Chapter 3

Dutch Syllable Structure

3.1. Introduction

In this chapter I will offer a detailed analysis of syllable structure in Dutch. In sections 3.3. and 3.4. I will discuss the linear and hierarchical structure respectively. In a recent monograph Trommelen (1983) offers an analysis of the Dutch syllable employing a somewhat different model, which I will discuss in section 3.5.1. One of Trommelen's claims is that her analysis of the Dutch syllable provides a fruitful basis for an analysis of the allomorphy of the Dutch diminutive suffix. I must show that my approach can do the same. In section 3.5.2 I will therefore present an analysis of the diminutive allomorphy and suggest that it compares favorably with the analysis offered by Trommelen.

3.2. Preliminary remarks

For the analysis of Dutch syllable structure presented here I will describe my own speech. Since, unlike some other speakers of Dutch, I do not have an apical /r/, the uvular variant, usually transcribed as [ʁ], will be used. Furthermore I do not make a distinction between a voiced velar fricative and a voiceless velar fricative. In my speech there is only /x/, the voiceless variant. Adopting for the moment a feature system like the one proposed in SPE, the consonants that we must take into account then are the following:

(1)

	p	t	k	b	d	f	s	x	v	z	m	n	ŋ	l	r	j	w	h
consonantal	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-
syllabic	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
sonorant	-	-	-	-	-	-	-	-	-	-	+	+	+	+	+	+	+	+
continuant	-	-	-	-	-	+	+	+	+	+	-	-	-	+	+	+	+	+
nasal	-	-	-	-	-	-	-	-	-	-	+	+	+	-	-	-	-	-
coronal	-	+	-	-	+	-	+	-	-	+	-	+	-	+	-	-	-	-
anterior	+	+	-	+	+	+	+	-	+	+	+	+	-	+	-	-	+	-
voice	-	-	-	+	+	+	-	-	+	+	+	+	+	+	+	+	+	-

The vowel system will be discussed below in section 3.3.3. A further consequence of taking my own speech as the basis for the analysis is that the consonant cluster /sxr/ as a realization of written <schr> is not accounted for, since I have [sr] here.

Like almost every language that comes into contact with other languages, Dutch has segments and segment combinations of non-native origin. For instance:

(2)

Foreign vowels		**Foreign consonants**	
[ɛ:]	serre	[dž]	jeep
[œ:]	freule	[tš]	chips
[ɔ:]	roze		
[y:]	centrifuge	[g]	goal
[u:]	rouge	[š]	charme
[i:]	analyse	[ž]	jury

(Significantly shorter versions of these six vowels occur in the native sound system, which will be discussed in section 3.3.3.) In the analysis offered here such foreign segments will be ignored. With respect to consonant clusters as well I will ignore a number of cases. In an attempt to say more about clusters (or syllable types in general) than just listing the possibilities, it is necessary to leave foreign (or marginal) segments or segment combinations out of consideration or, at least, to treat them as special in some way.

In the framework adopted here, these special cases, i.e. foreign clusters as well as clusters that somehow fall outside the core syllable structure because they "disturb" a consistent and elegant account of by far the largest part of Dutch syllable structure, must be accounted for by means of a number of **auxiliary templates**, that I will not formulate here. A **main template** accounts for the core of Dutch syllable structure. In addition I

use two types of statements to rule out sequences that are allowed by the quite general main template. Firstly, I will use **filters** to express certain gaps (either in the form of negative conditions or in the form of if-then conditions) and secondly I will use **dissimilarity conditions** that express whole sets of cooccurrence restrictions in terms of the notion 'sonority distance'.

Before proceeding to a detailed description of the Dutch syllable, let me mention some general facts. It will be shown that at the phonological level, word initial and word medial syllables in Dutch may consist of up to five segments, the minimum being two. Monosyllabic words and word final syllables may consist of up to 9 segments, as in the word under (3), which, except for the $X_{\emptyset}$-slot, is a real word **promptst** 'superlative of prompt'. Apparently no existing Dutch words exploit the full range of possibilities. Since words may begin with the cluster /spr/ I assume, however, that (3) represents a possible word of Dutch:

(3)

$X_{\emptyset}$ +	X_1	X_2	X_3	X_4	X_5 +	X_6	X_7	X_8
s	p	r	o	m	p	t	s	t

I will accept the now common idea, suggested in Fudge (1969) for English, that word-final syllables may be followed by a "syllabic suffix", called the **appendix** in the recent literature; Fudge uses the term termination. Consider in this respect the X_6-X_8 slots in (3) and below in (4) (the superlative of the adjective **bespraakt** 'eloquent'):

(4)

	$X_{\emptyset}$ +	X_1	X_2	X_3 X_4	X_5 +	X_6	X_7	X_8
(be)	s	p	r	a	k	t	s	t

With respect to the $X_{\emptyset}$-slot in both examples it may be argued that this /s/ represents a "syllabic prefix".

Apart from the "extras", the sequence of the segments within a syllable will be explained in terms of their sonority value. I will now give a tentative scaling of the segments of Dutch, which can serve as a starting-point. On this scale the classes of segments are given consecutive values for the multivalued feature [sonority]. The linear structure of the Dutch syllable will then be accounted for by assigning a sonority value to each slot:

(5)

obstruent	nasal	liquid	glide	vowel
1	2	3	4	5

One will notice that the approximants (called 'glides' here, i.e. /j/ and /w/) are regarded as a separate class and not as a class of segments that underlies both these approximants and the high vowels. At this point I will not take a definite position on the question as to whether glides should be identified with a subclass of the high vowels. This matter will be discussed below where the question arises naturally.

3.3. Linear structure

3.3.1. X_1 and X_2

Let us first consider syllables that have a one-consonantal "onset". As in chapter two, I use the term onset to indicate the prevocalic part of the syllable, without actually claiming, that there is a subsyllabic node that is labelled "onset". I will return to this matter in section 3.4. In a one-consonantal onset any consonant (except the velar nasal) may occupy the first slot. We indicate this as follows. Double square brackets around a slot indicate its sonority value. Thus we have for the first syllable position:

(6) $[[X_1]] < 5$

i.e. the sonority value of the first slot is less than 5

Thus to the first slot I assign an upper value, rather than a (set of) value(s) that refers to an interval on the scale. The non-occurrence of the velar nasal will be accounted for in terms of a filter:

(7) $$\begin{array}{c} {}^{*}X_1 \\ | \\ \text{ŋ} \end{array}$$

I am aware of proposals to derive /ŋ/ from an underlying cluster, i.e. /ng/ or /nx/. Both clusters do not appear at the surface. It is then explained, as

has been claimed, that /ŋ/ cannot occur in the onset, since the underlying cluster is ruled out in that position by an independently needed filter. I refer to Trommelen (1983), chapter 5, where she argues convincingly that proposals of this type run into serious problems.

The reader may have noticed that the provisional scale has given no place to /h/. I would like to propose here that /h/ is the realization of an empty X_1 slot. I will assume that /h/ is the default consonant, as schwa is the default vowel. Its sonority value is zero.

Turning now to the two-consonantal onsets I will first give some tables that show the possibilities for syllable-initial clusters consisting of two segments. I refer to Trommelen (1983, ch. 3) for a discussion of the foreign or marginal clusters that are not considered.

(8) **Clusters with liquids in X_2**

	p	t	k	b	d	f	s	x	v	z
l	+	–	+	+	–	+	+	+	+	–
r	+	+	+	+	+	+	+	+	+	–

(9) **Clusters with nasals in X_2**

	p	t	k	b	d	f	s	x	v	z
n	–	–	+	–	–	–	+	–	–	–
m	–	–	–	–	–	–	+	–	–	–

not considered: /pn/, /fn/, /xn/

(10) **Clusters with glides in X_2**

	p	t	k	b	d	f	s	x	v	z
j	–	–	–	–	–	–	(+)	–	–	–
w	–	+	+	–	+	–	–	–	–	+

not considered: /pj/,/tj/,/fj/

Bakker (1971) offers a detailed and useful study of the structure of monosyllabic words. Another important source has been Cohen et al. (1959). The clusters that I leave out of consideration either do not occur at all in Bakker's monosyllabic words or occur with an extremely low frequency. I refer to Trommelen (1983) who offers some discussion of these, and some other cases that are not mentioned here.

Clusters with /j/ deserve our attention. Word initially clusters with /j/ are rare, except perhaps the combination /sj/. It is possible to argue that what Bakker treats as /sj/ is in fact one segment /š/. However, in one type of complex words, viz. those formed with the diminutive suffix, we find what appear to be clusters of obstruent followed by /j/.

(11)

```
              σ                      σ
             /|\                    /|\
   r a a m p j ə          h a a x j ə
   p a a l t j ə          b o e f j ə
                          d o o s j ə
                          h a a k j ə
```

Below I will return to these cases. I will now proceed with an analysis of complex onsets.

Looking in general at the possibility of /s/ or /z/ to occur before sonorants we note the following complementary distribution: the voiced /z/ may only occur before /w/ whereas the voiceless /s/ occurs elsewhere:

(12)

	s	z
l	+	-
r	+	-
m	+	-
n	+	-
w	-	+

I express this distribution in terms of an if-then condition:

(13)

$$\begin{bmatrix}+\text{cont}\\+\text{cor}\end{bmatrix} \begin{bmatrix}+\text{ant}\\-\text{cor}\\-\text{nas}\end{bmatrix}$$
$$\Downarrow$$
$$[+\text{voice}]$$

It is not necessary to refer to specific positions in the syllable, as long as we specify somehow that the domain of this filter is the syllable.

Among the obstruent-liquid clusters we find that /tl/ and /dl/ do not occur. The following filter accounts for this gap:

(14)

$$^{*}\begin{array}{cc} X_1 & X_2 \\ | & | \\ [+\text{cor}] & [+\text{cor}] \end{array}$$

As formulated, this filter blocks the wellformed cluster /sl/ as well. We do not have to complicate the filter, however, because this cluster can also be analyzed as arising from a one-consonantal onset /l/ that is preceded by the prefixal /s/. The "price" we pay is that the filter must refer to specific positions, since (15a) is allowed, but (15b) is not:

(15) a. $\begin{array}{ccc} X & - & X \\ |\emptyset & & |1 \\ s & & l \end{array}$ b. $^{*}\begin{array}{ccc} X & - & X \\ |1 & & |2 \\ s & & l \end{array}$

Let us investigate which sonority value must be attached to X_2. In (16) I list the value assignments that are possible at first sight:

(16)
a. < 5 (i.e. all consonants)
b. 2-3 (i.e. nasals and liquids)
c. 2-4 (i.e. nasals, liquids and glides)
d. 3-4 (i.e. liquids and glides)
e. 3 (i.e. only glides)

I will now show that the first choice, (16a), is the correct one. In all choices (except the second) we include glides and we must therefore rule out in that case all combinations with /j/, at least if the syllable occurs in word-initial position.

(17) $^{*}\begin{array}{c} X_2 \\ | \\ /j/ \end{array}$ (in word initial position)

A number of clusters with /w/ must be ruled out as well.

(18)
a. pw, bw, fw, vw, xw
b. sw

(18b) is handled by the condition (13) given above. The other illformed clusters are handled by the following filter:

(19)
$$\left\{\begin{array}{cc} {}^{*}X_1 & X_2 \\ \vert^{1} & \vert^{2} \\ \begin{bmatrix}-\text{cor}\\ +\text{ant}\end{bmatrix} & \begin{bmatrix}-\text{cor}\\ +\text{ant}\end{bmatrix} \\ (p,b,f,v) & (w) \\ [+\text{cont}] & \\ (f,v,x,s) & \end{array}\right\}$$

On the other hand, if we exclude the glides (choice 16b) this implies that /tw/, /dw/ and /kw/, as well as medial clusters with /j/, must be accounted for by means of auxiliary templates.

Including nasals (choices a,b,c) also leads to the necessity of several filters (that I will not bother to formulate here). On the other hand if we exclude all nasals both /sn/ and /sm/ can be analyzed in terms of a prefixal /s/. In this approach only /kn/ requires an auxiliary template.

