Ellis Visch & René Kager

Syllable weight and Dutch word stress

0. Summary*

This article intends to give an analysis of Dutch word-stress based on the notion of quantity-sensitivity. This notion was introduced by Hayes (1980) as one of the parameters of the formal theory of (word-) stress. In quantity-sensitive languages the internal structure of the syllable is crucial to the construction of metrical structure. Dutch appears to be a language in which this is the case. A number of projection rules enable one to determine the relative weight of syllables in terms of the arboreal properties of the constituents in the syllable. We shall propose a wellformedness condition which will establish the matching between syllables of various degrees of weight and the *s/w* -nodes in the metrical structure. This condition may be seen as an instruction on tree-construction to the extent that it prefers certain matchings over others. We will also show that this condition on word-stress has interesting effects elsewhere in the grammar. The phenomenon of rhythmical shift under stress-clash is subject to degrees of acceptability which we claim can be brought under the scope of, and partly explained by our well-formedness condition: typically, this condition is violated under these circumstances and the acceptability of retraction tends to be partly due to the degree of violation of our condition.

1. Introduction

In Dutch main stress in underived words is largely predictable: it is always on one of the final three syllables of the word. Mainly stress falls on the penultimate, while deviations from this pattern are largely dependent on the shape of the final syllables. If, e.g., the final syllable has a long vowel followed by one or more consonants, it has main stress: *kaméel* 'camel', *jalóers* 'jalous'.

Metrical phonology generates binary branching trees over syllables. Among two sister-nodes, one is *w*(eak), the other *s*(trong). The direction of branching is uniformly right or left within a prosodic category (foot, word), and *s/w*labeling conforms to this direction. Furthermore, the introduction of a foot-level seperating the syllable- and word-levels is the way to obtain main-stress on non-wordedge syllables. Syllables group into feet, and feet into words. The theory allows languages to possess feet-construction rules taking crucially into account the internal structure of the syllable. Hayes (1980) calls these languages 'quantity-sensitive'.

He and Harris (1983) employ the formal notions *light* and *heavy* in order to characterize the weight of syllables: C_oV is light, and C_oVV, C_oVC, C_oVCC and C_oVVC are heavy. McCarthy (1979) cross-classifies among the heavy syllables by calling the latter two *superheavy*. It will be clear that in fact syllable-onsets are irrelevant to these distinctions.

We shall now show briefly that Dutch can be considered a quantity-sensitive language, and that the difference between heavy and superheavy plays an important rôle in the assignment of Dutch main stress. In section 2 we shall then elaborate upon our view on Dutch as quantity-sensitive, and propose a principle

for the construction of metrical trees in this framework.

In Dutch superheavy syllables have main stress if word-final:

(1) X-V́VC

toneel	'theatre'	siroop	'syrup'
piraat	'pirate'	minuut	'minute'
muziek	'music'	kameraad	'comrade'
citroen	'lemon'	kapitaal	'capital'
kameel	'camel'	lokomotief	'locomotive'
banaan	'banana'	personeel	'personnel'
konvooi	'convoy'	idioom	'idiom'

X-V́CC

spelonk	'cave'	modern	'modern'
insekt	'insect'	experiment	'experiment'
funest	'fatal'	uniform	'uniform'
augurk	'gherkin'	emerald	'emerald'
hyacint	'hyacinth'	anapest	'anapaest'
alarm	'alarm'	basilisk	'basilisk'
concert	'concert'	amorf	'amorphous'

A sizeable degree of vacillation occurs, however, if the final syllable of the word is different. Prefinal syllables must now be taken into consideration, as the examples under (2) show:

(2)a X-V́C-VC

atlas	'atlas'
nektar	'nectar'
sambal	'sambal'
harnas	'armour'
tarbot	'turbot'
elektron	'electron'
rododendron	'rhododendron'
sultan	'sultan'
badminton	'badminton'
herpes	'herpes'

b X-V́V-VV

ruzie	'quarrel'
kilo	'kilogram'
tuba	'tuba'
arena	'arena'
panorama	'panorama'
macaroni	'macaroni'
eldorado	'eldorado'
torpedo	'torpedo'
goeroe	'guru'
bombarie	'noise'

c VV-V́C

tabak	'tobacco'
barok	'baroque'
moeras	'marsh'
matras	'mattress'
fregat	'frigate'
patat	'chips'
karaf	'carafe'
barak	'shed'
amok	'amuck'
galop	'gallop'

d X-V́C-VV

panda	'panda'
bamboe	'bamboo'
rondo	'rondo'
pinda	'peanut'
porno	'pornography'
veranda	'verandah'
alliantie	'alliance'
flamingo	'flamingo'
agenda	'agenda'
aorta	'aorta'

The (a)- and (b)-columns indicate that under equal weight among the final two syllables the prefinal syllable wins out. The (c)-type, which we restrict to bisyllabic words for the time being, and the (d)-type show that Dutch makes a distinction between the heavy syllables VV and VC: the latter bears main stress when they compete. Apparently, VC is more heavy than VV in Dutch, although there is also a large class of exceptions: *sēsam* 'sesame', *rōtan* 'rattan', *chāos* 'chaos'

We shall return to these words in paragraph 2 where we shall give support for our notion that final stress is the regular pattern for this type.

