (10d). The third stage is the one generally postulated for non elided clitics in the adult grammar. In analyzing the results, we therefore have to consider these possibilities.



#### 4. Experiment

Nine normally developing children acquiring French in Québec, 6 boys and 3 girls, participated in a repetition task. Their ages ranged from 22 to 31 months (MLU 2.6 to 3.75). Their responses were audio- (digitalized at 22,050 Hz) and video-recorded.

The stimuli included 18 sentences with a monosyllabic noun, 18 sentences with a bisyllabic noun, and 18 sentences with an adjective followed by a monosyllabic word, for a total of 54 utterances for each child. Examples are given in (11). All the words were familiar to two-year-old children.

- (11) a. Il mange une pomme. ‘He eats an apple.’  
 b. Il mange une banane. ‘He eats a banana.’  
 c. Il mange une bonne pomme. ‘He eats a good apple.’

We collected a total of 432 utterances. The children’s responses were transcribed using broad phonemic transcription. The transcriptions were checked by two independent raters; 8% of the transcriptions were coded differently by the two raters. Only 18 of these differences were relevant to our study. The two raters met and agreed at a unique transcription for every case except one, which was dismissed from the analyses.

## 5. Results

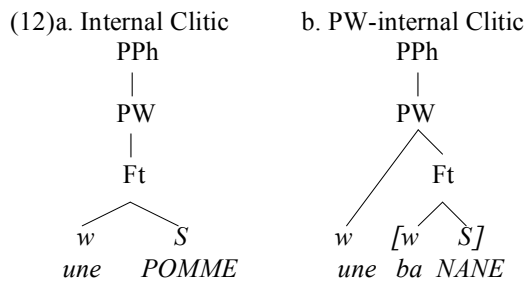
The results are summarized in Table 1. We see that there are more correct answers for monosyllabic nouns than for bisyllabic nouns, and more correct answers for bisyllabic nouns than for the adjective condition. The difference between the three conditions, comparing correct answers with the total of incorrect answers, is significant (chi-square (2df) =33.168327, p<0.0001).

**Table 1 – Global results per condition**

|          | No answer | Omission |          |     |         | Correct answer | Other | N   |
|----------|-----------|----------|----------|-----|---------|----------------|-------|-----|
|          |           | det      | 1st syll | adj | det+adj |                |       |     |
| mono     | 2%        | 5%       | -        | -   | -       | 87%            | 6%    | 148 |
| bisyll   | 4%        | 13%      | 3%       | -   | -       | 73%            | 7%    | 139 |
| mono+adj | 10%       | 18%      | -        | 6%  | 3%      | 57%            | 6%    | 144 |
| N        | 23        | 52       | 4        | 8   | 4       | 313            | 27    | 431 |

### 5.1 Bisyllabic nouns vs monosyllabic nouns

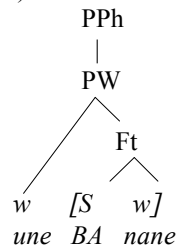
As expected, there is more determiner omission with bisyllabic nouns than with monosyllabic nouns. The difference in the percentage of determiner production in the two conditions replicates the results of Gerken and of Tremblay and Demuth. In the bisyllabic noun condition, we also counted 3% omission of the first syllable of the noun. This omission yields a sequence Det + monosyllabic noun, which may be integrated into the pattern for monosyllabic nouns (10a). This is straightforwardly accounted for under the hypothesis that there is a development in determiner attachment site. In a first stage, determiners are attached to a monosyllabic noun within an iambic prosodic foot (12a). For bisyllabic nouns, the determiner must be attached higher, at the prosodic word level (12b). This is a second stage of development.



We observed 46 cases where the first syllable of the bisyllabic noun is stressed. This should be related to the possibility in French of optionally placing secondary stress on the first syllable of a group, thereby forming a trochaic foot,

according to Goad and Buckley (2006). Here again, the determiner must be attached higher than the foot level (13).

(13) PW-internal Clitic



One example isn't explained by these structures. It is a case where the child stresses the determiner as well as the first syllable of the bisyllabic noun, producing two prosodic words.