Before deciding the issue let me point out that, apart from the fact that a sonority value must be assigned to X_2, we must account for the fact that associating a segment to X_2 restricts the possibility of associating a segment to X_1. To give an example, if X_2 is filled by a liquid /l/, X_1 cannot also be filled by another /l/, nor by /r/. As Harris (1983) states in his analysis of Spanish syllable structure, where a comparable situation exists, the latter type of sequence, i.e. /rl/, is ruled out automatically because it violates the sonority sequencing generalization (SSG). Harris then goes on to take this line of explanation one step further. He suggests that sequences consisting of segments that are too much alike in terms of their sonority value, are forbidden as well. This rules out sequences of identical segments (e.g. /ll/), but also those that consist of segments that are adjacent on the sonority scale (e.g. /nl/, /mr/). The conclusion is that a whole class of clusters is correctly ruled out if we formulate the following **dissimilarity condition:**

(20) segments associated to X_1 and X_2 must be non-adjacent on the sonority scale

To put it formally:

(21) $[[X_2]] - [[X_1]] > 2$

I.e. the minimal difference between the sonority value of X_1 and X_2 is 2. If this condition is accepted as part of the analysis then we do not have to exclude obstruents and nasals from X_2 and we can assign a sonority value to X_2 that allows obstruents, nasals and liquids. The only combination that is actually allowed to occur is obstruent + liquid. Condition (21) rules out combinations of classes that are identical or adjacent on the scale, i.e. obs.+obs., nas.+nas., liq.+liq., obs.+nas., nas.+liq., and classes like nas.+obs., liq.+nas. are ruled out by the SSG (although technically filter (21) takes care of these as well, since [[1]]-[[2]]=-1 in those cases).

(22) illformed

Obs Nas Liq

|-------|-------|

wellformed

This leaves us with the required class of obstruents and liquids.

On the assumption then that glides are excluded from X_2 the following values are assigned to the first two slots:

(23)
$$[[X_1]] < 5$$
$$[[X_2]] < 4$$

It now becomes more attractive not to exclude glides from X_2, because we can then simplify the analysis by saying that X_1 and X_2 have the same sonority value. The consequences of including glides are that we have to adopt filter (19) to exclude certain combinations of obstruents and /w/. Also we need the filter in (17) to rule out /Cj/, word initially. There is one complication, however. On the scale assumed so far nasals and glides are non-adjacent. This means that we wrongly allow combinations of these two classes. In a situation of this type, I have no choice but to modify the proposed sonority scale. There are two ways to modify it. Either we give liquids and glides the same sonority value, i.e. make them one class with respect to the sonority scale (cf. 24), or we assume a scale in (25) and say that the minimal sonority distance between X_1 and X_2 is 1.5, rather than referring to non-adjacency:

```
(24)      obs    nas   liq/gl  vow
           |-----|-----|-----|
           1     2     3     4

(25)      obs   nas liq gl   vow
           |-----|--|--|-----|
           1     2 2.5 3     4
```

Making either assumption we can assign the same sonority value to both X_1 and X_2. On the second view, however, it is required that the dissimilarity condition refers to a sonority **value** rather than to non-adjacency, i.e. the distance must be minimally 1.5. In chapter 2, section 2.2.2. I claimed that the analysis of Dutch syllable structure was going to provide support for the position that the value assignment for sonority is **absolute** rather than **relative**, because it would be necessary to assume that not all classes are equally spaced. The theoretical consequence of this would be that the sonority scaling cannot be derived from a traditional binary feature system but must itself be a primitive feature of the system. The question is therefore which of the two scales given above is the appropriate one to account for the remaining positions of the syllable. I will argue that it is indeed the second scale, given in (25), that we need.

In (26) one finds a summary of the analysis that has been proposed so far:

(26) a. $[[X_{1,2}]] < 4$

b. Dissimilarity condition
for X_1 and X_2 = 1 (or 1.5 if scale (25) is used)

c. filters: (7), (13), (14), (17), (19)

3.3.2. The syllabic prefix

The clusters I will discuss here have in common that they all contain an /s/:

(27) two consonantal clusters with /s/
a. sp st sk
b. sf sx
c. ps ts ks

(28) three consonantal clusters with /s/
spl, spr, str, skr, skl (,sxr)

It is assumed in most analyses of Dutch syllable structure that among the two consonantal clusters only /sp/, /st/ and /sx/ count as non-marginal, while among the three consonantal clusters this holds for /spl/, /spr/ and /str/ and /sxr/. I have pointed out above that /sxr/ is not considered in this analysis. With respect to 3-C clusters several approaches have been suggested in the literature.

In one approach we say that Dutch has a class of complex segments (cf. Booij 1984):

```
(29)     X          X          X
        / \        / \        / \
        s p        s t        s k
```

In autosegmental terms such a suggestion implies that two segments are associated to one slot.

In support of the complex segment analysis one could refer to the fact that /sp/, /st/ and /sk/ may occur in postvocalic position, where obstruent clusters are illformed. This could be explained by assuming that postvocalic /sp/, /sk/ and /st/ are not clusters, but single segments. My first objection to such an analysis is based on the fact that the cases in which the "complex segments" occur in word final position are rather small in number, and therefore marginal:

(30)		
	Weesp	kiosk
	esp	bruusk
	wesp	obelisk
	gesp	asterisk
	rasp	-esk (a suffix)
	risp	

Secondly, there appear to be no cases where the complex segments occur after a consonant, a fact that cannot be explained under the complex segment approach. It is simply not true then that /sp/ and /sk/ have the same distribution as simple obstruents. Final /st/ is fairly common, but this will be explained in terms of the notion "appendix". A third consideration that makes the complex segment approach less likely (in the context of this analysis at least) is that we still have to account for the occurrence of

/sn/, /sm/ and /sl/, common clusters that are not accounted for thus far. Recall that nasals were excluded from appearing in X_2 and /sl/ was ruled out by the filter in (15), that also rules out /tl/ and /dl/. A complex segment approach seems rather implausible for these cases and there is no independent evidence to back it up. Furthermore there is /sx/ to account for. It appears then that the /s/ has a wider distribution than is likely under a complex segment solution.

In a second approach we assume that the syllable template involves an additional slot that may precede X_1 and X_2 and furthermore that this slot may be occupied by /s/ only. In this approach the additional slot is analyzed as a **syllabic prefix** that is subcategorized for the main template. Trommelen classifies this prefix as an **extrametrical** element. Given the **peripherality condition**, saying that extrametrical units may only occur at the edges of domains (cf. Hayes 1982a, Harris 1982), a consequence of this proposal is that /s/ should only occur word initially as a member of onsets. If an /s/ occurs word medially and the word is wellformed the /s/ must be analyzable as part of a coda. I will return to the problematical aspects of this proposal in section 3.5.1. where I discuss Trommelen's analysis.

Extrametrical or not, we predict that /s/ can be combined with all clusters that have been allowed in X_1 and X_2 in terms of the main template. Some of the combinations do not occur, however:

(31) a.

	j	w	r	l	m	n	p	t	k	f	s	x	b	d	v	z	h
s	+	+	+	+	+	+	+	+	–	–	–	+	–	–	–	–	–

b.

	pl	kl	bl	fl	sl	xl	vl	pr	tr	kr	br	dr	fr	sr	xr	vr	tw	dw	kw
s	+	–	–	–	–	–	–	+	+	–	–	–	–	–	–	–	–	–	–

Most of the non-occurring clusters in table (31a) involve voiced obstruents. Clusters of obstruents with opposite values for voicing are not allowed in Dutch. This can be expressed in terms of the following filter:

(32) $$^{*}\begin{bmatrix}\text{1son}\\ \alpha\text{voice}\end{bmatrix}\begin{bmatrix}\text{1son}\\ -\alpha\text{voice}\end{bmatrix}$$

It is not necessary that this filter refers to specific positions, since disharmonic clusters are always illformed. The domain of this filter is in any case larger than the phonological word (cf. van der Hulst 1980).

In one case (/ss/) a different filter is involved. Dutch does not allow geminate consonants:

(33)
```
  * X   X
     \ /
      α
```
where α < [[vowel]]

As we will see, only vowels can be associated to two slots.

The 2-C clusters to be ruled out separately are /sh/, /sk/ and /sf/. Like Trommelen (1983), I attempt no further reduction:

(34)
```
  * X_Ø   X_1
    |     |
    s   {h,f,k}
```

This filter automatically rules out the following combinations of /s/ and a consonant cluster:

(35) skl, sfl, skr, sfr, skw

This leaves the combinations /sxl/, /sxr/ and /stw/ to be ruled out by separate filters:

(36)
```
a. * X   X   X        b. * X   X   X
     |   |   |              |   |   |
     s   x   liq            s   t   w
```

Let me turn finally to /sr/ and /sxr/. It is noteworthy that [sr] is a common pronunciation of written <schr> for which the standard pronunciation is [sxr]. Observe now that the replacement of /sxr/ by /sr/ simplifies the system in two places. Firstly we do not need a filter to rule out /sr/ and secondly the filter in (36a) ruling out /sxl/ can be stated more generally in that it also rules out /sxr/. Perhaps the replacement of [sxr] by [sr] (allowing a restructuring of /sxr/ into /sr/) can be seen as the result of a pressure to simplify the rule system (apart from possible phonetic pressure).

Trommelen's account differs slightly with respect to the illformed 3-C clusters. She rules out all 3-C clusters in which the third consonant is /l/ or /w/:

(37) onset

```
      onset
     /  |  \
    s  ... {l}
           {w}
```

Hence along with the impossible /stl/, /sfl/, /skl/ and /skw/ (that are already ruled out by other filters that block /tl/, /sf/ and /sk/) we forbid /sxl/ and /stw/, but also /spl/. It seems to me that Trommelen is making the wrong generalization here. By leaving out reference to the medial consonant we "gain" that (37) rules out /spl/. But this is not a desirable result because to my opinion /spl/ is a perfectly acceptable cluster, despite its being much less frequent then for example /str/. I admit, however, that the criteria that underlie a decision to regard a particular segment combination as either perfectly acceptable or marginal are difficult to make explicit, if we try to go beyond simplicity of the rule system.

Before I turn to the remaining slots I will consider (and reject) one possible refinement. We noticed that we needed a filter to rule out /tl/ and /dl/. Suppose now that we give the coronal stops a place on the hierarchy between the other obstruents and the sonorants:

(38) a.

```
obs /td/ nas liq gl      vow
|---|---|---|---|---|---|
1  1.5  2  2.5  3        4
```

b. $[[X_{1,2}]] < 4$
$[[X_{\emptyset}]] = [[s]]$

c. Dissimilarity condition:
for X_1 and X_2 = 1.5

Under this formulation we rule out /tl/ and /dl/, without a separate filter. We loose /tr/ and /dr/ as well, but this could be circumvented by giving /r/ and /l/ different values (as in (50) below).

A reason for rejecting this proposal is that it involves the claim that a subclass of the stops can count as more sonorous than the class of fricatives. Such a value assignment must be excluded on universal grounds, unless we are prepared to give up the idea that the feature [sonority] has a phonetic basis. One might object that the proposal to assume a scale as in (38a) is based on the same strategy that I have adopted throughout this section. This strategy is to organize the scale in such a way that it makes

the right predictions with respect to the behaviour of segment classes. One might furthermore argue that this strategy makes the analysis circular. I claim that this is not completely true. To a certain extent all language-specific feature systems are circular. Particular segments are assigned to the same class on the basis of their behaviour in the phonological system of the language. It is a commonly accepted view that the phonological behaviour of segments provides the analyst with one type of argument in favor of a featural analysis of sound systems. My proposals to assign classes of segments in Dutch a particular value for the feature [sonority] are completely in line with this view. However, a featural analyis must also be motivated on phonetic grounds. Although I do not want to deny that differences in place of articulation may correspond to sonority differences, I think that we stretch the phonetic interpretation of the feature [sonority] too far if we allow differences in place of articulation to override the distinction between stops and fricatives. In the above proposal this is just what we do.