These observations naturally lead to a hierarchy or scale of syllable-weight. This is displayed in (3) where weight increases downward. We reserve the light slot for final V, although these syllables hardly ever surface, Dutch having a lengthening rule for final syllable vowels. We submit that unstressable schwa is a member of this class.

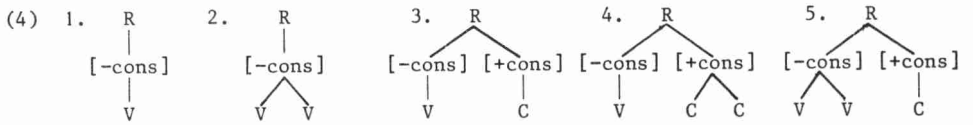
(3) 1. V
2. VV
3. VC
4. VCC
5. VVC

There is, we think, a small difference between the two superheavies VCC and VVC: the latter is heavier, as indicated. We shall present evidence for this in section 4, noting that this distinction will turn out to follow automatically from the principles behind hierarchy (3), which we shall discuss in the next section.

2. A wellformedness condition for Dutch metrical structure

The leading idea behind the observations and the weight hierarchy of section 1 was the desirability of a direct match between heavy syllables and heavy (prominent) positions in a metrical foot. The formalized version of this idea requires at least the availability of information on syllable-weight, preferably in structural terms. Hayes (1980) shows that this is feasible by the basic correlation between heavy and branching, and light and non-branching. As we have noted, the onset consonants of the syllable are *hors concours* in the determination of weight, which implies that only the rime *entre en balance*. Under the Dutch syllable-theory of Trommelen (1983), which observes the unmarked relation between vowels and peak, and consonants and coda, our hierarchy (3) can be transferred to (4):

(4)

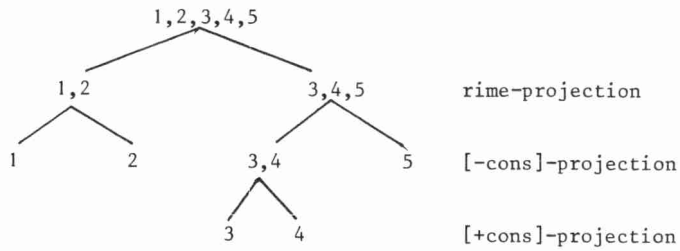


In metrical theory the way to obtain information on weight expressed in tree structure is through projection (cf. McCarthy (1979), Hayes (1980) of the relevant subtrees. As far as we can see, Dutch needs three of them:

- a rime-projection, making available the (immediate) branching structure of the rime. This sets of 1 and 2 of (3) against 3, 4, and 5.
- a [-cons]-projection, which makes available the (immediate) branching structure of the peak, setting of 1 against 2, and 3 and 4 against 5.
- a [+cons]-projection with the same task for the coda. This distinguishes 3 and 4.

These projections themselves when viewed together take the form of a hierarchical tree, as in (5):

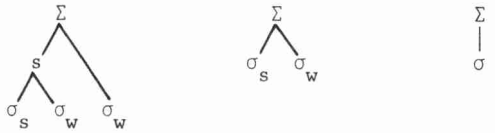
(5)



Each projection distinguishes between non-branching and branching constituents, which correspond to (relatively) light and heavy. If we build this into a hierarchical structure such as (5) under the condition of uniform labeling, we derive (3) as a result of our system of projections. This system implies also that foot-construction is preceded by the projection of the internal structure of the rime.

Thus, we now face the task of formalizing the idea that heavy syllables are attracted by heavy positions. We first assume three foot-templates for Dutch, since main stress in underived words varies over the final three syllables (cf. also Neijt en Zonneveld (1982)).

(6)



Feet are combined into rightbranching w/s-trees.

Just as Kiparsky's (1979) proposal to link a sonority-hierarchy to the syllable-template, we may link up our weight-scale to foot-templates. And just as the agreement between syllable and sonority-hierarchy must be maximal, we require the same of the match between foot and weight-scale. This allows us to formalize an instruction for building metrical structure (7a-c), and to add the wellformedness conditions (7d-e).

