# Stress Assignment in the Nominal System of Modern Hebrew (MH)

**Abstract**

The nominal system of MH displays a lexical accent system, where main stress assignment is a result of the interaction between lexical properties of the stem and lexical properties of the affix. In the case that no lexical properties are specified for stem and/or suffix, a general stress rule is activated, which assigns stress to the rightmost accentable syllable. In other words, final stress is the phonological "default" stress. The lexical accent properties of morphemes are taken to be marked by means of lexical prosodic structure, or more specifically, by the association of a syllable with a position in a strong foot (=head-foot).

The stress patterns presented in the data will be accounted for by an OT-analysis, in which the inherent conflicts of the nominal system will be solved due to the interaction between constraints demanding faithfulness to the lexically marked prosodic structure and alignment constraints, controlling the footing of the prosodic word and the position of main stress. The analysis will show that one constraint hierarchy generates adequately the regular as well as the irregular stress patterns in the nominal system of MH.

## 1. Introduction

The data concerning stress assignment for the MH nominal system indicate that stress assignment in MH nominals depends crucially on lexical specifications rather than on phonological demands, thus, the nominal system of MH is a lexically-controlled (lexical accent) system. Additionally, the system has a rhythmically determined default pattern, which is found where none of the morphemes of the word asserts its own accentual preferences.

This categorization of the MH stress system implies that it consists of two independent parts which stand in correlation: the phonological pattern and the morphological/lexical pattern. The phonological pattern, or the so called "rhythmical default pattern", is predictable and therefore can be accounted for by phonological demands in the grammar. In the morphological/lexical pattern, word stress is not predictable, but is rather the result of an interaction between the lexically marked properties of different types of morphemes. The

proposal advanced here is that the idiosyncratic properties of morphemes are specified in the lexicon in terms of prosodic structure.

The analysis of a system of this type will be consequently carried through in two steps. A short exploration of the phonological pattern will set the parameters for foot-form and foot-parsing. The resulting metrical structure will be used as a component in the analysis of the morphological/lexical pattern, which will be shown to be a consequent of constraint interaction in an Optimality Theory (OT) framework.

## 2. Organizing the Data

### 2.1 Preliminaries

MH is taken to be ***quantity-insensitive***. This assumption is reflected in the fact that stress assignment does not distinguish between open and closed syllables. I will not present in this paper data confirming the observation that syllable weight does not play a role in stress assignment; work to that intent was done by Bat-El (1993) and Graf & Ussishkin (in prep.) among others. A slight complication for the insensitivity-assumption is the observation that the language as a whole prefers to have a closed syllable in the final position in the word, formulated as the 'final coda condition' known for Semitic languages, a fact which can be explained diachronically. In a synchronic view, however, no conclusive arguments can be found to classify the final syllable as heavy (Graf 1999), such that all syllables can be treated in the same manner, independent of their position and/or internal structure.

Main stress is assigned to the final syllable (if no lexical prespecifications intervene) and secondary stress alternates rhythmically and is assigned leftwards (Bolozky 1982). Thus, MH is an rhythmic, *iterative* system. The assignment of iterative secondary stress, where the implementation of the principle 'No Clash' is demonstrated, is assumed to be the consequence of metrical feet construction. In the nominal system of MH only suffixes, as opposed to prefixes, are relevant for stress assignment.

## 2.2. Stems

Noun-stems in MH need to be classified into three lexically distinct groups[1]. The distinction between these groups is based on the surface correlation of the position of stress in the base form and the position of stress in the corresponding suffixed form. The three groups are as follows:

a. **Plain stems**: stress is ultimate in the base and ultimate in the suffixed form.
b. **Accented stems**: stress remains in the same position when a suffix is attached.
c. **Penultimate stems**: stress is penultimate in the base and ultimate in the suffixed form (mostly Segolates).

(1) *a. Plain stems*

| | | |
|---|---|---|
| gamád | gàmad-ím | '*dwarf*' (sg.-pl.) |
| tavlín | tàvlin-ím | '*spice*' (sg.-pl.) |
| xatúl | xàtul-á | '*cat*' (masc.-fem.) |
| gorál | gòral-í | '*fate-fateful*' |

*b. Accented stems*

| | | |
|---|---|---|
| méter | métr-im | '*meter*' (sg.-pl.) |
| tíras | tíras-im | '*corn*' (sg.-pl.) |
| dóktor | dóktor-it | '*doctor*' (masc.-fem.) |