3.3.3. X_3, X_4, X_5

In his discussion of the Dutch sound pattern Moulton (1962) observes that long vowels and diphthongs can be followed by at most one consonant (excluding the appendix) whereas short vowels can be followed by a consonant that is preceded by one sonorant consonant. In other words long vowels and diphthongs are structurally equivalent to short vowels plus one sonorant consonant. In the following table I have specified possible postvocalic clusters, consisting of two consonants:

(39)

X_4 \ X_5	j	w	r	l	m	n	ŋ	p	t	k	f	s	x
j	–	–	–	–	–	–	–	–	+	–	–	+	–
w	–	–	–	–	–	–	–	–	+	–	–	+	–
r	–	–	–	–	+	+	–	+	+	+	+	+	–
l	–	–	–	–	+	–	–	+	+	+	+	+	–
m	–	–	–	–	–	–	–	+	+	–	+	+	–
n	–	–	–	–	–	–	–	–	+	–	–	+	–
ŋ	–	–	–	–	–	–	–	–	+	–	–	+	–
p	–	–	–	–	–	–	–	–	+	–	–	+	–
t	–	–	–	–	–	–	–	–	–	–	–	+	–
k	–	–	–	–	–	–	–	–	+	–	–	+	–
f	–	–	–	–	–	–	–	–	+	–	–	+	–
s	–	–	–	–	–	–	–	–	+	–	–	–	–
x	–	–	–	–	–	–	–	–	+	–	–	+	–

All these clusters may appear after a short vowel and only those with a dental (**s** or **t**) may occur after a long vowel or diphthong. It will become clear in section 3.3.4. that we should consider postvocalic clusters involving dental obstruents separately. For the moment I will assume that only short vowels can be followed by a cluster of two consonants. The obvious explanation for the different behaviour of the two types of vowels is that long vowels occupy two syllable slots, whereas short vowels occupy only one. Halle and Vergnaud (198Øb) propose this analysis for German and Trommelen (1983) has applied it to Dutch as well.

Let us now turn to the question what sonority value should be assigned to the rhyme slots, using the term informally. As for the segment types that may occur in the three available slots the following holds. X_3 may only be associated to vowels, X_4 to both vowels and consonants and X_5 only to consonants. The sonority values that may be assigned to the rhyme slots are the following:

(4Ø) $[[X_3]] = 4$ (i.e. only vowels)
$[[X_{4\&5}]]$ are "free"

The claim is that with respect to slots X_4 and X_5 nothing needs to be said. This will of course result in "overgeneration" but I will show that the bulk of illformed clusters can be ruled out in terms of a single dissimilarity condition. Before I discuss that condition I will deal with illformed sequences that deserve a separate treatment.

There are certain restrictions on the combination of long vowels and the

approximants /j/ and /w/. The facts are as follows:

(41)

allowed			disallowed		
ī w	ȳw	ūj	Īj	ūj	ūw
ēw	–	ōj	ēj	ø̄j, ø̄w	ōw
	āj			āw	

The generalization is that front vowels take /w/ and back vowels take /j/. The only vowel that allows neither of the two glides is /ø̄/. We could say that the expected /ø̄w/ is accidentally missing or we could formulate another filter. For cases of this type I know of no reason to prefer either of the two possibilities. The filter that is required to express the above mentioned generalization is the following:

(42)
$$^{*}\begin{array}{cc} X_4 & X_5 \\ | & | \\ [\alpha B] & [\alpha B] \end{array}$$

The consonant clusters in (43) are illformed too. They are excluded by the filter in (44):

(43)

np		ŋp
nk	mk	
nf		ŋf
nx	mx	ŋx

(44)
$$^{*}\begin{array}{cc} X_4 & X_5 \\ | & | \\ \begin{bmatrix} 2\text{son} \\ \alpha\text{cor} \\ \beta\text{ant} \end{bmatrix} & \begin{bmatrix} 1\text{son} \\ -\alpha\text{cor} \\ -\beta\text{ant} \end{bmatrix} \end{array}$$

Filter (44) allows /ŋx/ which does not occur. Again I will leave the matter undecided as to whether we must formulate another filter or say that this gap is accidental. Note that filter (44) rules out the clusters /mt/, /ms/, /nt/ and /ns/, which are wellformed according to table (39). I will return to this point in sect. 3.3.4. (on the appendix).

In table (39) I left the voiced obstruents out of consideration. Voiced obstruents are only allowed to occur in one-consonantal onsets. The most straightforward way to explain their absence elsewhere is to exclude them from all positions except X_1. The following filter limits the occurrence of voiced obstruents to X_1:

(45) $\begin{array}{c} {}^{*}X_n \\ | \\ \left[\begin{array}{l} \text{lson} \\ \text{+voice} \end{array}\right] \end{array}$

where n =/= 1

Let us now look at the restrictions that hold for combinations of sonorant consonants. The facts are as follows:

(46)

X_4 \ X_5	r	l	m	n	ŋ
r	-	-	+	+	-
l	-	-	+	-	-
m	-	-	-	-	-
n	-	-	-	-	-
ŋ	-	-	-	-	-

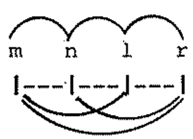
With respect to the velar nasal, I should mention that this consonant cannot occur after a long vowel in Dutch, unlike the other sonorants. Assuming a filter that blocks the velar nasal from X_5 takes care of that gap and the minusses in (46) at the same time:

(47) $\begin{array}{c} {}^{*}X_5 \\ | \\ \text{ŋ} \end{array}$

To rule out the remaining sequences let us note the following regularity. Suppose we assume the following scaling for sonorant consonants:

(48)

illformed



wellformed

This ordering of sonorant consonants is compatible with most if not all proposals in the literature (cf. Vogel 1977, 123-139). Whenever distinctions among sonorant consonants are made in those proposals, it is the scaling in (48) that we find.

We can then say that the following cluster types are illformed:

(49)
a. Sequences that violate the SSG (/ml/, /lr/,...)
b. Sequences of identical segments
c. Sequences of adjacent segments

This suggests that we can formulate a dissimilarity condition for X_4 and X_5, that rules out segments that are adjacent on the sonority scale. This is just like the non-adjacency requirement that we used to rule out certain sequences in the first two slots. Observe, however, that we are dealing with "adjacency" at different levels so to speak. For the onset it was necessary to consider nasals and liquids as a whole, but here it is crucial to consider the internal structure of these classes. A consequence of this is that the scale **must** be formulated in terms of **absolute** values. The dissimilarity condition for X_4 and X_5 requires that the distance is minimally Ø.5, given the complete scale that we now arrive at:

(5Ø)

```
obs       m    n     l    r    G       vow
|--...--|----|----|----|----|--...--|
1         2  2.25  2.5. 2.75  3       4
```

There is one remaining restriction that must be accounted for: combinations of diphthongs with /r/ are illformed. To be able to explain this fact with the dissimilarity condition just mentioned I have assumed that the glides /j/ and /w/ are adjacent to the /r/, which is not a controversial claim considering the relevant literature. The assumption here is that Dutch diphthongs can be analyzed as short vowel-glide sequences. I will now proceed with a discussion of the vowel system and show that this is indeed a possible analysis.

The following table gives a featural analysis of the vowel system:

(51) **long or tense vowels** **short or lax vowels**

	−B		+B	−B		+B
	(−R)	+R	(+R)	(−R)	+R	(+R)
+H (−L)	/ī/	/ȳ/	/ū/	/I/	/œ/	/ɔ/
−H −L	/ē/	/ø̄/	/ō/	/ɛ/		
(−H) +L		/ā/			/ɑ/	

diphthongs

−B		+B
(−R)	+R	(+R)
/ei/	/ui/	/ou/

I argued above that the difference between long and short vowels can be represented structurally by saying that long vowels are linked to two slots, whereas short vowels are linked to one slot. The question that then naturally arises is whether long and short vowels (and diphthongs) are represented in terms of a small set of "segmental melodies" that may be associated to a single slot, giving rise to short vowels or part of a diphthong, or to two slots, giving rise two long vowels.

A complication for this view is that there are more long vowels than short vowels and furthermore that in the case of diphthongs it is not clear which short vowels should be chosen. Let us discuss both sets of non-short vowels in turn. The minimal set of segments includes in any case the lax vowel segments:

(52) a. X $\begin{bmatrix}-B\\+H\end{bmatrix}$ /I/ b. X $\begin{bmatrix}-B\\-H\end{bmatrix}$ /ɛ/ c. X $\begin{bmatrix}-B\\+R\\-L\end{bmatrix}$ /œ/ d. X $\begin{bmatrix}+B\\-L\end{bmatrix}$ /ɔ/ e. X [+L] /ɑ/

When we associate these segments to two slots we arrive at the following representations:

(53) a. X X $\begin{bmatrix}-B\\+H\end{bmatrix}$ /ī/ b. X X $\begin{bmatrix}-B\\-H\end{bmatrix}$ /ē/ c. X X $\begin{bmatrix}-B\\+R\\-L\end{bmatrix}$ /ȳ/ or /ø̄/ d. X X $\begin{bmatrix}+B\\-L\end{bmatrix}$ /ū/ or /ō/ e. X X [+L] /ā/

Since the set of lax vowels is smaller by two members there are two cases where doubling a short vowel does not lead to one unique interpretation (case 53c and d). This implies that the segments in (52 c&d) must be represented **with association lines**, indicating that they may only be associated to one slot, and furthermore that we must assume four segments that must be associated to two slots:

(54) a. X X $\begin{bmatrix}-B\\+R\\+H\end{bmatrix}$ /ȳ/ b. X X $\begin{bmatrix}-B\\+R\\-H\end{bmatrix}$ /ø̄/ c. X X $\begin{bmatrix}+B\\+H\end{bmatrix}$ /ū/ d. X X $\begin{bmatrix}+B\\-H\end{bmatrix}$ /ō/

With respect to diphthongs there is a longstanding debate on the question whether they must be analyzed as combinations of two short vowels, or a short vowel plus a glide or as single segments specified with a feature that indicates their diphthongal nature. I refer to Zonneveld and Trommelen (1980) for a useful discussion.

The position that I will adopt here is that diphthongs result from combining short vowels and glides. This is the option that best fits in the analysis presented thus far. This interpretation of diphthongs is furthermore supported by the fact that in Bakker (1971), it is reported that /j/ and /w/ do not occur after short vowels. This alleged 'gap' is not expected, because slot X_4 allows vowels on the one hand and all consonants on the other. We do not expect that segments with an intermediate sonority value are not allowed in such a position. On my analysis there is no gap. I will in addition assume that combinations of short vowels are impossible because vowels have an identical sonority value.

Sequences of short vowels and glides are subject to the following filter:

(55) $* \begin{array}{c} X_3 \\ | \\ [\alpha B] \end{array} \quad \begin{array}{c} X_4 \\ | \\ [-\alpha B] \end{array}$

Let us see what the result would be given that /j/ and /w/ are specified as in (56):

(56) /j/ $\begin{bmatrix} -B \\ +H \end{bmatrix}$ /w/ $\begin{bmatrix} +B \\ +H \end{bmatrix}$

Combining these segments with the short vowels leads to the following segments:

(57) a.