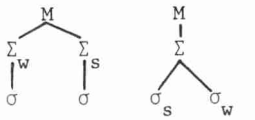
(7) Instruction for building metrical structure

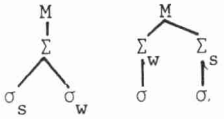
a. Project the entire internal structure of each rime of each syllable of the word.
b. Construct feet.
c. Combine feet into right-branching w/s-trees.
d. Weight Criterion
Within a foot, rime a in s-position will be as high as, but preferably higher in (3) than rime b in w-position; that is: $g_s \geq g_w$, where g stands for gravity and ranges out the value of (3), i.e. is 1-5.
e. If (7d) is undecisive: bisyllabic feet are preferred to odd-syllabic feet.

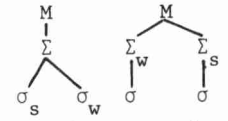
The Weight Criterion is, in essence, an expression of a procedure in which syllables are weighed against each other: full rimes are compared to arboreal properties. Moreover, (7d) expresses a preference for unequal weight-values for sister-syllables in a foot, over equal ones. This has an analogue for the syllable, where sisterbranches of constituents (say, branches of the peak) are preferably of unequal sonority. Provision (e), however, has a

specific task. If rimes have equal weight (cf. (2a-b)), our Weight Criterion, looking into feet, cannot select a bisyllabic foot over two bisyllabic ones. Since in Dutch this gives an empirical difference, we are forced to add the unmarked status of bisyllabic feet in order to derive the structures wanted. We suspect, ofcourse, much more behind this preference for the trochae, but will not indulge into speculation here.

Some examples may be useful to illustrate the operation of our Weight Criterion and (7e).

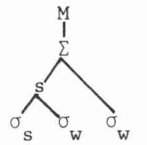
(8) a 

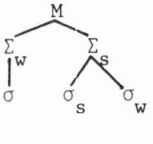
b 

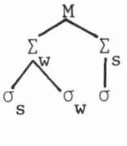
c 

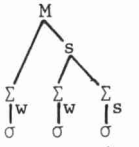
In (8a), only the lefthand tree survives the Criterion, with (8c) as its mirror image. In (8b) both trees survive the Criterion; in this case, (7e) decides for the bisyllabic foot.

These selectional properties of (7d) are even clearer in a trisyllabic word such as *agenda*, which has four logical possibilities:

(9) a 

b 

c 

d 

Entirely correctly, the Criterion selects (9b) as the only structure for *agenda*. The other three are marked, with $g_s < g_w$. Structure (9d) will be ruled out by an extension of (7d), which we shall present in section 3. We may therefore view the Weight Criterion as a markedness principle, deciding in this case markedness with respect to weight: the tree selected is more highly valued than other, logically possible, trees.

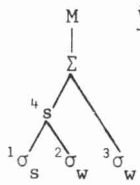
Recall that in section 1 we assumed VC to be more heavy than VV. The usual position of the literature appears to be to consider them both heavy, or even to consider VC heavy only if VV is (see e.g. McCarthy(1979:455)). Our motivation for a different view is the opportunity to be able to capture the exceptions through extrametricality. If cases such as *tabák* and *moerás* are regular by the Weight Criterion, we can mark the final consonant of words such as *sésam* and *rótan* as extrametrical vis-à-vis stress-assignment, which pushes the final rime up on our weight hierarchy, past VV of their penultimate syllables. Then, the Weight Criterion applies, and predicts prefinal stress. According to Hayes(1980), extrametricality is limited to domain-edges, which is the case here. Much more important, however, is the fact that we are able to formulate rules for the extrametric properties of subclasses of rimes, such as nasals after /α/: *pisaŋ* 'banana', *wajaŋ* 'wayang', *rotaŋ* 'rattan', *sesaŋ* 'sesame', *diwaŋ* 'divan', *sataŋ* 'satan', *koraŋ* 'koran'. In section 4 we will add another argument for considering VC as more heavy than VV. Further evidence as well as an extension

of (7d) and principles for the inclusion of exceptions, can be found in Kager & Visch (1983).

3. Branching nodes

Usually, as we have seen, (7d) and (7e) produce a single unmarked structure. At the same time, as formulated so far, they fail to predict main stress in a number of cases, which we will discuss here. The typical property of these cases is edge-stress in the final trisyllabic sequence, that is, they have either antepenultimate stress in a final foot (10a), or final stress in word of at least three syllables (10b).

