Sonority and acquisition of Dutch syllable structure*

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Fikkert (1994) proposes an account for the acquisition of syllable structure in Dutch. She proposes that acquisition of prosodic structure follows from the mastering of different syllabic templates, some of which are labeled with segmental features. This proposal suggests that acquisition of segmental structure may depend on the mastering of specific syllabic templates. Such an account presents some theoretical problems and fails to capture important generalizations. In this paper, I discuss these weak aspects of Fikkert’s (1994) proposal. Rejecting the labeling hypothesis, I show that syllabic and segmental structures are acquired independently, even though their development proceeds in parallel (during the same period of acquisition). I also show that acquisition of sonority structure reflects the organization of the sonority features proposed by Rice (1992). I thus provide new external evidence for Rice’s (1992) organization of the sonority dimension in segmental representations.

0. Introduction

Fikkert (1994) proposes an account for the acquisition of syllable structure in Dutch. Her account, which is based on the acquisition of different syllabic templates at different stages of acquisition is interesting in many respects. However, her account presents some theoretical and empirical problems. In this short paper, I show that Fikkert’s (1994) analysis of the acquisition of syllable structure in terms of syllabic templates labeled with segmental features raises different questions and fails to capture some generalizations. I also show that syllabic and segmental structures are acquired independently, even though their development proceeds in parallel (during the same period of acquisition). Finally, I show that the acquisition of sonority distinctions reflects the organization of the sonority features proposed by Rice (1992). I therefore provide new external evidence for Rice’s organization of the sonority dimension in the feature geometry.

The paper is organized as follows. In Section 1, I present an overview of the prosodic word and syllabic constraints in Dutch. In Section 2, I present the data from one child, named Jarno, from age 1;4 to 2;4. I also present in this section a synopsis of Fikkert’s analysis. In Section 3, I discuss some problems posed by Fikkert’s account. In Section 4, I propose a counter-analysis based on the same data. Finally I briefly discuss some issues addressed in this paper in Section 5.

1. Dutch prosodic structure

In Dutch, more than one segment is allowed in pre-rhymal, rhymal and post-rhymal positions. The prosodic word in Dutch is presented in (1).

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* I wish to thank Heather Goad and Glyne L. Piggott for their helpful comments and extremely helpful suggestions. I would also like to thank Mark Hale, Éliane Lebel, Keren Rice and the audience of the 1997 MOT Phonology Workshop for discussions on various issues addressed in this paper. I am also grateful to Evan Mellander for his careful revision of this paper. Of course, all errors or omissions are mine. This research was supported by a SSHRCC fellowship #752-95-1415.
(1) **Prosodic word in Dutch** (Fikkert 1994: 51)

![Prosodic Word Diagram]

We see in (2) that there is a vowel-length contrast in Dutch, but only in closed syllables. In open syllables, there is no length contrast: vowels must be long.

(2) **Dutch’s long/short vowels distribution**

<table>
<thead>
<tr>
<th></th>
<th>Closed σ</th>
<th>Open σ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short vowel</td>
<td>－VC$</td>
<td>*—V$</td>
</tr>
<tr>
<td>Long vowel</td>
<td>－VVC$</td>
<td>－VV$</td>
</tr>
</tbody>
</table>

On the one hand, the distribution in (2) reflects the fact that the rhyme in Dutch is minimally bipositional: there are no short vowels in open syllables in Dutch. On the other hand, it is also assumed that the onset and the rhyme are maximally bipositional. The assumption about rhymal maximality follows Kaye and Lowenstamm (1981), who claim that the rhyme is universally maximally bipositional. So if the rhyme is filled by a long vowel, the following consonant will automatically fall into the extra-rhymal position. The rhymal constraints in Dutch are presented in (3) and (4), respectively.

(3) **Dutch’s minimal rhyme constraint** (Fikkert 1994: 44)

Rhymes are minimally bipositional in Dutch.

(4) **Dutch’s maximal rhyme constraint** (Fikkert 1994: 45)

Rhymes are maximally bipositional in Dutch.