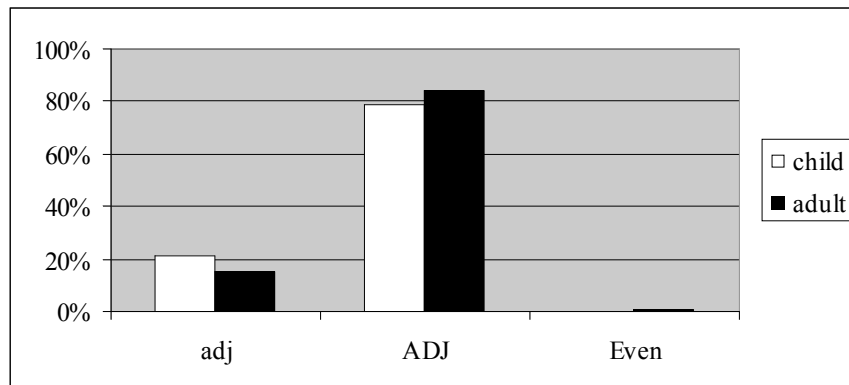
## 5.2 Adjective condition

Turning now to the adjective condition, we see in Table 1 that children refused to repeat the sentence more often in this condition than in the other two conditions. There is also more determiner omission in the adjective condition, and there is adjective omission. Moreover, the adjective condition is the only one that the older children failed.

Let us come back to the two predictions discussed in (8) and (9). If children construct linear sequences of iambic feet, both structures lead us to expect that the percentage of determiner omissions would be either similar to the one found with monosyllabic nouns, as in (8) or similar to the bisyllabic noun condition, as in (9). The results of our experiment did not support these predictions.

In view of these results, we decided to study in more detail the children's productions for the adjective condition. The aim was to determine whether the child placed stress on the adjective or not. This could give us an idea of the prosodic structure preferred by young children. We selected the cases where the stimulus was Det + Adj + N, where the child's utterance was interpretable and where the Adj and the N produced by the child were conform to the model (excluding the cases where the Adj was omitted). The children's utterances were coded for stress assignment by three independent raters. Each word was coded: accented, non-accented, even or unassignable. If there was no agreement the stress assignment was judged indeterminable. We also compared the child's utterance with the stimulus produced by the adult experimenter.

Figure 1 shows that the child produced the adjective stressed a little bit less often than the adult.



**Figure 1 - Comparison child-adult on the adjective condition**

Consider first the case of unstressed adjectives. Our hypothesis in (8) assumes that the unstressed adjective forms a type of complex word with the N, following an analysis proposed by Lamarche (1991). In this structure, the determiner cliticizes to the prosodic word (14), and we expect the same rate of determiner omission as with bisyllabic words.

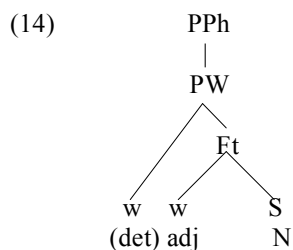
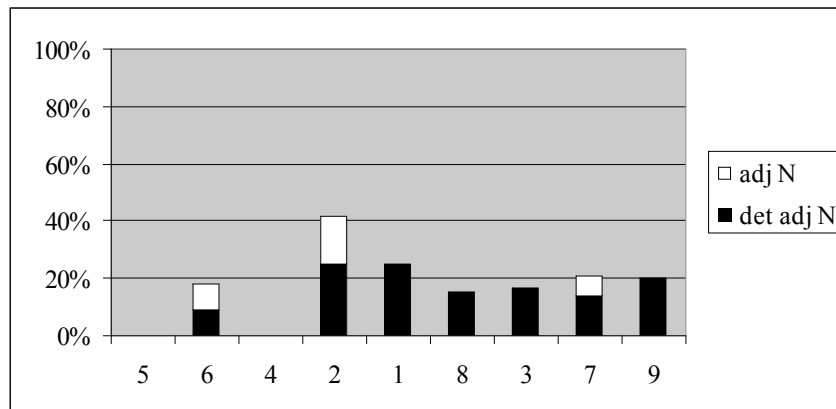
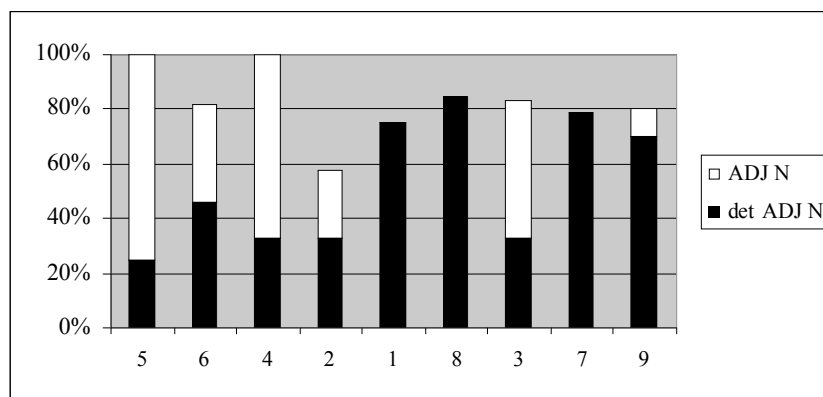