*c. Penultimates*

| | | |
|---|---|---|
| délet | dlat-ót | '*door*' (sg.-pl.) |
| jéled | jald-á | '*child*' (masc.-fem.) |
| xódeʃ | xodʃ-í | '*month-monthly*' |
| rakévet | ràkav-ót | '*train*' (sg.-pl.) |

Group (b) as opposed to both (a) and (c) illustrates fixed stress, a fact which indicates lexically marked stress. Group (a) as well as group (c) illustrate variable stress, as evidenced by the final stress in the suffixed forms. Under the assumption that the language-specific phonological pattern assigns final stress to nouns if they are not marked otherwise, the stress pattern for isolated as well as for suffixed forms in group (a) of Plain stems is totally

predictable. The assignment of penultimate stress to the isolated penultimate (especially Segolate) forms in group (c) is unpredictable and will have to be accounted for.

## 2.3. Suffixes

The suffixes of the nominal system must be categorized in different classes according to their inherent stress properties, similar to the categorization of stems. I suggest the following categorization: **accented** suffixes, **prestressing** suffixes and **variable** suffixes.

• **Variable suffixes** are not necessarily stressed but may carry stress assigned by the default stress pattern, and as such are supposed to have no lexical specification for stress. Variable suffixes include all inflectional suffixes: the plural-formation-suffixes *-im* and *-ot*, the feminine-suffixes *-a*, *-it*, and *-at*, but also some derivational suffixes like the adjectival suffix *–i* and the nominalizer *–ut*. The listed suffixes build the major part of all suffixes that can be attached to nominals. The examples below involve the feminine nominalizer and adjectival formations:

| | | | |
|---|---|---|---|
| (2) | a. ACCENTED STEM: | optími *'hopeful'* | optímij-ut *'hopefulness'* |
| | b. PLAIN STEM: | mahír *'fast'* | mehir-út *'speed'* |
| | c. ACCENTED STEM: | demokrát *'democrat'* | demokrát-i *'democratic'* |
| | d. PLAIN STEM: | israél *'Israel'* | israel-í *'Israeli'* |

The examples in (2) are construed in pairs. In (2a) the suffix *–ut* is attached to an Accented stem and stress stays on the stem. In (2b) the same suffix is attached to a Plain stem and stress falls on the suffix. The same behavior can be observed with the suffix *–i* in (2c) and (2d).

• **Accented suffixes** are characterized by inherent stress which stays put whatever stem they are attached to, i.e. they are obligatorily stressed. When attached to stems with lexical stress (Accented stems), such as were chosen for the examples, the lexical specification of the suffix wins the overhand over the specification of the stem. The examples below illustrate the stress

[1] This classification goes back to Bat-El (1989) and Rosen (1977). Examples were partly taken from Bat-El (1989, 1993).

patterns of nouns with an accented suffix as compared to the same nouns with a variable plural suffix:

| (3) | | accented suff. | variable suff. |
|---|---|---|---|
| | a. miljón *'million'* | miljon-ér *'millionaire'* | miljón-im *'millions'* |
| | b. tráktor *'tractor'* | traktor-íst *'tractor driver'* | tráktor-im *'tractors'* |

• **Prestressing suffixes** - these are suffixes which require main stress on the syllable that precedes them. This 'prestressing' effect holds also in the case when an additional suffix is attached:

| (4) | | prestressing suff. | prestress.+variable suff. |
|---|---|---|---|
| | a. dʒób *'job'* | dʒób-nik *'shirker'* | dʒób-nik-it (fem.) |
| | b. kibúts *'Kibbutz'* | kibúts-nik *'a Kibbutz-member'* | kibúts-nik-im (pl.) |

(compare sg.-pl.: *kibúts* → *kibuts-ím*)

A special case of a prestressing suffix is the feminine suffix *-et*, used in both participle- and nominal-formation. The suffix *-et* not only demands main stress on the preceding syllable, it also lays supplementary conditions on the segmental and prosodic structure of that syllable. The preceding syllable must be open and must contain an */e/* or an */o/* as the nucleus, depending on the stem. Additionally, the suffix *-et* cannot be attached to every stem, but only to such that fulfill certain prosodic and phonological conditions. In the case those conditions are not met with a different feminine suffix will be attached[2]:

| (5) | | |
|---|---|---|
| | a. arnáv *'hare'* | arnév-et *'fem. hare'* |
| | b. rakáv *VERB-STEM 'to ride'* | rakév-et *'train'* |
| | c. tarnegól *'cock'* | tarnegól-et *'hen'* |

[2] The suffix *–et* shares some properties with the Segolate nouns, as can be inferred form the final disyllabic sequence CéCeC. There are various possibilities for the analysis of *–et* (such as a suffix *–t* and an epenthetic /e/), which must be further looked into.