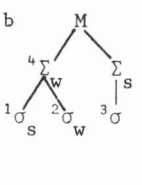
(10) a



V̄V/V̄C-VV-VC

bariton	'barytone'
lucifer	'match'
anorak	'anorak'
ananas	'pineapple'
almanak	'almanac'
alkohol	'alcohol'
jaguar	'jaguar'
marathon	'marathon'
carnaval	'carnival'

b

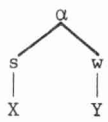


VV-VV-V̄CC

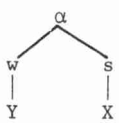
sonorant	'sonorant'
arabesk	'arabeque'
paradox	'paradox'
manuscript	'manuscript'
anapest	'anapaest'
dialekt	'dialect'
emerald	'emerald'
dramaturg	'dramaturge'
labyrinth	'labyrinth'

Note that our Weight Criterion compares weight values within feet. It is an easy job, therefore, to have (7d-e) compare terminal nodes 1 and 2, with favorable results. In order to distinguish between (10a) and (10b), on the other hand, it seems as if we should be able to compare non-terminal (branching) nodes, 4 with 3. This forces an extension of the Weight Criterion to branching nodes, and implies that we assign a weight value to branching nodes on scale (3). Although we are not in a position to motivate this value in a principled way, we may nevertheless reconstruct it in a roundabout and at least empirical manner. First, trisyllabic feet abhor superheavy syllables (VXC) in position 3. Therefore, the weight value of a branching node must be smaller than that of a superheavy syllable, i.e. < 4. (10b)-type trees, however, require superheavies in position 3. It follows that a branching node must be > 3, as 3 is the value of the heaviest syllable barred from position 3. So we derive indirectly that for branching nodes: $3 < g < 4$. Our reformulation of the Weight Criterion in (11) captures these notions.

(11) In the following trees, where X and/or Y are terminal nodes



and



within α, X is as high as, but preferably higher than, Y on the weight scale, i.e. $g_s \geqslant g_w$.

Principle (11) is able to select the correct structures for the examples in (10). The Weight Criterion is now a true wellformedness condition on metrical trees.

4. Rhythmical stress-shift under stress-clash

The addition of the wellformedness condition in (11) to the grammar of Dutch

appears to have a number of interesting consequences. We mean here in particular its rôle in the explanation of degrees of acceptability in rhythmical stress-shift under stress-clash. The phenomenon can be illustrated by the cases in (12).

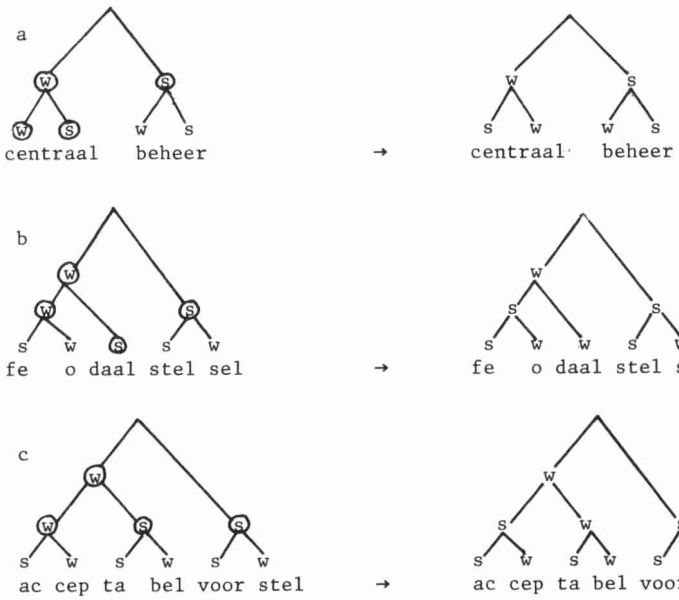
(12) a centráal vs. cèntraal behéer 'central management'
b feodáal vs. fèodaal stélsel 'feudal system'
c acceptábel vs. àcceptabel vóorstel 'acceptable proposal'

Proposals as to the formal characterization of this phenomenon in English abound in the recent literature (Liberman & Prince (1977), Kiparsky (1979), Prince (1983), Hayes (1984)). Kiparsky (1979) presents the following rule:

(13) *Rhythm Rule* (Kiparsky (1979:424))

If applied to (12), this gives the following output:

(14)



The Dutch variant of the phenomenon, however, has its intricacies. There is a clear difference between *còntant gèld* 'cash money' and **glòbaal ínzicht* 'global view', which is not easily explained by conditions or proposals in the literature. It is not uncommon also to find an appeal to nonlinguistic factors as the resources of linguistic ones run out (see e.g. Liberman & Prince (1977)).