2. **Data**

In the following subsections, I present the data according to Fikkert’s classifications, that is, separated into four different stages, in order to be consistent with the way she accounts for these data. In Section 4, however, I will propose more steps in the acquisition process, in order to better exemplify the current proposal.

2.1 **Stage 1: CV stage**

Stage 1 looks like a CV Stage, in which, at first, syllables must have an onset. This obligatory onset becomes optional at the end of this stage but, when it is realized, it is always a plosive. We see in (5) that there are no codas nor branching onsets in Jarmo’s production. Also,
the vowel length shows no regularities. The variation of the vowel length is therefore likely to be attributed to the phonetics of Jarmo’s production.

(5) Words at Stage 1 (Fikkert 1994: 57, 58, 129)

| /dær/  | → [daː], [da]  | (1;4.18) |
| /klær/ | → [ka], [kaː]  | (1;5.2)  |
| /pus/  | → [pʊs]  | (1;5.2)  |
| /dʊt/  | → [ʊ], [ti]  | (1;5.2)  |
| /tɔk/  | → [kɔ], [kɑː]  | (1;5.27) |
| /ɔtɔt/ | → ['tɔtɔ], ['tɔtɔ]  | (1;6.27) |
|        | → ['tɔtɔ], ['tɔtɔ]  | (1;6.13) |
|        | → ['tɛtɔ], ['tɛtɔ]  | (1;7.15) |
| /apir/ | → [tapiː]  | (1;7.15) |
| /ɔp/   | → [pa]  | (1;7.15) |

2.1.1 Fikkert’s account for Stage 1

The data at Stage 1 support Fikkert’s basic assumption, that the canonical CV syllable does not have to be acquired. The child has this syllable for free. Stage 1 looks like the “UG Stage”, where no extra language-specific structures are acquired. So the canonical CV syllable is the starting point for Jarmo, as schematized in (6).

(6) Syllable at Stage 1 (Fikkert 1994: 148)

```
  σ
Onset  Rhyme
  /
 C  V
```

2.2 Stage 2: Appearance of the first codas

The second stage is characterized by the appearance of the first codas in Jarmo’s production. Examples are provided in (7).

(7) Words at Stage 2 (Fikkert 1994: 131)

| /dezə/ | → [teɪʃ]  | (1;6.13) |
|        | → [dɛs]  | (1;6.27) |
| /pus/  | → [pʊs]  | (1;7.29) |
| /ap/   | → [ɑp], [ap]  | (1;7.15) |
| /ent/  | → [æt]  | (1;7.15) |
| /part/ | → [pɑst]  | (1;7.15) |
| /boʊm/ | → [bɔʊm]  | (1;7.29) |
| /dær/  | → [dər], [da]  | (1;6.27) |
| /klær/ | → [ka], [kaː]  | (1;6.27) |
| /bal/  | → [ba]  | (1;7.15) |
|        | → [bʊf]  | (1;8.12) |
The most important pattern to notice at Stage 2 is that the nature of the consonant in coda is restricted. We see in (7) that the codas are only obstruents; no sonorant consonants appear in this position at this stage of acquisition. They are either replaced by obstruents or deleted. We can also see that the vowel length remains random.

2.2.1 Fikkert’s account for Stage 2

From Stage 1 to Stage 2, Fikkert proposes that the child becomes able to encode codas in his syllable structure, as we see in (8).

(8) Rhyme at Stage 2 (Fikkert 1994: 151)

\[
\text{Rhyme} \quad \begin{array}{c}
\text{Nucleus} \quad \text{Coda} \\
V(t) \quad C_{\text{obstruent}}
\end{array}
\]

Fikkert also claims that the coda position is specified for the feature (or label) [obstruent]. This encodes the fact that sonorants are forbidden in this position.

2.3 Stage 3: Appearance of final sonorants

At Stage 3, sonorants begin to appear in coda position. We can see examples of this in (9).