	/I/	/ɛ/	/æ/	/ɔ/	/ɑ/
	$\begin{bmatrix} -B \\ +H \end{bmatrix}$	$\begin{bmatrix} -B \\ -H \end{bmatrix}$	$\begin{bmatrix} -B \\ +R \\ -L \end{bmatrix}$	$\begin{bmatrix} +B \\ -L \end{bmatrix}$	$[+L]$
/j/ $\begin{bmatrix} -B \\ +H \end{bmatrix}$	D	A	B		
/w/ $\begin{bmatrix} +B \\ +H \end{bmatrix}$				C	E

b. $A = \begin{array}{cc} [-H] & [+H] \\ | & | \\ X & X \\ \multicolumn{2}{c}{[-B]} \end{array} \quad B = \begin{array}{cc} [-L] & [+H] \\ | & | \\ X & X \\ \multicolumn{2}{c}{\begin{bmatrix} -B \\ +R \end{bmatrix}} \end{array} \quad C = \begin{array}{cc} [-L] & [+H] \\ | & | \\ X & X \\ \multicolumn{2}{c}{[+B]} \end{array}$

The combinations A, B and C lead to adequate representations of the diphthongs that were informally represented as /ei/, /ui/ and /ou/ in table (51). Rather then ruling out combination D (i.e. /Ij/) in terms of an additional filter I will assume that this sequence is simply interpreted as a long /Ī/. Combination E can be ruled out by stipulating that X_4 may not be [+L] or by assuming that C and E are phonetically interpreted as the same sound.

Given that diphthongs are represented as vowel-glide sequences we can account for the non-occurrence of /r/ after diphthongs in terms of the same dissimilarity condition that also rules out clusters of liquids and nasals. To summarize let us look at the complete set of possible and impossible combinations for X_3, X_4 and X_5, also taking into consideration obstruents and vowels:

(58)

X_3	X_4	X_5
V	*V	...
	G	*G, *r, l, n, m, Obs
	r	*r, *l, n, m, Obs
	l	*l, *n, m, Obs
	n	*n, *m, Obs
	m	*m, Obs
	Obs	*Obs

It is a nice result that all starred possibilities are ruled out by a single dissimilarity condition for X_4 and X_5.

We can now also give an answer to the question as to whether Dutch glides should be analyzed as a separate class or as "high vowels" placed in non-nucleus position. If we analyze them as high vowels we face two problems. Firstly, it is not clear which high vowel we must choose. As can be seen in (51) there are at least three high vowel segments, whereas there are only two glides. We also make the analysis inconsistent, because whatever vowels we choose, the prediction will be that these vowels cannot be followed by /r/. But, as we may learn from Bakker (1971), all vowels can occur before /r/, except the diphthongs. For these reasons I choose to regard the glides as separate segments of the language.

In (59) I give a summary of the analysis that has been proposed in this and the preceding sections:

(59) a.

```
obs        m     n     l     r     G        vow
|--...--|----|----|----|----|--...--|
1          2   2.25  2.5. 2.75   3        4
```

b. $[[X_\emptyset]] = [[s]]$
$[[X_{1,2}]] < 4$
$[[X_3]] = 4$
$[[X_{4,5}]]$ are free

c. Dissimilarity conditions:
for X_1 and X_2: 1.5
for X_4 and X_5: Ø.5

d. Filters: (7), (13), (14), (17), (19), (32), (33), (34), (36a), (36b), (42), (44), (45), (47), (55) This completes the analysis of the linear structure of the core of Dutch syllables. Before proceeding with a discussion of the **appendix** let me once more make explicit what the theoretical consequences of the present analysis are.

I have made crucial use of a sonority scale on which segment classes have been supplied with certain values. The specific scale that I have adopted is in conformity with sonority scales that have been proposed elsewhere on the basis of other types of evidence (cf. Vogel 1977 for an overview). I deviate from current proposals by claiming that the values are absolute rather than relative. This claim is based on the necessity to assume that the sonority distance between some classes is bigger than the distance between other classes. It remains to be shown that this claim is backed up by an argument involving the phonetic interpretation of the feature [sonority]. My main concern here has been to supply phonological motivation for such a claim. Let me point out, however, that it would be possible to maintain the less powerful theory in which sonority values are relative only. In that case we must assume that liquids and glides are assigned the same sonority value (cf. the scale in 24) and furthermore that the absence of the syllable final cluster /ln/ and the absence of /r/ after diphthongs have nothing to do with the notion sonority distance. There are a few other minor adjustments to be made if we decide to abandon absolute values. I claim, however, that we arrive at a less satisfactory analysis in that case in which more is stipulated or left unexplained. Given the fact, however, that an alternative analysis is possible an answer to the question as to whether it must be allowed to use absolute values must be based on more case studies of this type. I strongly suspect that on the basis of this analysis and others to be carried out within the same framework the question will be answered in a positive way.

3.3.4. The appendix

Dutch word final syllables may have more complex postvocalic clusters than we have considered so far. The same fact has been observed for English where the more complex codas always involve dentals, as is also the case in Dutch. It has been proposed that the dentals should not be regarded as forming part of the core syllable structure, but should rather be treated as a special constituent, called the **appendix**. The main reason is that it appears to be the case that a cluster of dentals can be added to each syllable that was so far found to be wellformed, provided that it stands in word final position.

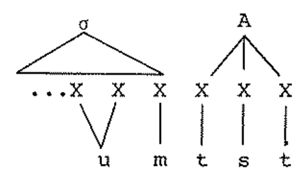
As said any segment appearing in the appendix must be a dental (strictly speaking, for Dutch: alveolar). The obstruent or obstruent cluster must furthermore be voiceless. Filters that have already been proposed will take care of this latter fact (cf. 32 and 45). The maximal number of segments in the appendix is three. Given that /t/ and /s/ are the only voiceless dentals, the following appendices are logically possible:

(59)	t	s	ts	tst
			st	sts

All occur except for /sts/.

In almost all cases where an appendix is present (especially a two or three consonantal one) we are dealing with complex words. Dutch has various suffixes of the segmental form /t/ or /s/ or /st/ and some of these can be combined:

(60) a. be + roem + d + st 'famous (superl.)'
be + roem + d + s 'famous (gen.)'

b. beroemdst 

I know of no morphological derivation that may give rise to /sts/, however.

The occurrence of /tst/ is the subject of some controversy. Booij (1984) claims that this sequence does not occur as an appendix. His claim is that the appendix may only contain two segments. I see no reason to follow him in this respect, although it is true that there exists an optional rule that deletes the first /t/ in such cases.

Given its independent status, we expect that the appendix can be added to each word final core syllable. Indeed, I know of no restrictions. This does not imply that all combinations actually occur. Base words ending in particular clusters may be accidentally missing, so that we will find no cases where such a cluster is combined with the possible appendices.

The fact that dentals occur in the appendix offers a possibility to explain that clusters of nasals and **non**-homorganic obstruents always involve a dental. We can now say that the filter given in (44) expressing the homorganicity applies to the main template and not to the main template plus appendix.

3.3.5. Exceptions

The following syllable types are exceptions to the main template:

īrp	wierp	āלf	twaalf	ēsp	weesp	ērn	deern
īlp	hielp tjielp			ūsk	bruusk	ōrn	doorn hoorn
īrf	stierf verwierf bedierf					ārn	baarn

There are several ways to explain these exceptions away. Booij (1984) proposes to derive the /ī/ in the first set of exceptions from an underlying short /I/ which does not occur in that position. The third type could be explained under the complex segment approach, a position that I have rejected. The last four examples could be explained by saying that the appendix allows nasals as well or by saying that these words are actually bisyllabic.

3.4. Constituent structure, syllabification and related issues

In the preceding sections the following linear structure has been proposed:

(61)
$$\underset{/s/}{X_\emptyset} + \underbrace{X_1 \quad X_2}_{<4} \quad \underset{4}{X_3} \quad \underbrace{X_4 \quad X_5}_{\text{free}} + \underbrace{X_6 \quad X_7 \quad X_8}_{\substack{1 \\ [+\text{coronal}]}}$$

SD: 1.5 (between X_1 and X_2); Ø.5 (between X_4 and X_5)

('SD' = sonority distance) In this section I will discuss what hierarchical structure we may assume for Dutch syllables. In chapter 2 I discussed several types of arguments that may play a role in proposing a particular hierarchical structure. We have seen that, according to Clements & Keyser

(1983), phonotactic constraints (i.e. filters) cannot be used in favor of a particular structuring of the syllable. One of their arguments was that there are constraints on combinations of vowels and preceding segments, just as there are constraints on vowels and following segments. It can now be confirmed, however, that the absence of certain combinations of vowels and preceding segments is noticeably different from gaps involving vowels and following segments, or gaps that only involve pre- or postvocalic material. In most cases of the latter type we are clearly dealing with reference to whole classes of segments, and not with reference to individual segments. The type of 'gaps' that I discussed in section 2.2.3. (cf. 26), involving vowels and prevocalic consonants or consonant clusters, clearly involves reference to individual segments. This type of gap can also be found with respect to vowels and postvocalic segments. To mention a few examples, in the tables provided in Bakker (1971) one will find that the short vowel /œ/ does not occur before the velar nasal /ŋ/ or the cluster /mp/. Similarly, /I/ does not occur before certain cluster types, such as /rk/, /rm/ and others (only for some of them Booij (1984) can assume that we find /ī/ instead; cf. section 3.3.5.). Furthermore, the long vowel /ȳ/ does not occur before /p/, /k/, /f/, /s/, /m/, /n/ and /l/, according to Bakker. Although one may question some of the gaps that Bakker reports, there can be little doubt that certain combinations of vowels, with either preceding or following segments or segment clusters are absent in Dutch, or, as one is tempted to put it: happen to be absent in Dutch. It does not seem right to treat these gaps on a par with the gaps that have been discussed in the preceding section and for which filters have been formulated.

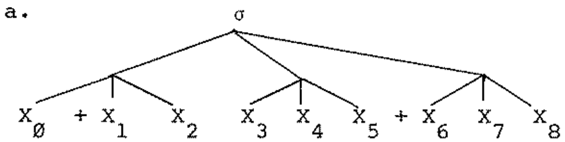
In the analysis that has been presented here thirteen phonotactic constraints have been proposed (cf. 59d). If we only consider those that refer to two or three specific slots we see that phonotactic constraints in Dutch refer to the following substrings of the syllable:

(62)

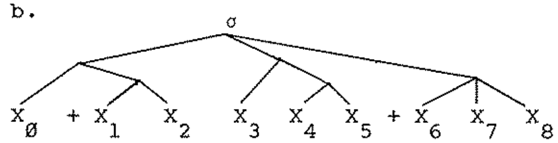
$X_\emptyset\ X_1$	: (34)
$X_\emptyset\ X_1\ X_2$	: (36a), (36b)
$X_1\ X_2$	: (14), (19)
$X_3\ X_4$	: (55)
$X_4\ X_5$	: (42), (44)

In addition the substrings X_1-X_2 and X_4-X_5 have been referred to as a group in the two dissimilarity conditions (cf. 59c). If a proposal concerning the constituent structure must be based on the fact that certain substrings are (or are not) referred to in phonotactic conditions then it seems that the following hierarchical structure could be assumed for Dutch:

(63) a.



b.



Given the fact that the substrings X_1-X_2 and X_4-X_5 are referred to more than other substrings, there may be a preference for the structure in (63b).

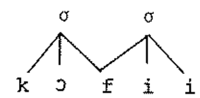
I will now turn to a different type of argument in favor of a particular hierarchical structure, one that is based on the distinction between optional and obligatory parts of the syllable. Dutch syllables can begin with a vowel and end in a vowel, so pre- and postvocalic consonants are optional. There is one restriction, however. Dutch syllables cannot end in a short vowel, unless this vowel is a schwa. If a syllable contains a short full vowel it must be a closed syllable to be wellformed. The closing consonant can be a sonorant or an obstruent. In the analysis I have proposed we can say that positions X_3 and X_4 are the obligatory slots, but observe now that these two positions do not form a constituent in the structures given in (63). Before I discuss the consequences of this, there is one other matter to be taken care of.

For word final syllables the restriction stated above is not controversial, since syllables ending in a short vowel are simply absent in that position. Word internally the matter is more complicated. Trommelen (1983) and Booij (1984) assume that word internally short vowels do occur in open syllables. I will now argue that we make better predictions if we say that in those cases the following consonant is ambisyllabic and hence that these alleged open syllables are in fact closed.

Consider a word like **koffie** [kɔfī]. The vowel of the first syllable is short and the intervocalic consonant is short as well, at least phonetically. I claim that an intervocalic consonant following a short vowel is **ambisyllabic**. I will first point out how ambisyllabic consonants will be represented and then turn to some arguments for this analysis. I give here two alternatives for the representation of ambisyllabic consonants.