In the theory put forward here stress shift is often the cause of a violation of the wellformedness condition: w-nodes are relabelled to s, or conversely. We might therefore attempt to put the explanatory power of the condition to the test, and inquire after the hypothesis that acceptability of stress shift is related to the degree of violation of the Weight Criterion. It turns out that

this hypothesis holds at least in an interesting range of cases - see (15):

(15) a V -VVC : *mèneer Jánsen
'mister Johnson'

b V -VCC : *pèdant vèntje, *rècent nïeuws
'conceited fellow''recent news'

c VV-VVC : *fàtaal óngeval, *mòbiel ónderdeel, *glòbaal ïnzicht
'fatal accident' 'mobile section' 'global view'

d VV-VCC : ?rïant húis, ?gàlant vóorstel, ?dïrekt ántwoord
'spacious house''charming proposal' 'direct answer'

e VC-VVC : fòrmeel kénmerk, àktief óptreden, fròntaal áangezicht
'formal property' 'firm appearance' 'frontal features'

f VC-VCC : còntant géld, ïntern prikbord, brïljant ïnzicht
'cash money' 'internal bulletin''brilliant insight'

We observe an increase of acceptability as the weight-difference of the two target syllables decreases. We conclude that the correctness of our prediction is independent evidence for our proposal to consider VC > VV for Dutch. The same holds for VCC and VVC (cf. (c) and (d)).

A second prediction of our theory is that a modification of the relative prominence of branching nodes ought to be easily expected. Note that (11) is completely silent on this issue, and hence modification of this type cannot be correlated to a violation of it. Relative prominence internal to the branching nodes is not affected. The examples of (16) may serve as illustrations.

(16)

A	lek	san	der	A	lek	san der	Pola (proper name)
Doc	to	ran	dus	Doc	to	ran dus	P. (nickname)
mi	se	ra	bel	mi	se	ra bel	gevoel 'miserable feeling'
ac	cep	ta	bel	ac	cep	ta bel	voorstel 'acceptable propos'
op	ti	mis	tisch	op	ti	mis tisch	mens 'optimistic person'
au	to	ma	tisch	au	to	ma tisch	antwoordapparaat 'automatic reply'

A third prediction is that shift of prominence among word-nodes ought to be an easy matter, as well. Syllable weight is relevant only within words, so shift cannot be hampered between them. Again, this prediction seems correct, although we feel we ought to add cautiously that it is far from clear whether the shift occuring in cases such as (17) is at all comparable to the earlier ones. Its obligatoriness perhaps argues against this.

(17)

vuur	vast	vuur	vast	kommetje	'heet-proof bowl'
doof	stom	doof	stom	kind	'deaf-mute child'
even	redig	even	redig	verband	'proportional relati

dol	driftig	dol	driftig	kind	'hot-headed child'
brood	nodig	brood	nodig	oponthoud	'urgent break'

While further research is no doubt highly necessary, we conclude that there are clear indications that the Weight Criterion, and the degree in which it is violated, play an important role in an explanation of the degrees of acceptability accompanying the application of the rule of stress shift.

Note

* We would like to thank Wim Zonneveld who has contributed to the present article with his criticisms and comments.

Bibliography

HARRIS, J.W.
1983 *Syllable Structure and Stress in Spanish; a nonlinear analysis*, MIT Press, Cambridge Mass.

HAYES, B.Ph.
1980 *A Metrical Theory of Stress Rules*, Ph.D. dissertation, MIT
1984 The Phonology of Rhythm in English, in *Linguistic Inquiry* 15,1, p.33-74

KAGER, R. en E. VISCH
1983 *Een metrische analyse van ritmische klemtoonverschijnselen*, unpublished M.A. thesis, Instituut de Vooys, University of Utrecht

KIPARSKY, P.
1979 Metrical Structure Assignment is Cyclic, in *Linguistic Inquiry* 10,3, p.421-441

LIBERMAN, M. and A. PRINCE
1977 On Stress and Linguistic Rhythm, in *Linguistic Inquiry* 8,2, p.249-336

McCARTHY, J.
1979 On Stress and Syllabification, in *Linguistic Inquiry* 10,3, p.443-465

NEIJT, A. en W. ZONNEVELD
1982 Metrische fonologie - de representatie van klemtoon in Nederlandse monomorfematische woorden, in *De Nieuwe Taalgids* 75-6, p.527-547

PRINCE, A.
1983 Relating to the Grid, in *Linguistic Inquiry* 14,1, p.19-100

TROMMELEN, M.T.G.
1983 *The Syllable in Dutch - with special reference to diminutive formation*, Ph.D. dissertation, University of Utrecht