(9) Sonorants in coda at the beginning of Stage 3 (Fikkert 1994: 136-140)

| /bom/    | [bom] | (1;7.29)        |
|/ha:n/   | [hom] | (1;7.29)        |
|/bom/    | [pom] | (1;7.29)        |
|/œyl/    | [en]  | (1;7.29)        |
|/bol/    | [bœu] | (1;10.23)       | (liquid replaced by an approx.)
|/lekəl/  | [leʃka]| (2;1.8)        |
|/redən/  | [leiə] | (2;1.8)        |
|/læw/    | [lew]  | (2;1.22)        |
|/sχur/   | [χur]  | (2;2.6)         |
|/bnl/    | [pul]  | (2;3.9)         |

It is important to note that nasals appear before liquids in the coda. At the stage where nasals first appear in the child’s phonology, liquids are replaced by nasals or approximants. The first liquids appear about four months later, as we see in (10).

(10) First liquids in onsets and codas at Stage 3 (Fikkert 1994: 62, 137)

| /bol/    | [bœl]  | (1;11.20)     |
|/lekəl/  | [leʃkə]| (2;1.8)       |
|/redən/  | [leiə]  | (2;1.8)       |
|/læw/    | [lew]   | (2;1.22)      |
|/sχur/   | [χur]   | (2;2.6)       |
|/bnl/    | [pul]   | (2;3.9)       |

Concerning vowel length, Fikkert mentions that, even though it is not completely random, it is not completely acquired yet. However, she claims that one pattern is significant: sonorants are
generally deleted when preceded by long vowels and long vowels are shortened before sonorants, if the sonorants are produced. We see this pattern in (11a).

(11) Environments for vowel length errors (Fikkert 1994: 139)

a) $\text{VVC}_{\text{son}} \rightarrow \text{VC}_{\text{son}}$
   $\text{V}_{\text{son}} \rightarrow \text{VV}$

b) $\text{VVC}_{\text{Obst}} \rightarrow \text{VC}_{\text{Obst}}$
   $\text{V}_{\text{Obst}} \rightarrow \text{VVC}_{\text{Obst}}$

2.3.1 Fikkert’s account for Stage 3

Fikkert’s hypothesis concerning Stage 3 is drawn in (12).

(12) Possible rhymes at Stage 3 (Fikkert 1994: 156)

a) $\text{Rhyme} \bigg/ \text{Nucleus} \rightarrow \text{Coda} \bigg/ \text{C}_{\text{Obstruent}}$

b) $\text{Rhyme} \bigg/ \text{Nucleus} \rightarrow \text{V} \bigg/ [+\text{sonorant}]$

Given the representation in (12b), the child now allows for branching nuclei and, therefore, long vowels. About the alternations between final sonorants and long vowels illustrated in (11a), Fikkert’s proposal is that sonorants appear inside the branching nucleus in (12b). In such cases, there is no space to fit the second half of a long vowel.

Before I go on subsequent stages of acquisition, I want to stress the fact that the pattern described in (11a) applies during the period where the sonorant consonants, especially the liquids, are being acquired. So, for example, all the examples of liquid deletion Fikkert presents apply before the child begins to really pronounce liquids, that is, until age 1;11.20; as we see in (13).

(13) Non-production of liquids at (early) Stage 3 (Fikkert 1994: 140)

$$/styr/ \rightarrow [\text{tyr}] \hspace{1cm} (1;10.9)$$

$$/dair/ \rightarrow [\text{da:}] \hspace{1cm} (1;10.9)$$

$$/bair/ \rightarrow [\text{bo:}] \hspace{1cm} (1;10.9)$$

$$/uil/ \rightarrow [\text{oev}] \hspace{1cm} (1;10.9)$$

$$/re\chi\alpha(\emptyset)/ \rightarrow [\text{te\chi\alpha}] \hspace{1cm} (1;11.20)$$

$$/re\chi\alpha/ \rightarrow [\text{te\chi\al}] \hspace{1cm} (1;11.20)$$

Another issue to be addressed concerns the pattern described in (11) and accounted for in (12). Why would it be the case that the child masters vowel length before sonorants but not before obstruents? The templates in (12) suggest that the vowel length errors in front of obstruents are attributable to the phonetics of Jarmo’s production whereas the vowel length errors in front of sonorants are attributable to Jarmo’s phonology.
2.4 Stage 4: Mastering vowel length and extra-rhymal consonants

At Stage 4, we observe, in the examples presented in (14), that the vowel length is completely mastered.