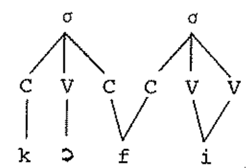
The first alternative incorporates the treatment that Kahn (1976) proposed (cf. chapter 2, sect. 2.2.2.). In this approach we allow that a single consonant following a short vowel is linked simultaneously to two syllables:

(64)



The second alternative is given here to reject the claim that ambisyllabicity can provide us with an argument in favor of the autosegmental (i.e. flat) structuring of the syllable and thus against the metrical structuring in which improper bracketing is not allowed. It has been pointed out in Van der Hulst and Smith (1982a) and in Borowski et al. (1983) that ambisyllabic consonants can also be represented as follows:

(65)



An obvious objection to such a representation would be to say that a segment linked to two slots must be interpreted as a long segment. In the publications mentioned it is claimed, however, that no language allows a contrast between (phonetically) long consonants and ambisyllabic consonants. The absence of such a contrast is explained by giving long consonants and ambisyllabic consonants the same representation at the phonological level. The fact that in one language doubly associated segments surface as phonetically long and in other languages as short would be a matter of phonetic interpretation. An additional indication for the fact that the relation between the number of slots and length should not be interpreted too literally comes from the vowel system in Dutch. In section 3.3.3. I showed that we must distinguish between structurally long and short vowels in terms of double and single association. Yet at the phonetic level only mid and low "long" vowels are clearly longer than "short" vowels. Phonetically speaking, the difference in vowel quality may be more important or as important as a simple difference in length.

Let me now return to the claim that word internally syllables may end in a short vowel. In my point of view (whichever representation of ambisyllabic consonants we choose) short vowels occur in closed syllables only. This analysis makes the following prediction. It predicts that a word internal syllable which, according to Trommelen and Booij, ends in a short vowel, must always be followed by a syllable that starts with a consonant. This prediction is borne out. There are no words in Dutch in which we find a word internal syllable ending in a short vowel, while the following syllable starts with a vowel. Whereas words as in (66a) exist, those in (66b) are illformed:

(66) a. /hii.aat/ hiaat b. * /hI.aat/
/kree.ool/ creool * /krɛ.ool/

If word internal syllables ending in a short vowel are allowed then the illformedness of the words in (66b) remains a mystery.

Let us now return to the issue of obligatory parts of the syllable. I would like to argue that, since X_3 and X_4 form the obligatory part of Dutch syllables, the constituent structure that we assign to Dutch syllables must allow a simple statement of this fact. A possibility would be to say that these two slots form the nucleus of the syllable. Observe that the resulting structure is not compatible with the structures that I gave above in (63).

A third important indication for assuming a particular constituent structure comes from the interplay between stress assignment and syllable structure. In Dutch stress assignment is sensitive to syllable structure in more than one way. An extensive discussion of the relation between stress and syllable structure (with special reference to Dutch) is offered in chapter 5. It will be necessary, however, to anticipate some of that discussion here.

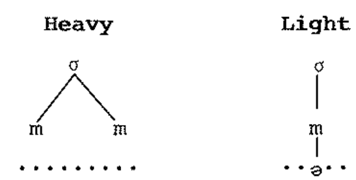
The first observation is that syllables with a schwa never bear main stress. So far I have not given explicit attention to the schwa. Trommelen (1983) draws our attention to two other properties of schwas, one of which I mentioned already. With the long vowels the schwa shares the property that it may occur in open syllables. The third special property of the schwa is that it can be followed by at most one consonant (ignoring the appendix). As we will see in section 3.5.1. Trommelen explains these facts by assuming that the vowel schwa occupies two syllable slots, just like long vowels. I will not follow her in this respect. I will assume that it is the structure of syllables containing a schwa that is special rather than the schwa itself. The precise way in which we differentiate between syllables with a

schwa and syllables with a full vowel depends on the choice we make with respect to the different possibilities for the syllable structure as a whole.

In chapter 2 we have discussed various ways of structuring the syllable to account for the relation between what was called syllable weight and stress assignment. We ended up with two rivalling theories. In the one (referred to as the metrical theory) one recognizes intrasyllabic constituents such as onset, nucleus, coda and perhaps rhyme, and in the other (the mora theory) constituents of a different type are assumed. In sketching the interplay between syllable structure and stress in Dutch I will first adopt the mora theory.

In the mora theory we can account for the difference between syllables with schwa and syllables with full vowels in a way that is familiar from other cases where syllable weight plays a role (cf. chapter 2, sections 2.2.3.-4.), i.e. syllables with a schwa can be considered to consist of one mora and syllables with full vowels as consisting of two morae. The heavy-light distinction (in Dutch) can be graphically represented as in (67):

(67)

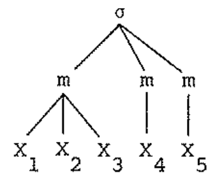


I.e. heavy syllables are branching and light syllables are non-branching. Combining this with what we said about the parts of the syllable that are obligatory we can say that in Dutch:

(68) Heavy syllables are obligatorily branching
Light syllables are obligatorily non-branching

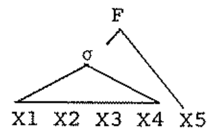
Ignoring the prefixal /s/ and the appendix let us investigate how X_5 would be integrated in the mora approach. Again evidence from the behaviour of syllables with an X_5 position with regard to stress placement provides us with a clue. As will be demonstrated in chapter 5, word final syllables of the type VVC (and to a lesser extent VCC) attract stress, whereas words ending in other syllables with a full vowel bear final stress only exceptionally. The stress attracting character of VXC syllables suggests that these syllables have a structure that is different from ordinary heavy syllables. I will suggest that syllables of this type contain three morae and I will call them superheavy (following Kager & Visch 1983). Syllables of the VXC type behave exactly like the syllables that McCarthy calls superheavy in his analysis of the stress system of various Arabic dialects (cf. McCarthy 1979) and they also have a comparable structure, i.e. an "extra consonant" at the end of the syllable. I propose to assign the following constituent structure to "superheavy" syllables in Dutch:

(69)



In McCarthy's analysis the "extra consonant" is analyzed as a degenerate syllable, which leads to the position that VXC syllables have the structure of a foot:

(70)

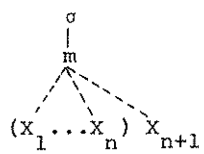


In chapter 5 I will advance a different proposal that explains the foot-like behaviour of superheavy syllables without questionable assumptions about constituent structure.

Since so far the mora theory seems adequate to represent the structure of Dutch syllables, let us also see how syllabification would work for the case of Dutch. Recall our discussion of syllabification rules, offered in section 2.2.4. The rules proposed there were intended as universal schemata and I will investigate to what extent the syllabification rules that we must assume for Dutch are instantiations of these schemata.

The first rule introduces the syllable node dominating the first mora:

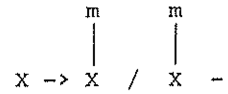
(71)



Where X_{n+1} is a sonority peak and $X_1 \ldots X_n$ is a maximal sequence such that m is wellformed

The rule that creates the second mora is the following:

(72)



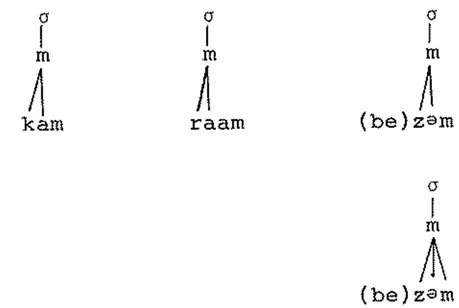
Threshold: any segment following the 1st mora qualifies as a mora

The language-specific complication that we find is that this rule may not apply if the first mora is linked to a schwa. Schwas can be followed by a consonant but, as will be pointed out when I discuss stress assignment, this does not give them more weight. To handle this, I postulate a special rule that adjoins a consonant following a schwa to the preceding mora. I will furthermore assume that the rule in (72) is iterative, i.e. it may operate twice, thus creating sequences of unassociated morae. Consider the following illustrations:

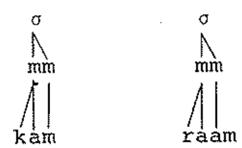
(73)

kam	raam	(be)zəm
kat	ramp	
kaa		

(71)



(72)

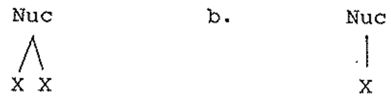


(72)

The fact that the schwa may be followed by a consonant presents a slight problem for the mora analysis, since we do not want this consonant to function as a second mora. Since an extra rule is required we do not explain why a schwa may be followed by at most one consonant, a property that this vowel shares with the long vowels.

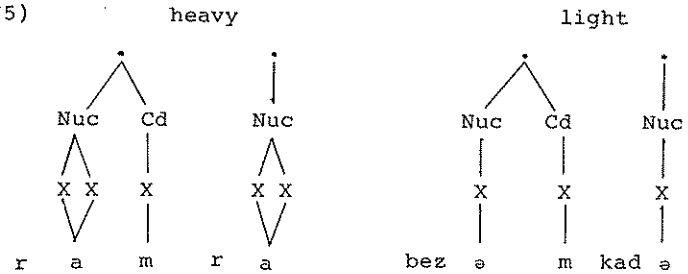
Let us now turn to the metrical theory of the syllable. As before, I assume a version of this theory in which the internal structure of syllables contains a category nucleus, so that structural differences between light syllables (those with a schwa) and heavy syllables (those with a full vowel) can be made by allowing two types of nuclei:

(74) a. b.



In this approach, the complication involving the schwa lies in the fact that we must stipulate that the nucleus in (74b) may only be occupied by a schwa. Given this, we can then say that in Dutch all syllables obligatorily contain the category nucleus. Superheavy syllables can be represented by assuming that there also is a category coda, that may comprise at most one consonant. It is reasonable to assume that this category may follow both types of nuclei:

(75)



In the next section we will see that, if the structures in (75) are adopted, the unlabelled node in (75) can be regarded as still another constituent of the syllable (the rhyme). Observe furthermore that in this theory the post-schwa consonant does not lead to a problem. In fact, one expects it to be possible, given that the difference between heavy and light syllables is a matter of nucleus structure. Moreover, we explain why only one consonant can follow both the schwa and long vowels.

It seems that both the mora theory and the metrical theory are

satisfactory, in that both theories allow us to characterize straightforwardly which parts of the syllable are obligatory and also to distinguish between the classes of syllables, that show different behavior with respect to stress assignment.

A second conclusion to be drawn from the present discussion of arguments in favor of hierarchical structure (as we find them in Dutch) is that the arguments coming from phonotactic constraints and other arguments involving the distinction between optional and obligatory parts of the syllable, and stress, do not point in the same direction in all respects. It is not the case, however, that phonotactic constraints do not point in a particular direction, as is claimed by Clements and Keyser (1983) and Davis (1982). As can be concluded from the structures given in (63), the evidence from phonotactic constraints can be interpreted as support for the metrical theory, but not up to the finest detail. Whereas evidence from phonotactics seems to suggest that positions X_4 and X_5 form a constituent, the other evidence discussed in this section strongly suggests that X_3 and X_4 form a constituent, viz. the nucleus.

In the following section I will discuss the major differences between the analysis that has been presented in the preceding sections and the analysis offered in Trommelen (1983).

3.5. Trommelen (1983) and the diminutive suffix

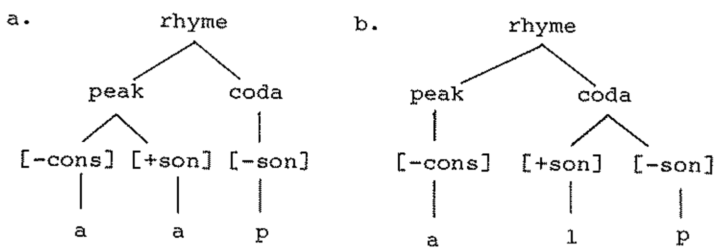
In Trommelen (1983) an account of Dutch syllable structure is offered which, it is claimed, allows an explanatory analysis of the rich allomorphy of the Dutch diminutive suffix. In this section I will indicate the differences between my views and those of Trommelen. Then I will show (in section 3.5.2.) how the diminutive allomorphy must be handled if one assumes an analysis of the syllable along the lines of the previous sections.