## 3. The phonological pattern

The rhythmical default pattern assigns word stress in the cases where no morpheme in the word possesses a lexically specified accentuation. According to my classification of morphemes in MH the default pattern is active for words consisting of Plain or Penultimate stems and combinations of those stems with variable suffixes. The data show that the system assigns main stress to *each* final syllable; secondary stress is iterative and depends on the location of main stress. Following Hayes (1995), I assume that stress assignment is construed as the parsing of a word into metrical feet. The existence of iterative secondary stress suggests that the prosodic word is *exhaustively* footed.

Setting the stage for the parsing of the prosodic word into feet and assigning prominence to the head foot (main stress) and to the other feet (secondary stress) involves the following considerations, which will be shortly formulated in terms of OT-constraints. According to universal principles I will assume a binary foot structure. Since MH does not have any prosodic constituents beneath the syllable level (quantity insensitive), the foot template is assumed to be disyllabic, parsed from Right-to-Left. The decision whether the feet should be right-headed (iambic) or left-headed (trochaic) will be met on theoretical grounds, for the language does not display dominant properties of neither a trochaic nor of a iambic system. The location of main stress seems to be directly linked to the final syllable and independent of foot structure. It will be accounted for by **End Rule Right,** which straightforwardly demands main stress to fall on the final syllable.

Under the presumption that MH is quantity-insensitive (stress counts syllables and not moras), and under consideration of the wide acceptable notion that surface syllabic iambs are not supposed to exist (Hayes 1995, Kager 1993), the only possibility for a metrical analysis is to assume construction of syllabic trochees.[3]

A trochaic analysis shows it necessary to assume non-binary, degenerate feet. The assignment of a degenerate foot on the final syllable is a result of assigning main stress by an

[3] In Graf (1999) two contrasting analyses are presented in detail: a trochaic analysis is compared with an iambic analysis in the frame of metrical theory and results in favor of the trochaic analysis. A somewhat different view, considering foot form to be emergent and not fixed is elaborated in an optimality theoretical frame in Graf & Ussishkin (in prep.)

End-Rule. The only possibility for a trochaic system to have a binary final foot is to assume a final catalectic syllable as demonstrated in (6) (see Kiparsky 1991 on this suggestion), an assumption I would not like to make here for reasons discussed in Graf (1999).

(6) e.g. xàtulím '*cats*' [σ̀σ][σ́(σ)]

All in all we came up with the following properties for footing in MH:

- Foot Form: stress is assigned by means of binary, disyllabic feet, but *degenerate feet* are also allowed. The prominence of feet is taken to lie on the left constituent, thus rendering feet *trochaic*.

- Foot Parsing: The Head-Foot is parsed always on the final syllable. The prosodic word as a whole must be *exhaustively footed*.

## 4. OT-Analysis

The following analysis will present the stress patterns that arise by lexically conditioned properties, assuming that stems and suffixes must be lexically specified for stress. The account given here argues in favor of marking morphemes in the lexicon for a role in a foot. The categorization of the data suggests that every stem and every suffix are either lexically specified or lexically unspecified for stress, such that ***Plain stems*** and ***variable suffixes*** are lexically unmarked; ***Accented stems*** and ***accented suffixes*** are specified for the head-role in a foot; and ***Prestressing suffixes*** are specified for the tail-role in a foot. The final vowel of ***Penultimate stems*** is assumed to be epenthetic, such that penultimate stress in the unsuffixed form is a result of the default stress pattern (stress the rightmost *accentable* syllable): *séfr* 'book'. In the suffixed form, the epenthetic vowel is not necessary and is consequently not present. The suffix is attached to the monosyllabic stem. Here, again, stress is assigned by the phonological default pattern: *sfarím* 'books'. Penultimate stems are thus unspecified for a prosodic role and are assigned stress in the same manner as Plain stems.[4]

[4] The lexical representation of Segolates is a complex issue. The assignment of stress depends thoroughly on the assumptions made on the structure of the singular and/or the plural Segolate stem. I will not attempt to solve this matter here.

I will concentrate upon the stress patterns emerging from the concatenation of one stem with *one* suffix, though concatenations of a stem with more than one suffix are possible as well. Under the assumption of lexical specification there are four logical possibilities for the combination of one stem with *one* suffix (- for unspecified and + for specified):

a) –/– cases are assigned the "default" phonological stress.
b) +/– cases: stem is specified for prosodic role.
c) –/+ cases: suffix is specified for prosodic role.
d) +/+ cases: "Multiple stress conflict".