(14)  **Vowel length mastery (Fikkert 1994: 143)**

| /ɪən/  | → [ɪəm]  | (2;2.6) |
| /ɜːm/  | → [ɜːm]  | (2;2.6) |
| /tœyn/ | → [tœyn] | (2;2.27) |
| /mæm/  | → [mæm]  | (2;1.22) |

Finally, we also observe, in the examples in (15), the appearance of the first final consonant clusters in Jarno’s production.

(15)  **Appearance of final consonant clusters at Stage 4 (Fikkert 1994: 142)**

| /hɒnt/ | → [hɒnt] | (2;3.9) |
| /strant/ | → [dɒnt] | (2;3.9) |

2.4.1 Fikkert’s account for Stage 4

At the beginning of Stage 4, Fikkert proposes that the child’s syllable structure becomes more complex. With the new template added in (16b), Fikkert aims at accounting for the fact that vowel length is mastered. Notice also that, under Fikkert’s analysis, sonorant consonants are allowed to appear in branching nuclei, as illustrated in (16c).

(16)  **Possible rhymes at the beginning of Stage 4 (Fikkert 1994: 157)**

<table>
<thead>
<tr>
<th>a) Rhyme</th>
<th>b) Rhyme</th>
<th>c) Rhyme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nucleus</td>
<td>Coda</td>
<td>Nucleus</td>
</tr>
<tr>
<td>V</td>
<td>C&lt;sub&gt;obstruent&lt;/sub&gt;</td>
<td>V</td>
</tr>
</tbody>
</table>

Finally, Fikkert accounts for the examples of final consonant clusters in (15) with the syllabic structures drawn in (17). In essence, she proposes that the combination of the templates in (16b) and (16c) is now conflated within one single template, which is presented in (17b).

(17)  **Possible syllables at the end of Stage 4 (Fikkert 1994: 158)**

<table>
<thead>
<tr>
<th>a)</th>
<th>b)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Onset</td>
<td>Rhyme</td>
</tr>
<tr>
<td>Nucleus</td>
<td>Coda</td>
</tr>
<tr>
<td>V</td>
<td>C&lt;sub&gt;obstruent&lt;/sub&gt;</td>
</tr>
</tbody>
</table>
3. Discussion of Fikkert's (1994) proposal

We have seen that Fikkert assumes labeling of syllabic positions from Stage 2 to Stage 4. These labels arbitrarily predict the quality of the segments that appear in syllabic positions. One other problem with the use of these labels is that, even though plosives are the only possible obstruents at Stage 1, no special labeling is assumed at this stage. Moreover, the labels also have to have been removed in the adult grammar. Thus, according to Fikkert's analysis, the child has to get rid of labels and templates in the course of acquisition. Finally, some templates do not predict the patterns observed. For example, the template in (12b) does not account for the fact that nasal consonants appear earlier than liquids in coda position, even though there is a delay of more than four months between the first nasal and the first liquid in coda.

In the following section, I present an counter-analysis of the data presented in Section 2 that will take into account the development of sonority structure in Jarmo's production. I will argue that the production of specific classes of segments is not caused by labeling of syllabic structure. Rather, I will suggest that it is constrained according to the limits imposed by the child's feature geometry in his overall production of segments.

4. Sonority and syllable structure acquisition

To account for the data observed, I assume the Sonority Scale proposed by Clements (1990), which is presented in (18).

(18) **Sonority Scale** (see, among others, Clements 1990)

least sonorant obstruent << nasal << liquid << glide << vowel most sonorant

Following this scale, I base my representations on Rice (1992: 65), who encodes sonority distinctions between consonants by establishing a link between sonority and the number of relevant features in the representations. Under this proposal, obstruent consonants are the least marked (or least complex) class of segments. They are unspecified for sonority-features, as we see in (19a). We see in (19b) that nasal consonants are the second class of segments in the hierarchy. Liquids represent the most sonorous class, and contain one more feature in their representation, as we see in (19c).