3.5.1. Trommelen (1983)

One of the major differences between Trommelen's proposal and mine involves the constituent structure that is assumed for Dutch syllables.

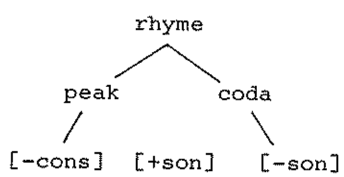
Firstly, Trommelen (henceforth 'T') argues that syllables containing a long vowel are structured differently from syllables containing a short vowel followed by a consonant cluster. In the case of long vowels and diphthongs T assumes a branching nucleus (peak, in her terminology), because the two short vowels that represent the long vowel or diphthong at the phonological level are interpreted as one long segment on the surface. On the premiss that phonological rules generally refer to phonological constituents, she concludes that the short vowels form a constituent. Dutch also has a rule, however, that inserts a schwa in between a sonorant consonant (provided that it is a liquid) and an obstruent (provided that it is not coronal). Both consonants must be tautosyllabic: **kerk -> kerək.** The result of this line of argumentation is that Dutch appears to have two basic syllable (or rather rhyme) types:

(76)



To capture the similarities between the two templates T introduces an abbreviatory convention, which enables her to collapse the two templates as follows:

(77)



> As any abbreviatory convention (braces, parentheses, mirror image rules, etc.) it will be accompanied by a universal interpretive mechanism, which, in this specific case, will automatically provide the 'floating' feature [+son] with either a connection to the left, or a connection to the right. This interpretive convention may be a case of the instruction 'associate' known from recent work on so-called autosegmental phenomena [...] (p. 81)

I suspect that the reference to the association of "floating" features is guided by a mere superficial resemblance with floating entities that have

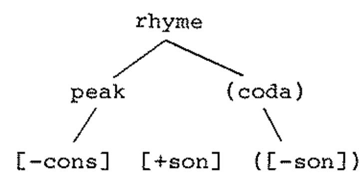
been proposed in tonal analyses, but more importantly I find T's arguments for postulating two templates insufficient. I reject her premiss that all segments referred to in phonological rules must form a constituent. To put it in the terminology of Selkirk (1980b) it is simply not the case that all rules are **domain span rules**. We also have **domain juncture rules**, that crucially refer to segments that do not form a constituent. Now I am not arguing that the schwa-epenthesis rule is a juncture rule (operating on the juncture of nucleus and coda), I am only suggesting that in the absence of evidence it is not justified to conclude that the rule is either a domain span rule or a domain juncture rule.

However, let us accept T's analysis for the moment and proceed with her treatment of optional parts of the syllable.

> [...] there is a difference in status between the peak and the coda for Dutch, to the effect that the peak is obligatory (this may be universally true), while the coda is optional. (p. 83)

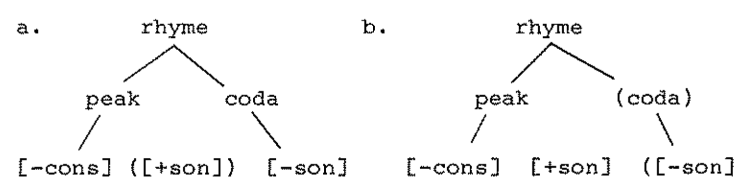
T captures this fact by putting parenthesis into the template:

(78)



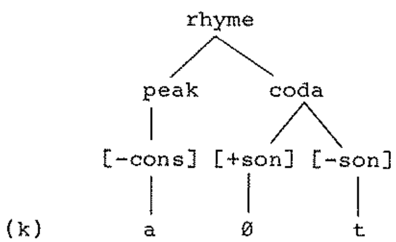
Note that it will not be possible to parenthesize the floating [+son] as well, because that would entail that Dutch syllables could end in a short stressed vowel, which is not possible, as we have seen in the previous section. However, there is good reason to parenthesize it, considering the fact that a syllable consisting of a short vowel only followed by an **obstruent** is wellformed. Hence the **sonorant** may be absent. The crucial point is that the sonorant and the obstruent may **not both** be absent. One would expect therefore that the optionality of the sonorant consonant necessarily forces T to adopt (79a) in addition to (79b):

(79)



Without saying why, T does not consider such a move. The consequence is that the following syllable structure tree is assigned to a syllable like **kat**:

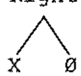
(80)



T's claim is that the [+son] node belongs to the obligatory part of the syllable. This leads to the presence of an empty slot if no sonorant is actually present. Below I will show why the empty slot forms part of the coda rather than the peak. The only reason (that I can think of) for allowing an empty slot in the syllable representation is not reluctance to introduce another abbreviatory device to collapse (79a) and (79b), but rather that the presence of this slot is convenient for the rules that T proposes to handle the allomorphy of the diminutive. This will become clear when we look at T's rules that handle the allomorphy of the diminutive. It will turn out that one of the rules makes crucial use of the empty slot in (80). Here I am merely drawing attention to the fact that this part of the analysis is not motivated.

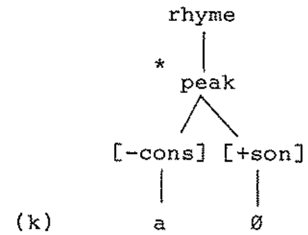
Observe that T's analysis offers no possibility of characterizing a certain **constituent** of the syllable as obligatorily branching to account for the fact that syllables ending in a short vowel are illformed. To express this fact T must formulate a separate constraint (p.86):

(81) Right Sister Constraint



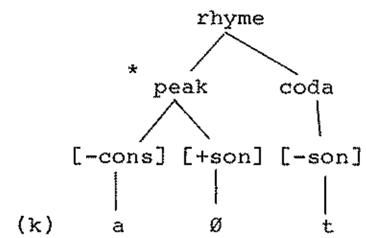
This constraint rules out a syllable like /ka/:

(82)



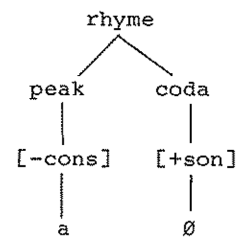
The right sister constraint also blocks the possibility of giving **kat** a representation with the empty slot as part of the nucleus:

(83)



Apparently the right sister constraint is not meant to block a structure as in (84):

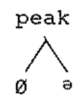
(84)



We will see shortly hereafter that T allows this structure word internally (cf. 88). But if the right sister constraint does not block the structure in (84), it is not clear how T's analysis will mark word final short vowels as illformed. Although T assumes otherwise implicitly (cf. her figure 64 on p. 86), there is nothing to prevent a word final rhyme with a structure as in (84).

Let me now discuss T's treatment of the schwa. Trommelen observes three important properties of syllables with a schwa. I mentioned these properties in the preceding section, but I will repeat them here for convenience. Firstly, syllables with a schwa cannot be stressed. Secondly, unlike the other short vowels, a schwa cannot be followed by two consonants. In this respect schwa behaves like a long vowel. Thirdly, open syllables ending in schwa are wellformed. In this respect too schwa behaves like a long vowel. To account for its special behaviour Trommelen proposes to represent the schwa as in (85):

(85)



By saying that the schwa occupies two slots it is explained why there is room left for one consonant only. In diphthongs we observe that the first part of a bimoric vowel is stressed. Hence by saying that the first part of the schwa is empty T claims to explain its unstressability. Thirdly, syllables with a schwa may be open, because the obligatory nodes (i.e. [-cons] and [+son]) are present (filled by nothing and the schwa respectively).

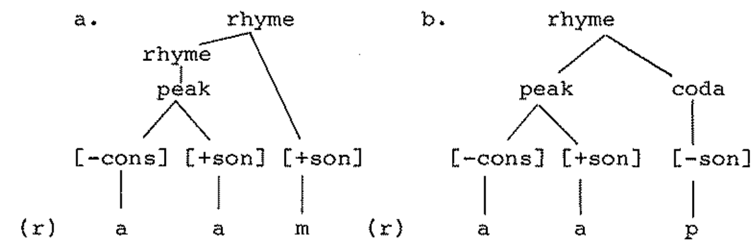
The three properties of the schwa are also explained in my approach to the schwa. Firstly, syllables with a schwa are non-branching (either at the syllable level or the nucleus level, depending on the particular theory that is adopted), hence such syllables can contain one consonant less. (I have argued in the previous section that the metrical theory is more adequate on this point than the mora theory.) Secondly, they can occur word finally because all syllables can occur word finally, keeping in mind that there are heavy and light syllables. Finally, the unstressability of syllables with a schwa is explained by interpreting the distinction between syllables with a full vowel and syllables with a schwa as a distinction in **syllable weight.**

It seems to me that my views are preferable. Firstly, no use is made of "null segments" or "empty slots". This holds whether we adopt the mora theory or the metrical theory with respect to the hierarchical structure. Secondly, in the light of the observed relationship between syllable structure and stress assignment, in my account the structure of syllables not containing a schwa is in accordance with the general fact that stress-attracting syllables are branching (or have a branching nucleus) as opposed to syllables that do not attract (or reject) stress, which are non-branching (have a non-branching nucleus). On T's analysis syllables with short and long full vowels do not form a natural class from a geometrical point of view. Long vowels and schwas correspond to a branching peak, whereas short vowels correspond to a branching rhyme. To account for the unstressability of schwas T must therefore invoke an ad hoc explanation

(involving the unstressability of null segments), whereas in my account use can be made of the fact that a relation between branching nodes and prominence has been firmly established within the metrical theory of stress.

Another difference which I want to focus on concerns superheavy syllables. The rightmost segment (ignoring the appendix) that T allows in the rhyme is an **obstruent.** T shows that in word-medial position sonorants following a long vowel or short vowel-sonorant sequence are rare in Dutch when we consider only monomorphemic words. Word final sonorants which are rather common are adjoined to the rhyme via Chomsky adjunction. A consequence of this is that **raam** and **raap** are structurally different:

(86)



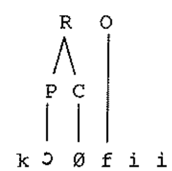
I know of no independent motivation for this different structuring of syllables ending in an obstruent and syllables ending in a sonorant, although it will become clear below that the structural difference is exploited by T in her formulation of the rules for the diminutive suffix.

Apart from this problem, T's analysis has a rather undesirable consequence with respect to syllabification. The procedure T proposes is the following (p. 134):

(87) match (i) the obligatory nodes
(ii) the maximal onset
(iii) the optional nodes

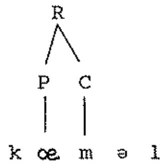
If the medial consonant happens to be an obstruent we get the following structure:

(88)



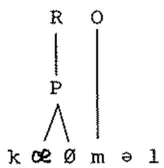
However if the medial consonant is a sonorant we arrive at a different result:

(89)



Why should that be so? Recall first of all that the [+son] node is obligatorily present. The first step in syllabifying a string is therefore to match [-cons][+son]. In the case of (88) there is no segment to fill the [+son] position; in (89) there is. At first sight it may seem possible to assign a structure as in (90) to **kummel** [kœməl], but this possibility is blocked by the right sister constraint (cf. 81 above).

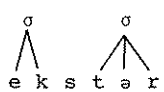
(90)



I agree with Booij (1984) that there is absolutely no basis for the different syllabification of the two examples, so I interpret this as an argument against T's decision to exclude sonorants from the "fifth position", despite their rareness in monomorphemic words. Moreover, I have pointed out in section 2.2.4. that there is no good reason to limit the analysis to syllables occurring in underived words.