The cases, where neither stem nor suffix are lexically specified for stress, i.e. the –/– cases, are the combinations that are assigned the "default" phonological stress. These consist of the combinations of a Plain stem or a Penultimate stem with a variable suffix. In all other cases either the stem or the suffix or both are specified for stress. In the +/– and –/+ cases, only one formative is lexically specified, so that there is no lexical stress conflict, whereby two distinct cases have to be accounted for: suffixes specified for the head-role in a foot, and suffixes specified for the tail-role in a foot. The basic assumption for these cases in metrical theoretical terms is that ordinary stress rules cannot override the lexically specified structure, known in the metrical theory literature as the Free Element Condition, as formulated by Hayes (1995:115) after Prince (1985):

(7) **Free Element Condition**: Rules of primary metrical analysis apply only to free elements.

In other words, lexically specified metrical structure has priority over phonologically assigned structure, the latter able to apply only to elements which are not specified otherwise. In optimality theoretical terms the assumption is that the constraints demanding faithfulness to lexically specified prosodic structure are ranked higher than the general faithfulness constraints and other constraints responsible for foot parsing, termed here 'the metrical hierarchy'.

The remaining cases (+/+) are the ones where a "multiple stress conflict" arises, since both formatives are specified for stress. It will be demonstrated that in the case of a conflict the properties of the rightmost element 'win'.

I will present a somewhat schematic OT-analysis of the lexically-conditioned stress conflicts. I take OT to offer the best stage for an analysis of the data, since the theory is based on constraint interaction. Because most requirements in a stress system are not absolute, constraint interaction allows us to solve conflicting demands without repair strategies. The ranking of the constraints (the grammar) represents both the conflicting requirements themselves as well as the priorities the language sets to them. OT can account for interaction of concurring principles. For MH this property will be of use for resolving conflicts inherent to the lexical-marking system, as well as conflicts between lexical specifications and phonological demands.

The basic assumptions of the following analysis are based on the setting of parameters concerning foot structure, which were discussed in the previous section. In an OT analysis the construction of feet and the manner of foot-parsing is designated by constraints. The following constraints form a relevant subset of the constraints required for foot construction:

(8) **FT-BIN** (McCarthy&Prince 1993)
Feet must be binary under syllabic analysis [σσ].

(9) **PARSE-SYLL** (McCarthy&Prince 1993)
Every syllable must be parsed by a foot.

The assumed disyllabic, trochaic foot will be accounted for by a gradient constraint:

(10) **FT-FORM (TROCHAIC)** (McCarthy&Prince 1993)
$[\sigma_s\ \sigma_w]_{Ft} > [\sigma_s]_{Ft}$

The constraint on foot-form is built in the form of a hierarchy, where the canonical trochee (strong syllable followed by a weak syllable) ranges higher than the non-canonical trochee, which is monosyllabic. For a quantity-insensitive language, such as MH, this hierarchy enables the construction of degenerate feet, which in their turn must be licensed (to use the metrical theoretical formulation) as the head foot of the prosodic word. The existence of degenerate feet under a trochaic analysis cannot be ignored in MH. The licensing of such feet in terms of constraint interaction will occur due to the ranking of ALIGN-HEAD higher than the constraints on foot-structure.

ALIGN-HEAD is an alignment constraint, which is the equivalent of End-Rule-Right and which accounts for the assignment of main stress to a foot at the right edge of the prosodic word:

(11) **ALIGN-HEAD (PrWd, R, Hd(PrWd), R)** (McCarthy&Prince 1993)
align the right edge of every prosodic word with the right edge of the head of the prosodic word. (every σ́ is in final position in the PrWd)

An important part of the constructed grammar is a constraint which demands the prosodic matching of input and output. Since we assume a lexical specification of prosodic structure (role in a foot) in the input, we require faithfulness of the output to the input in this respect, in terms of correspondence theory. I suggest the following faithfulness-constraint:

(12) **MAX-HEAD-FT (MAX-HDFT)**
Every head-foot of the input has a correspondent head-foot in the output.