(19) **Sonority structure** (from Rice 1992; slightly modified)\(^1\)

\begin{tabular}{lll}
\hline
a) Obstruent & b) Nasal & c) Liquid \\
Root & Root & Root \\
Sonorant Voice & Sonorant Voice & Liquid \\
\hline
\end{tabular}

With these presuppositions in mind, and also assuming that the child starts with a minimum amount of structure in his representations, I will now show that the stages of acquisition of Jarmo's syllabic structure are independent of the development of his segmental representations.

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\(^1\) As Rice (1992, footnote 3) mentions, the liquid /r/ appears to have a SV node with a dependent in English, i.e. a structure parallel to the lateral /l/. The data observed in the acquisition of Dutch suggest that /r/ and /l/ belong to a single class which contrasts with nasal consonants, along the continuum of the Sonority Scale.
4.1 Stage 1: UG Stage

As mentioned earlier, I adopt Fikkert’s point of view concerning Stage 1: the universal CV syllable in (20a) does not have to be acquired. So the child has this syllable for free in his language. It is from this starting point that the child has to build his language-specific syllable.

We have seen in the data in (5) that, at Stage 1, Jarmo only produces plosive consonants. I therefore propose that the only possible segments that Jarmo can produce at this stage are obstruents, as illustrated by the unmarked sonority representations in (20b).

(20) Representations at Stage 1
    \[ \begin{array}{c}
    \sigma \\
    \text{Onset} \quad \text{Rhyme}
    \end{array} \]

    a) Syllable
    b) Sonority (only obstruents allowed)

    \[ \text{Root} \]

4.2 Stage 2: First CVC syllable, restricted to obstruents

At Stage 2, we saw that Jarmo produces CVC syllables. At this stage, onsets and codas are restricted to obstruents. Because only one type of consonant is allowed in Jarmo’s overall production, it is unnecessary to posit special labels for syllabic positions. I therefore propose that Stage 2 is only marked by the addition of a branching within the rhyme, which now dominates the positions nucleus and coda, as illustrated in (21a).

(21) Representations at Stage 2
    \[ \begin{array}{c}
    \sigma \\
    \text{Onset} \quad \text{Rhyme}
    \end{array} \]

    a) Syllable
    b) Sonority (only obstruents allowed)

    \[ \text{Root} \]

    \[ \begin{array}{c}
    \text{Nucleus} \\
    \text{Coda}
    \end{array} \]

4.3 Stage 3a: Appearance of nasals in Jarmo’s productions

We have seen in (9) that, at the beginning of Stage 3, Jarmo produces nasals in coda position. He also begins to produce nasals in onsets at the same age, as we can see in the examples in (22).

(22) First nasals in onsets at the beginning of Stage 3 (Fikkert 1994: 60)

    /mam/ → [məm], [mam] (1;9.9)
    /məŋkti/ → [məŋˆ] (1;9.9)
    /məri/ → [mi] (2;0.28)

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2 Fikkert’s data do not contain any target words whose initial consonant is a fricative. It is therefore impossible to see whether plosives are the least marked onsets at the beginning of Jarmo’s production.
As compared to Stage 2, the syllable shape produced by Jarmo is not significantly different at Stage 3. The major distinction between stages 2 and 3 is thus a segmental one, namely that the child can now produce segments that are more complex with respect to sonority. I therefore propose that, at Stage 3, only the sonority dimension has changed in Jarmo's production, as we see in (23b).

(23) **Representations at Stage 3a**

a) Syllable

```
    σ
   / \
Onset Rhyme
   / \
Nucleus Coda
```

b) Sonority (obstruents and nasals allowed)

```
Root
\   /
Sonorant Voice
```

4.4 **Stage 3b: Vowel length mastering and extension of the syllable template**

We noticed earlier in (11) that Fikkert's Stage 3 is also marked by an interesting phenomenon, a significant amount of consonant deletions after long vowels.

The hypothesis I propose to account for both consonant deletions after long vowels and vowel length mastery is that, at Stage 3, Jarmo is learning the rhyme maximality constraint of his language, presented in (4), i.e. that rhymes are maximally bipositional. Jarmo's new representations are schematized in (24).