I will now consider a case of syllabification, that will lead us into a discussion of the medial /s/. T points out that a medial /s/ must be attached to the preceding syllable, given the fact that the /s/ is an extrametrical segment. A problematical aspect to this proposal is that there are cases (as Trommelen observes herself) in which the /s/ cannot be attached to the preceding syllable, because this would result in an illformed syllable. Consider the word **ekster** 'magpie':

(91)



In this example the /k/ occupies the [-son] position (which is the last position in the syllable) hence there is no room for the /s/ to occur in the coda of the first syllable. The existence of word internal /s/ is anything but exceptional if we extend our analysis beyond monomorphemic words. Words derived with suffixes like **-ster**, **-st** and **-te** lead to many instances of word medial /s/ where this segment cannot be attached to the preceding syllable. The conclusion must be that the syllable prefix cannot be given the status of an **extrametrical** element that can only occur at the periphery.

This concludes my discussion of T's proposals. I have shown that where significant differences exist between my proposal and that of Trommelen it is certainly not the case that T's proposals are superior in terms of explanatory power or elegance.

3.5.2. The diminutive suffix

3.5.2.1. Introduction

The diminutive suffix in Dutch has a rich allomorphy that has inspired many phonologists from various theoretical backgrounds to test their framework. For references and a discussion of various analyses I refer to Trommelen (1983).

Cohen (1965) gives the first full treatment, in which it is shown that the distribution of the various allomorphs is governed almost completely by phonological factors, more precisely: by the shape of the final syllable of the base word. Cohen stated the distribution in terms of segmental generalizations. Following his lead I will give here the basic facts in terms of segmental characterizations of the environments in which the different allomorphs appear:

(92) allomorph	environment	examples	
a. **-etje**	short vowel + liquid or nasal	balletje	tolletje
		karretje	torretje
		kannetje	tonnetje
		kammetje	bommetje
		tangetje	tongetje
b. **-je**	obstruent	busje	baasje
		hulsje	kerkje
		balkje	huisje
c. **-pje**	long vowel + **m**	duimpje	raampje
		boompje	bloempje
	short vow. + liq. + **m**	halmpje	bermpje
		zwermpje	
d. **-tje**	long vow. + **n**	laantje	boontje
		duintje	heintje
	l	baaltje	kuiltje
		wieltje	stoeltje
	r	boortje	boertje
		veertje	vuurtje
	j	zooitje	boeitje
		vlaaitje	kooitje
	w	eeuwtje	kieuwtje
		duwtje	zwaluwtje
	Ø	zeetje	kadootje
		laatje	uitje
	short vow. + **r** + **n**	kerntje	urntje
	+ **l** + **m**	halmpje	helmpje

I will refer to the first allomorph as the **long** form and to the other ones as **short** forms. A key issue in the analysis of diminutive formation is to differentiate between the environments in which the short and long forms occur.

There is an additional set of data that must be considered:

(93) a.	**-pje**	short vow + **m**	bodempje	bezempje
b.	**-tje**	**n**	haventje	torentje
		l	lepeltje	mereltje
		r	bakkertje	gozertje
c.	**-kje**	ŋ	koninkje	landinkje

We see here that the two short forms **-pje** and **-tje** occur in one other context in addition to those given in (92) and furthermore that in this context a fourth short form appears, viz. **-kje**.

The environmental specification given in (93) is identical to that in (92a). One of the controversies in the literature concerns the proper way in which the two environments should be further differentiated. The traditional position (found in Cohen's paper) is that stress is the relevant factor. In the example given in (92) the final syllable of the base noun bears stress. In the examples given in (93) stress is on the first syllable.

In the following sections I will discuss a number of nonlinear characterizations of the environments in which the allomorphs of the diminutive suffix appear. Firstly, in sect. 3.5.2.2. I will discuss the analysis presented in Trommelen (1983). In section 3.5.2.3. I will discuss the position taken by Kooij (1982) and Van Voorst (1983), who also work within a nonlinear framework, showing that a slightly modified variant of their analyses represents an attractive alternative to T's analysis. This alternative is based on a view on syllable structure that is somewhat different from the views that I have defended in the first half of this chapter. In section 3.5.2.4. I will therefore offer an alternative analysis that is consistent with these views.

3.5.2.2. Trommelen's analysis

The central goal of T's analysis is expressed in the following quote (p. 4):

> Above all, my aim will be to show that diminutive formation is, in the intuitive sense, a local process, and that in the most economical description a very limited type of phonological information suffices to characterize the distribution of the various allomorphs. The relevant phonological information does not consist of factors such as sonorance, stress, vowel length or morphological make-up, but rather it concerns the final portion of the noun stem involved. This portion will be identified as the **rime of the final syllable** of the noun, and **only** this rime

On the basis of the facts we have just seen one might want to disagree with this statement, since one of the relevant factors appears to be stress. But, as we will see, there are several ways to encode this factor locally in the rhyme structure.

Let us first discuss the rule that accounts for the long allomorph, i.e. **-etje**. T proposes the following rule:

```
(94)   DIM
       tje      ->   etje /   rhyme
                              1/\2
```

This rule should be read as follows: a schwa is inserted after a branching rhyme, whose daughters are terminal nodes of the syllable (i.e. the use of integers is meant as a notational convention to indicate the notion terminal node). T assumes that the underlying form is /tje/. Hence rule (94) is an epenthesis rule. The requirement that the daughters of the rhyme must be terminal rules out all bases having a long vowel, because then node "1" branches. One can check this by looking at the syllable structure tree in (76a). It also rules out cases where a short vowel is followed by a consonant cluster, since then node "2" branches (cf. 76b). In fact, given rule (94) there are only two cases that may seem problematical at first sight:

(95) a. short vowel plus obstruent (i.e. **kat**)
     b. schwa plus single sonorant (i.e. **bezem**)

Case (95a) poses no problem since, as the reader will recall, **kat** is assigned a structure with a branching coda, the left daughter being zero

(cf. (80)). It will be recalled that precisely this aspect of T's analysis of Dutch rhymes was not really motivated. I now claim that the empty node in syllables like **kat** is simply an ad hoc step to circumvent reference to the features that distinguish obstruents from sonorant consonants. This ad hoc step allows T to locate the difference between **kat** (with the short form) and **kam** (with the long form) at the level of syllable structure.

The second syllable of **bezem** has, according to T, the following syllable structure tree:

```
(96)                  rhyme
                     /     \
              rhyme          \
                |             \
              peak             \
              /  \              \
        [+voc]  [+son]       [+son]
          |       |             |
          Ø       ə             m
```

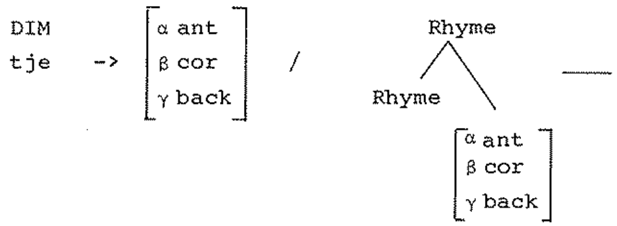
Syllables with a schwa are represented with a branching peak of which the first node dominates no feature matrix. The reasons for this move have been discussed in the previous section. So in this case the empty node (independently motivated, but shown to be at odds with current theories of stress) allows T to locate the difference between (k)**am** and (bez)**em** again at the level of syllable structure.

Given these two empty slots we see that the only case in which the rhyme has a structure that meets the SD of rule (94) is the one in which a short vowel is followed by a single sonorant consonant:

```
(97)                 rhyme
                    /     \
             [-cons]       [+son]
                |             |
     (k)        a             m
```

The other short allomorphs (**-pje** and **-kje**) are handled by the following rule:

(98)



The reader will recall that syllables ending in a sonorant like **raam** are structured differently from syllables ending in an obstruent like **raap** (cf. (86), above). Hence rule (94) will only apply to words in which a sonorant follows a long vowel (or a schwa). Again reference to segmental properties have been reduced to a minimum, thanks to an assumption about syllable structure.

The remaining short form (**-je**) is derived by a rule of t-deletion that, according to T, is independently motivated (p. 55):

(99)		
	kat + tje	raap + tje
t-del	Ø	Ø
	katje	raapje

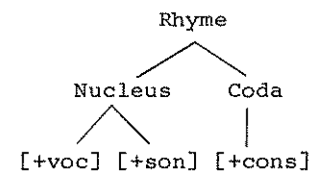
After having undergone all the rules discussed here underlying /tje/ has only survived after long vowels: **zee+tje.**

This completes my sketch of T's analysis. My purpose has been to show that T's analysis is internally consistent in that reference to segmental or suprasyllabic structure is systematically avoided. I have also indicated, however, that the assumptions concerning syllable structure on which this strategy crucially rests are not always independently motivated or the most desirable ones in the light of arguments concerning the interaction between syllable types and stress placement.

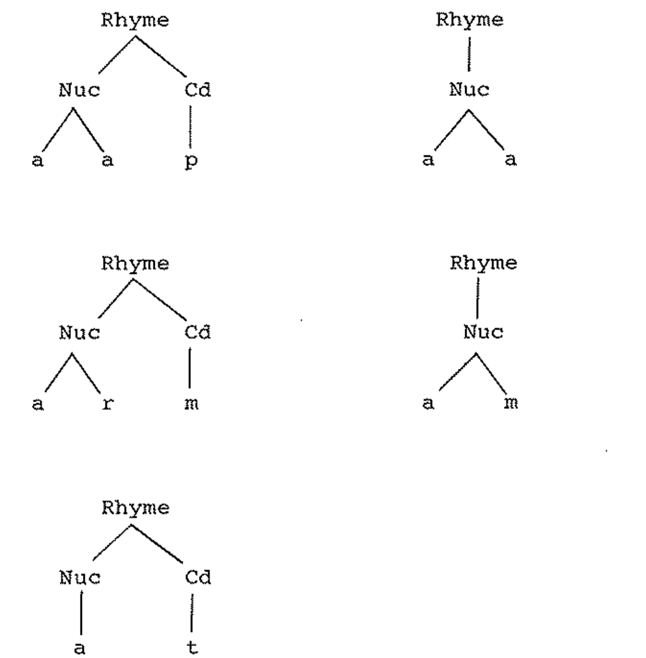
3.5.2.3. Alternative analysis I

In section 3.5.1. I have questioned T's reason for assuming two basic syllable templates. In considering alternative analyses I will start out by assuming that there is only one syllable template. This is the simplest position, and should be maintained as long as real counterevidence is absent. A straightforward approach within the metrical theory of the syllable involves the following template (cf. Halle and Vergnaud 1980b); I use the term nucleus instead of peak:

(100)



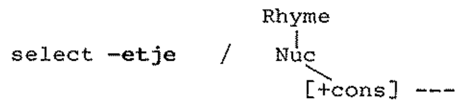
(101) **Branching rhymes** **Non-branching rhymes**



Given the set of possible rhymes the distribution of the long form can be stated as follows: **-etje** occurs after a non-branching rhyme. However, there is one problematical aspect to this statement. We now also select **-etje** after a long vowel: **zee+etje**, which is incorrect. We can adjust the analysis by adopting a schwa deletion rule, but this rule has little if any independent motivation. Inflectional endings (like the plural or infinitive **-en**) can be added to bases ending in a long vowel without being subject to the deletion rule.

The unpleasant aspect of this analysis then is that we have to introduce an ad hoc deletion rule. This can be avoided if we are willing to refer to segmental properties, i.e. if we are willing to stipulate in the rule that selects **-etje** that the rhyme must end in a consonant:

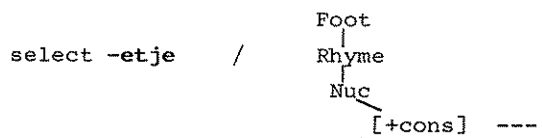
(102)



I see no principled reason to avoid reference to segmental material. Having added arboreal structure to phonological representations we have not committed ourselves to present analyses that avoid reference to segmental structure.