It should be noticed that this constraint expresses faithfulness to an abstract prosodic construct (the foot). In order to associate the foot with its segmental content, a further constraint is necessary, demanding faithfulness to the *position* of a correspondent segment in a prosodic/morphological category, which was formulated in the Correspondence Theory (CT) literature as a constraint of the ANCHOR-family (Benua 1997, McCarthy 1997). For the case at hand, I propose an anchor-constraint which demands correspondence of a segment(s) at the initial/final position of a foot in the input to a segment in the initial/final position of a foot in the output: **ANCHOR-POS$_{IO}$ (FT, FT, INITIAL/FINAL)**. To put it in more concrete terms, the Anchor-constraint demands faithfulness to the *association* of a segment with its specified prosodic role. For that reason the constraint ANCHOR-POS$_{IO}$ does not compete with MAX-HDFT, but rather complement it. For the sake of simplicity the constraint ANCHOR-POS$_{IO}$ will not be integrated in the tableaus; instead, MAX-HDFT will be taken to incorporate ANCHOR-POS$_{IO}$. This way, the constraint MAX-HDFT can be violated for two reasons: for one there is the violation of the *existence* of a head foot – as specified in the input. For another there is the violation of the *position* of the head foot.

The evaluations presented below demonstrate the interactions between the constraints on faithfulness to lexical accents in terms of prosodic roles (MAX-HDFT) and the constraint on

the location of primary stress (ALIGN-HEAD). The tableaus are simplified with respect to foot structure constraints. The constraints on foot construction and parsing are not significant for the resolution of lexical stress conflicts. Nevertheless, the assumed foot structure is crucial for the treatment of the phonological regular stress assignment, as well as for the assignment of secondary stress. In the treatment of the lexically unmarked cases, some of the constraints on foot-structure will play a role, whereby the exact positioning of these constraints in the hierarchy must be examined in a complete analysis of the data, as well as the role of supplementary foot-structure constraints.

An important notice at this point is that polysyllabic words can only be exhaustively footed, if a degenerate foot is 'licensed' to bear main stress (due to ALIGN-HEAD). In all other cases, polysyllabic words cannot be exhaustively footed, thus leaving a syllable unparsed. This observation leads to the ranking **FT-BIN > PARSE-SYLL**, which is not manifested in the tableaus. Further it should be noticed that the construction of trochaic feet, as already mentioned, is taken for granted although it is necessary in the interaction. I assume that the construction of trochaic feet follows from the interaction of constraints on foot structure, such that the best possible trochees are built. The constraint FT-FORM, which also allows degenerate feet, is operating in the background, except for the illustration of phonologically assigned stress, where it will be discussed separately.

The operation of the suggested grammar depends on the assumed lexical representations of the involved morphemes. Following is a graphic representation of the assumptions made beforehand:

- Accented stem and accented suffixes: ($F_s$ stands for a strong foot=head-foot)

(13)

| $F_s$ | $F_s$ | $F_s$ |
|---|---|---|
| \| | \| | \| |
| s | s | s |
| \| | \| | \| |
| traktor | miljon | -er |

- prestressing suffixes:

(14)


-et

- -tʃik

The morphemes in (13) are assumed to be accented in the sense that a syllable is associated with the strong position (=head) of a strong foot (=head-foot). For the morpheme *traktor* the penultimate syllable is associated with a strong position, whereby for the morpheme *miljon* it is the ultimate syllable which is associated with the strong position. The monosyllabic prestressing suffixes, presented in (14), are assumed to be associated with the weak position of a head-foot in a fully specified, binary trochee.

## 4.1. Specified stem + unspecified suffix

This combination consists of only one case, that is an Accented stem followed by a variable suffix. Since the stem is lexically marked for stress and the suffix is not, the suffixed form is expected to carry stress on the prespecified syllable of the stem. In terms of OT that means that faithfulness to lexical accent must be higher ranked than the constraints on the metrical structure of the prosodic word.

(15) Accented stem + variable suffix (*tiras* 'corn' + *-im* PLURAL)

| Fs<br>\|<br>s<br>\|<br>tiras + im | MAX-HDFT | ALIGN-HEAD |
|---|---|---|
| ☞a. [tíra]sim | | ** |
| b. ti[rásim] | !* | * |
| c. [tìra][sím] | !* | |

Candidate (b) and candidate (c) are not faithful to the lexical specifications in terms of association to segments, where candidate (b) fails to parse the syllable *ti*, and in terms of association in a head-foot, where candidate (c) fails to parse the syllable *ti* in a head-foot. Only candidate (a) is faithful to the prosody of the input at the cost of violating ALIGN-HEAD

twice (ALIGN-HEAD is a gradient constraint which counts syllables). This case provides us with the ranking MAX-HDFT >> ALIGN-HEAD.