(24) **Jarmo's possible rhymes at Stage 3b**

a) Rhyme

```
Nucleus Coda
  \   /
X   X
```

b) Rhyme

```
Nucleus
  \   /
X   X
```

The schemas in (24) predict, on the one hand, that Jarmo's possible rhymes are minimally and maximally bipositional, as it is the case in Dutch. On the other hand, they predict that long vowels are never followed by a consonant and that short vowels must be followed by a consonant.

4.5 **Stage 4: Appearance of liquids in Jarmo's productions**

Fikkert proposes that the examples of liquids in coda that we saw in (10) are part of the same stage as the first nasals produced in coda, given in (9). Concerning the acquisition of syllabic structure, I agree that Jarmo's production looks the same for both types of segments. But in terms of segmental features, there is a clear distinction between nasals and liquids in codas. Here, I want to stress the fact that, as we saw in Section 2, the first nasals appear more than four months before the first liquids. I therefore claim that the sets of data in (9) and (10) are representative of two different stages in the acquisition of sonority features. Stage 4 thus constitutes a complexification of Jarmo's sonority representations, as illustrated in (25b).

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3 Sonority representations remain the same at this stage of acquisition.
(25) **Representations at Stage 4**

a) Possible rhymes

```
   Rhyme
  / Nucleus \   / Coda \  
    X       X
```

b) Sonority (obstruents, nasals and liquids allowed)

```
   Rhyme
  / Nucleus \   / Root \  
    X       X   X  
```

Again we see that the acquisition of new segmental features does not necessarily affect the syllabic representations. This analysis also allows for a more precise account of the facts observed.

4.6 **Stage 5: Consonant clusters**

Since Jarno cannot delete his final consonants indefinitely, he has to build a position into his representations which will permit him to both license these consonants and satisfy the rhymal constraints of his language. Following the claim that Jarno has mastered the rhymal maximality constraint at Stage 3b, the only solution he now has is to allow for an extra position that will not be part of the rhyme. The optional extra-rhymal position is presented in (26).

(26) **Jarno’s syllable at Stage 5** (onsets omitted)

```
   Rhyme
  / Nucleus \   (ERP) \  
    X       X       X
```

This new improvement in Jarno’s syllable does not violate any rhymal constraints. Also, Jarno can now pronounce VV and VVC sequences with the template in (26a), and VC and VCC sequences with the template in (26b). The new possibilities offered by the extra-rhymal position are present in Jarno’s production. Examples are presented in (27).

(27) **Words at the end of Stage 5** (Fikerv 1994: 142-143)

| /bun/ | → [bun] | (2;2.6) |
| /hun/ | → [hun] | (2;2.6) |
| /strunt/ | → [tunt] | (2;3.9) |
| /ba'nun/ | → [nam] | (2;3.9) |

Recall that Fikerv still assumes labeling of syllabic positions by segmental features at the equivalent stage (cf. Fikerv’s Stage 4) and the possibility of licensing sonorant consonants in the nucleus at this late stage. My hypothesis offers the following improvements: First, labeling, which is disputable for the reasons mentioned earlier is completely avoided. Second, under my proposal, Jarno is not only “patching” a non-working syllable structure to fit his new production; he is as well extending his representations to the new possibilities he has learned, having mastered the basic rhymal constraints of his language. And third, the mastering of all the stages analyzed here
demonstrates a natural continuity in the process of acquisition of both syllabic and segmental representations.

5. Discussion

In this paper I have first reviewed the analysis of syllable structure acquisition in Dutch as proposed by Fikkert (1994). I pointed out that Fikkert’s analysis, which assumes labeling of syllabic constituents, cannot capture all the facts present in the data and also presents theoretical problems. On the one hand, the analysis I propose basically supports the idea that, starting with a universal CV template, the learner builds his syllable representations according to the specific segmental sequences found in the language acquired. On the other hand, I claim that, from a universal sonority scale, the child builds representations in order to encode the sonority contrasts that are present in his language. Acquisition of segmental representations proceeds independently of—and in parallel with—acquisition of syllabic representations. Following these lines, I have demonstrated that ad hoc labels can be avoided if we consider syllabic and segmental acquisition separately. This analysis also provides external evidence for the organization of sonority features as proposed by Rice (1992).

References