We must modify the analysis further, however, to prevent the appearance of **-etje** after words like **bezem**, whose final syllable seems to meet the SD of rule (102). The obvious modification involves adding reference to stress. The syllable ending in a sonorant consonant must be stressed, which in nonlinear theories means that it must be the head of a foot. Since we are dealing with a word final syllable and since Dutch feet are [SW] (as we will see in chapter 5) the relevant requirement is that the word final rhyme must be the head of a monosyllabic foot:

(103)

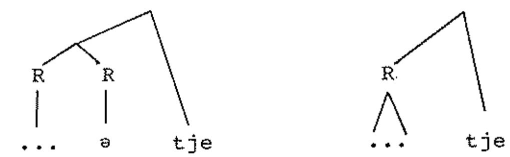


The translation of the traditional claim concerning the relevance of stress into the claim that "foot structure" is relevant is found in Van der Hulst (1981) and Kooij (1982). Both ignore the possibility of referring to the rhyme structure and, as a consequence their statement of the rule has to refer to the crucial presence of the string **short vowel + liquid or nasal** (cf. (1a)).

Van Voorst (1983) captures the insight that is expressed in rule (103), viz. that both the rhyme and the foot must be non-branching. His formulation of the rule is different for reasons that need not concern us here.

The theory applied in this section leads to an analysis that can be offered as a reasonable alternative to T's analysis. In particular it allows us to characterize the environments in which the long form appears in such a way that we bring to the surface straightforwardly the equivalence of a **light** syllable (one with a non-branching rhyme) followed by schwa and a **heavy** syllable (one with a branching rhyme):

(104) **Light syllable** **Heavy syllable**

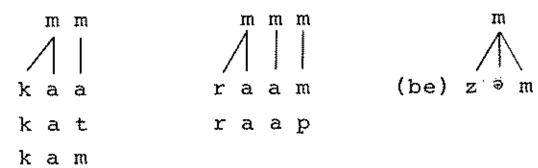


Theories that express this equivalence meet what Halle & Vergnaud (1980c) have once called "a boundary condition on an adequate theoretical framework".

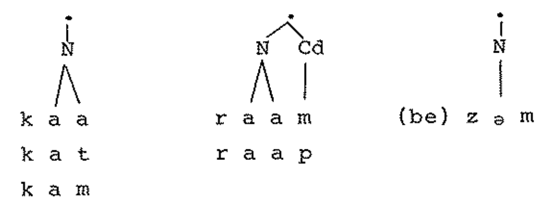
3.5.2.4. Alternative analysis II

The analysis of the preceding section is not consistent with the analyses of the structure of (Dutch) syllables, discussed in the first half of this chapter. In my account of the linear structure, I have not limited slot X_4 to sonorants only. In neither the metrical structuring nor the mora structuring of the proposed linear structure, there is a geometrical distinction then between syllables like **kat** and **kam**, although there is a difference between these two and a syllable like **raam**. Consider the relevant cases, including those with schwa:

(105) **Mora theory**



(106) **Metrical theory**



The rule that accounts for the occurrence of the long form can now be formulated as follows:

(1Ø7) $$\text{select } \textbf{-etje} \ / \ (\ m\ \underset{\begin{bmatrix}+\text{cons}\\+\text{son}\end{bmatrix}}{m}\ )_\sigma \ \_\_\_$$

(1Ø8) $$\text{select } \textbf{-etje} \ / \ \underset{\begin{bmatrix}+\text{cons}\\+\text{son}\end{bmatrix}}{\text{Nuc}})_\sigma \ \_\_\_$$

Observe that rule (1Ø8) will not apply if the nucleus is followed by a coda. If we decided to assume a rhyme constituent comprising the nucleus and the coda, rule (1Ø8) could be formulated as in (1Ø8'):

(1Ø8') $$\text{select } \textbf{-etje} \ / \ \underset{\underset{\begin{bmatrix}+\text{cons}\\+\text{son}\end{bmatrix}}{\text{Nuc}}}{\text{Rhyme}} \ \_\_\_$$

The requirement in rule (1Ø7) that two morae are present excludes **raam/p** and **bezem**. In both versions of rule (1Ø8), these forms are excluded by expressing the necessary absence of a coda. In all three rules [+cons] excludes **kaa**, [+son] excludes **kat**.

Comparing rule (1Ø7/1Ø8/1Ø8') to rule (1Ø3) we note that it is no longer necessary to refer to stress. Light syllables are structurally different from heavy syllables. Hence we can refer to **stressability** rather than to **the presence of stress**.

To conclude let me give the full set of rules that account for the distribution of both the short and the long forms. I reject T's suggestion that we have to spell out the rhyme structure to account for the short allomorphs (cf the rule in 98). We then fail to express the "elsewhere" relation that holds between the rules. For reasons that are independent from what has been discussed so far, I will assume that there is not a single underlying form, but rather that the various allomorphs are stored in the lexicon. Limiting myself to the metrical variant (without the rhyme), the rules given below constitute the full set of **distribution rules**:

(1Ø9) a. $$\text{insert } \textbf{-etje} \ / \ \underset{\begin{bmatrix}+\text{cons}\\+\text{son}\end{bmatrix}}{\text{Nuc}})_\sigma \ \_\_\_$$

b. **-Cje** / [+son] -

c. **-je** elsewhere

The allomorph **-Cje**, represents the set **-tje**, **-kje** and **-pje**. "C" stands for a voiceless obstruent which is unspecified for the features indicating place of articulation. I assume an autosegmental spreading rule which will copy the features of a preceding sonorant consonant, or, if there is no preceding consonant, turns C into the unmarked obstruent, i.e. a **t**. Note that the order in which these rules must be applied follows from the Principle of Proper Inclusion Precedence, the only universal ordering principle that meets with general acceptance.

I claim that the analyses of the diminutive suffix discussed in this section are simple and consistent. I have not made use of an abbreviatory convention (which signals the missing of a generalization, rather than the making of one), nor empty syllable slots that have no independent motivation.

To conclude this section I will discuss some of the problematical cases. In most of the problematical forms we find a vacillation between the long and the short form. We may distinguish at least four categories.

The first category consists of words that ought to get a short form but that also occur with the long form:

(11Ø) bloemetje
wieletje

It is noteworthy that these forms contain high tense vowels, which are structurally long, but phonetically not significantly longer than lax vowels. This phonetic property makes it understandable why the forms in (11Ø) occur, but this is all I will say about them.

The second category involves words that may have the short form (**-je**) but select the long forms as well:

(111) bruggetje kippetje
weggetje poppetje
vlaggetje ribbetje
biggetje
ruggetje

Whatever the historical explanation for these forms might be, I claim that these exceptional forms can be derived by a rule system that is just like the system given in (109), with the exception that the first subrule is simplified in that it does not contain the feature [+son] in its SD. In T's analysis such forms require a more drastic revision of the relevant rule, because the rhyme of the base nouns in (111) has a different structure from the rhyme of nouns that regularly select the long form, e.g. **kam**.

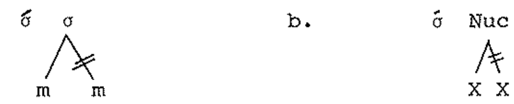
The third class of problematical cases involves full short vowels followed by a nasal or liquid that do not carry main stress (cf. Trommelen 1983, 47-49):

(112) a. pýthon b. Jerúzalem
wígwam Ísrael
sátan hórizon
slálom léxicon
bízon bóemerang
súltan chárlatan
álbum wándeling
sérval Hílversum
ménthol
cónsul

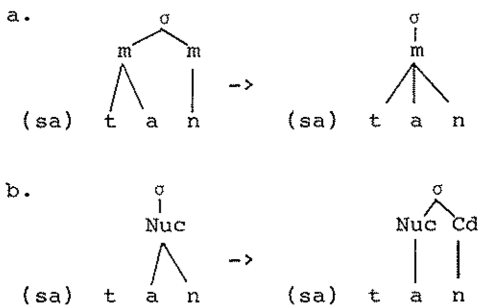
eléktron
oerangóetan
catamáran

Since in all cases the final syllable contains a full vowel this syllable meets the structural description of the rule that introduces the long form. Indeed the forms under (112b) have a strong preference for this allomorph. In the cases under (112a), however, we find a vacillation between the long form and the short form (**-Cje**), with a weaker preference for the long form in most cases. If it is only the preferred possibility that we want to explain then we could say that our analysis makes the correct predictions. What we have not explained of course is why we find vacillation in (112a) and no

vacillation in (112b). My proposal is to assume an optional rule that turns branching syllables (or nuclei) into non-branching syllables (or nuclei) in poststress position:

(113) a. b.


After this rule has applied to a form like **satan** the final syllable meets the rule that introduces the short allomorph:

(114) a. b.


The implication of this rule is that in the derived structure we may find monomoric syllables that do not contain a schwa, but this does not compromise our overall analysis. One might say that rule (113) is a first step toward vowel reduction, the next step being that the short vowel is reduced to schwa.

In one particular type of case we find the short form consistently, viz. when words end in the sequence **-ing** /Iŋ/. In most cases we are dealing with nouns that are derived from verbs with the suffix /iŋ/, but where a possible verbal base is missing (.e.g. in **koning** 'king' and many others) we also find the short form consistently. There are two ways in which the behaviour of this sequence can be explained. Either we stipulate that rule (113) is obligatory here or we derive the sequence /Iŋ/ from an underlying sequence with a schwa. This is what Trommelen (1983) proposes to do. In support of this proposal, she points out that a schwa may never appear before the velar nasal.

An alternative approach toward the forms in (112) involves the claim (incorporated in the analysis that was presented in section 3.5.2.3.) that stress rather than stressability is relevant. In the cases under (112b) there is a secondary accent on the final syllable (as will be pointed out in chapter 5); cf. (115a). Hence if we say that some degree of stress is required to select the long form we explain why the forms in (112b) select the long form. But under this approach we also need an optional rule to explain the vacillation in the forms under (112a); cf. (115b):

```
(115)   a.   F    F
             /\s  |w
            s  w  |
            horizon + etje

        b.   F             F    F
             /\           |s   |w
            s  w     ~    |    |
            satan + tje   satan + etje
```

It is not clear to me which alternative must be preferred.

It has been observed by Giljiamse (1982) that forms ending in /r/ behave differently from forms ending in one of the other sonorant consonants in that they consistently select the short form:

(113) a. néstor
Óscar
dóllar
proféssor
dictátor

The preference for the short form can be explained by saying that rule (113) is obligatory when the syllable ends in /r/.

A final problematical group concerns prefinal syllables with an /Ī/, where we find the short form consistently:

(112) a. gymnásium b. júpiter
ópium lúcifer
válium júnior

I offer two escape routes. With respect to the forms in (112a) we might agree with Trommelen, that we are dealing with schwa here, despite the spelling <um>. The forms in (112b) might be explained by saying that rule (109) is not only obligatory when the syllable ends in /r/, but also contextless in that case.

I have mentioned the exceptional groups for the sake of completeness and not because they can be accounted for under my approach toward syllable

structure without some extra rules or stipulations. Trommelen's analysis is not fundamentally different on this point. Also in this analysis the exceptional cases discussed here require something like the notion 'analogy', or 'brute force', i.e. special statements (p. 51).

3.6. Conclusions

In this chapter I have proposed a number of analyses of the Dutch syllable that are consistent with the ideas that were favorably discussed in the previous chapter. The linear structure of Dutch syllables has been analyzed in terms of a multivalued feature [sonority]. I have claimed that the most desirable analysis requires that segments are specified for this feature in terms of absolute values. With respect to the question which hierarchical structure must be attributed to the Dutch syllable, I have supplied evidence that there are two alternative approaches (referred to as the metrical theory and the mora theory) between which it is difficult to choose on the basis of their capability to account for the data that have been considered, viz. behaviour of syllable types with respect to stress assignment and the allomorphy of the diminutive suffix. Perhaps then the choice between these two approaches must be made on the basis of other types of evidence, such as the evidence that is offered in Hyman (1983), or on the basis of the conceptual arguments that have been mentioned in section 2.2.3., where we first introduced the mora theory.