### 4.2. Unspecified stem + specified suffix

In these cases, like the one described above, there arises no conflict between two lexically marked formatives, since only one of them is marked; however, the lexically marked prosodic structure for suffixes involves two different cases: the suffixes marked for a head-role (=accented suffixes) and for a tail-role in a foot (=prestressing suffixes). The following tableaus (15) and (16) evaluate the combination of Plain/Penultimate stems with an accented suffix, tableau (17) evaluates the combination of a Plain stem with a prestressing suffix. One combination is missing, though, that is the combination of a Penultimate stem with a prestressing suffix (concretely, a Segolate stem to which either *–et* or *–nik/-ʧik* are attached). According to my knowledge, this combination is not attested in the language, a fact which might be an accidental gap, but may also implicate that Segolates have some properties which are not compatible with the demands imposed on the stem by prestressing suffixes. I will leave this issue for future investigation.

#### 4.2.1. Accented suffix

(16) Plain stem + accented suffix (*ʃirjon* ‘armored forces’ + *-er* ‘member of’)

| F<sub>s</sub><br>ʃ<br>ʃirjon + er | MAX-HDFT | ALIGN-HEAD |
|---|---|---|
| ☞a. [ʃìrjo][nér] | | |
| b. ʃir[jóner] | *! | * |
| c. [ʃírjo]ner | *! | ** |

Here the demands of both MAX-HDFT and ALIGN-HEAD fall together for candidate (a), which is the most harmonic output possible under this ranking. It is faithful to the prosodic structure of the input (suffix) and fulfills the demand to stress the rightmost syllable.

Candidates (b) and (c) are not faithful to the input in terms of associating the specified segments to the head-foot in the output.

(17) Penultimate stem + accented suffix *(/sifr/* 'book (stem)' + *-on* DIMINUTIVE)

| $F_s$<br>\|<br>s<br>\|<br>sifr + on | MAX-HDFT | ALIGN-HEAD |
|---|---|---|
| ☞a. sif[rón] | | |
| b. [sífron] | *! | * |

The evaluation of this combination runs in exactly the same manner as the evaluation for a Plain Stem in (16). No candidate can be more harmonic than (a), under the assumption that the suffix is attached to a Penultimate stem and not to the attested singular surface form, which is *sefer*. As already mentioned above, the second vowel of the surface singular form is considered here to be epenthetic and not part of the stem. The comparison between both evaluations in (16) and (17) justifies treating Penultimate stems as lexically unspecified for a prosodic role and classifying them together with Plain stems.

### 4.2.2 Prestressing suffix

The following tableau evaluates the combination of a Plain Stem with a prestressing suffix:

(18) Plain stem + prestressing suffix (*katan* 'small' + *ʧik* DIM)

| $F_s$<br>s w<br>katan+ʧik | MAX-HDFT | ALIGN-HEAD |
|---|---|---|
| ☞a. ka[tánʧik] | | * |
| b.[kátan]ʧik | !* | *!* |
| c.[kàtan][ʧík] | !* | |

Here the suffix specifies a binary foot. Candidate (c) violates MAX-HDFT, since the binary trochee over the syllables *ka.tan* is not the head-foot in the word. The head-foot over the syllable *ʧik*, on the other hand, is not a binary trochee, and additionally, the suffix stands in the strong (only) position in that foot. Thus there is no possible faithful correspondent to the

foot specified in the input. Candidate (b) builds a binary trochee, which is also the head-foot of the word, and as such violates MAX-HDFT in terms of not associating the specified segments of the input to the head-foot in the output. Candidate (a) is faithful to the prosodic structure of the input, having a binary trochee as the head-foot in the word, which is also associated with the segments specified in the input. The placement of that trochee one syllable to the right, compared with candidate (b), has the advantage of generating penultimate stress and thus violating ALIGN-HEAD only once.

The evaluation of this case has manifested the ranking MAX-HDFT >> ALIGN-HEAD.

### 4.3. Specified stem + specified suffix

The most interesting cases for understanding the lexical-marking system are those combining two lexically specified formatives. In concrete terms, two combinations are possible: an Accented stem with an accented suffix and an Accented stem with a prestressing suffix. Indeed, both cases are attested. Such combinations arise the question of a "multiple-stress-conflict": since every word allows for only *one* main stress, it is clear that the output can only be faithful to the prosodic structure of *one* of its input formatives, inevitably being unfaithful to the prosodic structure of the other input formative. The evaluation in (19) demonstrates the fact that the constraint hierarchy used so far is sufficient, in order to account for the "multiple-stress-conflict" cases:

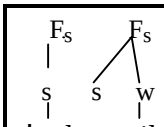
(19) Accented stem + accented suffix (*traktor* 'tractor' + *-on* DIM)

| $F_s$ $F_s$<br>\| \|<br>s s<br>\| \|<br>traktor+ ist | MAX-HDFT | ALIGN-HEAD |
|---|---|---|
| ☞a. [tràkto][ríst] | * | |
| b. [trákto]rist | * | *!* |
| c. trak[tórist] | *!* | * |

Two lexical accents compete for the assignment of primary stress, which can only be assigned once in the prosodic word. Hence, MAX-HDFT will be inevitably violated and the decision about the optimal candidate is transferred to the lower-ranking constraint ALIGN-HEAD. Candidate (c) violates MAX-HDFT, being unfaithful to both stem and suffix

specifications. Candidate (b) fails to parse the specification of the suffix, and candidate (a) fails to parse that of the stem. Here ALIGN-HEAD, demanding stress on the rightmost syllable, becomes decisive. The rightmost syllable is, per definition, the syllable of the suffix, as manifested in the winning candidate (a).

(20) Accented stem + prestressing suffix (*ʤob* 'job' + *-nik* 'AGENT)

|  | MAX-HDFT | ALIGN-HEAD |
|---|---|---|
| ☞a. [ʤóbnik] | | * |
| b. ʤob [ník] | !* | |

This specific combination does not implicate a "multiple-stress-conflict", because faithfulness to both lexical specifications can be achieved, as demonstrated by candidate (a). This candidate builds a trochee over the two available syllables and so stays faithful to both specifications of the stem and of the suffix, at the cost of violating ALIGN-HEAD once. Candidate (b), with final stress, violates both specifications and is thus ruled out. However, candidate (a) is able to remain faithful to both specifications due to the fact that the accented stem in this case is monosyllabic. A disyllabic Accented stem with stress on the penultimate syllable would have probably shown a different result, namely, that *stress shifts* to the syllable preceding the suffix (the final syllable of the stem), thus demonstrating faithfulness to the demands of the suffix and not to those of the stem. Relying on Bat-El (1993) and according to my own research, there are no forms where a prestressing suffix is attached to such an Accented stem. The prediction of the analysis is, however, in accord with the native speaker's intuition that if we attach *–nik* to a stem like *tráktor* we will get *traktórnik* and not **tráktornik*. In that case, the combination of an Accented Stem with a prestressing suffix will indeed present a "multiple-stress-conflict", parallel to the case presented in (19). And again parallel, MAX-HDFT will be inevitably violated, and the decision about the optimal output will be transferred to the lower-ranking ALIGN-HEAD, designating the output with the rightmost accented syllable as the 'winner' (*traktórnik).*

## 4.4 Unspecified stem + unspecified suffix

In the combinations where neither stem nor suffix are lexically specified for stress, the "default" phonological pattern becomes active, for which lexical marking is obviously irrelevant, as well as the constraints demanding faithfulness to prosodic structure. For these cases we focus our attention on the constraints on foot-structure and foot-parsing, which are constantly active in the grammar, as mentioned above. The main observation is that final stress will be generated due to the ranking of ALIGN-HEAD above the constraints on foot structure such as FT-BIN, PARSE-SYLL and FT-FORM. Under the assumption that a degenerate foot is a tolerated foot (a non-canonical trochee), the hierarchical constraint FT-FORM as formulated above will not be violated. However, the generation of a monosyllabic trochee is costly, expressed by violation of FT-BIN. That makes the ranking of FT-BIN crucial for the issue at hand.

To put it in different words, the cases at hand demonstrate in the first place a top-down parsing of trochaic feet, to use the terms of metrical analysis. We are concerned here with the assignment of word stress to the final syllable prior to the construction of (ideally) binary feet. This mode of parsing forces the generation of a degenerate foot on the last syllable, even if the prosodic word is made of two syllables only. The subsequent parsing of the word into adequate constituents is a matter which will not concern us here further, although of course a complete analysis must account for it in order to generate (at least) secondary stress. In terms of OT, the following evaluations are concerned with the interaction between ALIGN-HEAD and FT-BIN.

(21) Plain stem + variable suffix (*xatul* 'cat' + *-im* PLURAL)

| xatul+ im | ALIGN-HEAD | FT-BIN | PARSE-SYLL |
|---|---|---|---|
| ☞a. $[xàtu]_F[lím]_F$ | | * | |
| b. xa$[túlim]_F$ | *! | | * |

The postulation of FT-BIN ranking higher than PARSE-SYLL was motivated at the beginning of section 4. All the same, PARSE-SYLL and its relative ranking are not crucial for the evaluation in (20). As candidate (b) shows, the construction of a canonical trochee and thus penultimate stress, which is a standard strategy for many trochaic languages, manifests a

violation of ALIGN-HEAD. Hence, ALIGN-HEAD must be highest-ranking in order to avoid the standard strategy and to force stress on the final syllable. Candidate (a) demonstrates that evasive strategy, where a degenerate foot is parsed over the final syllable at the cost of violating FT-BIN. That way, the language prefers to fulfill the demand of ALIGN-HEAD (=final stress) at the cost of violating foot binarity.