Figure 2 displays the children's utterances containing an unstressed adjective. In the figure, the children are displayed according to age in months; the numbers under the lines indicate the rank order of each child in term of MLU. Only 21% of the children's productions (17) contain an unstressed adjective, 16% with a determiner and 5% without. Two of the youngest children didn't produce any unstressed adjective (subjects 4 and 5). It is not clear that there is a progression with age or with MLU on the rate of production of the sequence of determiner + unstressed adjective + N.



**Figure 2 - Production of unstressed adjectives per age**

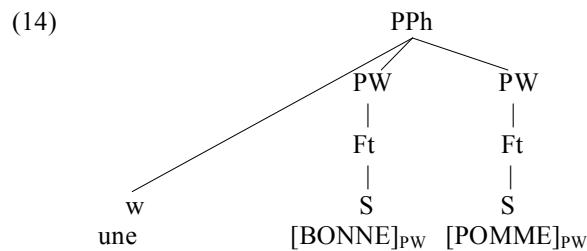
Consider now the case where the adjective is stressed. In total 65 of the utterances (79%) studied contained a stressed adjective, 17 without determiner, and 48 with a determiner. We see in Figure 3 that all children produced a high rate of stressed adjectives. In general, determiner omission diminishes with age: the four youngest children produce a higher percentage of omitted determiners than the older ones, (except for child 3 who displays patterns similar to that of younger children in other respects.)



**Figure 3 - Production of stressed adjectives per age**

If children are limited in their production to the construction of a linear sequence of iambic feet (or sometimes trochaic feet), we expect the determiner to be produced here, as it may form an iambic foot with the following adjective. However, with monosyllabic nouns the determiner is omitted only 5% of the time (13% of the time with bisyllabic nouns), whereas here, the omission of the determiner represents 26% of the production of stressed adjective. This is a huge difference. We suggest that the determiner is more prone to be omitted in this

condition because the prosodic phrase is complex. If we assume that children prefer prosodic phrases containing one prosodic word, we are able to explain why children tend to omit the determiner more often in this construction. This is because constructing a binary prosodic phrase would be more costly than constructing a binary foot. The idea is that at the beginning of acquisition, children construct utterances with simple prosodic phrases containing only one prosodic word, composed of a single foot. At this stage, the determiner is produced when it forms part of the foot. In a second stage, the child starts to cliticise the determiner to the prosodic word, producing determiners with bisyllabic nouns, but still with only one prosodic word per phrase. When the child is forced to produce two prosodic words within a prosodic phrase, the higher level of complexity required by the computation at the prosodic phrase level interferes with the cliticisation of the determiner at the prosodic word level. It is also possible that the stressed adjective creates a prosodic word boundary to its left, preventing the determiner from attaching to it. This forces the determiner to cliticise to the prosodic phrase.



## 6. Conclusion

To summarize, we found more determiner omission with bisyllabic nouns than with monosyllabic nouns, as expected. This is straightforwardly accounted for if determiners are first part of a binary foot, then cliticised to the prosodic word. But we also found more determiner omission in the adjective condition than with either monosyllabic or bisyllabic nouns. This is unexpected under the view that children are limited in their computation to a lower level of prosodic structure, constructing a linear sequence of iambic feet, because they could in principle attach the determiner to the following prosodic adjective to form a binary foot. The fact that they tend not to do so suggests that the higher level of structure introduced by the adjective plays a role in determining the production of the functional word. We suggested that the higher rate of determiner omission in the adjective condition follows if children first construct simple prosodic phrases of one prosodic word, and only in a second stage construct binary prosodic phrases.

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