**Final ranking**:

(22) MAX-HDFT >> ALIGN-HEAD >> FT-BIN >> PARSE-SYLL

## 5. Conclusion

Under the assumption that diacritic stress properties are marked in the lexicon by *means of prosodic structure*, the following generalizations can be accounted for in an OT-analysis:

a. If no morpheme is lexically specified for stress, the phonological pattern will assign final stress.
b. Lexical stress applies before phonological stress, accounted for by the ranking MAX-HDFT >> ALIGN-HEAD.
c. When both morphemes are specified for stress, a multiple-stress-conflict emerges, in which case the right-most element wins.

The analysis was simplified with respect to the interaction of constraints on foot-structure, which play a role in the parsing of the prosodic word into feet and the assignment of secondary stress. This simplification aimed to show that there is no need to distinguish between different stress assignment mechanisms – the lexical and the phonological – and there is no need for special rules. The constraints MAX-HDFT and ALIGN-HEAD and their interaction demonstrate two major properties of a lexical accent system from the sort of MH. On the one hand, faithfulness to lexically specified prosodic roles must be preserved; on the other hand, each word form should be assigned final stress. The conflicts arising in the system when trying to fulfill both demands were shown to be solved in an OT-frame by way of ranking MAX-HDFT above ALIGN-HEAD. Ranking the prosodic faithfulness constraint MAX-HDFT higher than the head-alignment constraint ensures that lexical stress is always preserved and takes precedence over the phonologically assigned stress. The alignment constraint

ALIGN-R (PRWD, PRHD) has a double function: when lexical specifications are involved, it ensures that the properties of the right-most element (suffix) 'win'; in the phonological pattern, it interacts with the foot-structure constraints and guarantees the assignment of final stress. The proposed constrains compose a constraint-hierarchy which is able to generate the correct outputs for the combinations of one stem and one suffix.

A central property of the proposed analysis is the marking of diacritic properties of stems and suffixes in the lexicon. Indeed, it is this property which enables a simple constraint-hierarchy to be established in the first place. Lexical marking is not an obvious matter, but an issue for controversies, not only between competing theories but within the framework of OT as well. Potentially, OT provides the means to mark diacritic features either in the lexicon in the form of prosodic structure in the input, or in the grammar in the form of Morpheme-Structure-Constraints. The decision as to which representation is the adequate one, relies on theoretical and not on technical considerations. In her analysis of Turkish exceptional stress, Inkelas (1999) has proposed two contrasting OT-analyses of the data. One analysis made use of Morpheme-Structure-Constraints and contained consequently a relatively complicated grammar and a simple lexicon. The other analysis made use of prespecification in the lexicon in form of prosodic structure, such that the representations in the lexicon possessed relatively rich structure, with the result of a simple grammar. Inkelas has shown that both analyses were descriptively adequate. Thus, the decision as to the 'correct' analysis was made on explanatory grounds. The lexical account provided a better generalization of the data, on the one hand, and a unitary representation for all exceptions, on the other hand. This is true for the MH case as well. Using prespecified representations leads to a simple grammar which, nonetheless, encompasses the generalizations evident from the data. This is especially true for the cases of a multiple-stress-conflict, where the generalization 'rightmost wins' is accounted for by a single constraint ALIGN-HEAD and its interaction with the other constraints. Should the exceptional properties of suffixes be represented in the grammar as Morpheme-Structure-Constraints, this generalization would not have been visible. A further positive effect of this approach is the fact that the grammar can account for the phonological 'default' stress by means of the same constraint interaction, since also in this case the generalization holds 'rightmost wins'. The proposed marking of roles in a lexically specified foot has the advantage of referring to trochees, which are the basic foot-form in the language in any case,

and of keeping any idiosyncratic information from being reflected in the grammar. This form of lexical representation was shown to be adequate for the data of MH.

I believe that the analysis of the MH data presented here can contribute a part in the controversy over the issue of lexical vs. grammatical marking, in demonstrating the advantages of prespecified representations for a system, where diacritic features of morphemes are not an exception, but the rule.

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