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Head Dominance in Modern Hebrew Prosodic Morphology

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1 Introduction

Based on observations about faithfulness and markedness in different morphological domains, McCarthy & Prince (1995:364) propose a universally fixed ranking between two different types of faithfulness constraints. This 'Root-Affix Faithfulness Metaconstraint' (henceforth RAFM) was originally introduced in McCarthy & Prince (1994), and is presented in (1):

(1) Root-Affix Faithfulness Metaconstraint (RAFM)

ROOTFAITH » AFFIXFAITH

McCarthy & Prince motivate this universal ranking based on two types of arguments. The first of these concerns the unattested typologies predicted within a constraint-based system that is not under a restriction such as the RAFM. The second of the arguments concerns the distribution of marked elements in roots compared with that in affixes: roots tend to display more marked structures than affixes.

The RAFM has recently been criticized in work by Revithiadou (1999), who examines counterexamples to it and concludes that the RAFM is simply too powerful a metaconstraint per se; in other words, empirical evidence contradicting it is abundant. Revithiadou investigates lexical accent systems in several languages which seem to exhibit exceptions to the RAFM, and captures a very important observation: that in fact it appears to be morphological *headedness* that is at stake. Within Optimality Theory (Prince & Smolensky 1993), Revithiadou proposes a prosody-morphology interface that is formalized as *Head Dominance*, as shown in (2):

(2) Head Dominance (HD; Revithiadou 1999:5)

HEADFAITH » FAITH

Head Dominance as schematized in (2) states that faithfulness to heads dominates general faithfulness, and as such is an instance of the familiar *Specific » General* rankings that are discussed by Prince & Smolensky (1993). In short, (2) mandates that morphological heads require greater faithfulness than other material. Crucially, if HEADFAITH is ranked above FAITH, outputs that are unfaithful to root material will be allowed to surface, as long as they are faithful to material dominated by a head.

In this paper, I apply the theory of Head Dominance to the empirical domain of denominal verb formation (DVF) in Modern Hebrew (MH). This process, discussed by Bat-El (1994) and Ussishkin (to appear), involves a case of faithfulness that is

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constrained by structural markedness. More specifically, as will be shown below, MH denominal verbs are restricted to two syllables by a set of prosodic constraints. However, given that inputs to DVF consist of (at least) three vowels, in addition to their consonantal material, the question arises as to which vowels are realized in the bisyllabic denominal verb. Reviewing the analysis presented in Ussishkin (to appear), we will observe that the RAFM is violated. This may at first appear to be a problem for the analysis, but I will show that adopting Revithiadou's theory of Head Dominance actually predicts the facts attested in DVF.

The structure of the paper is as follows. In section 2, I review one of the two arguments in McCarthy & Prince (1995) that motivates the RAFM (the second of these is not directly relevant to the MH case to be examined here). In section 3, I review the analysis of DVF presented in Ussishkin (to appear), and will demonstrate how this analysis contradicts the RAFM. In section 4, I present Revithiadou's Head Dominance theory, and provide an analysis of DVF based on this approach, showing that the RAFM does not hold for Hebrew. Section 5 concludes the paper and provides questions for further research.

2 The Root-Affix Faithfulness Metaconstraint

McCarthy & Prince (1995) review a number of observations that share a common theme: morphological affixes are phonologically unmarked with respect to roots. For instance, affixes tend to have reduced segmental inventories; some examples are Amharic (Broselow 1984), where affixes tend to contain coronal consonants, and English (Yip 1987), where affixes exhibit unmarked vowels. Another case is root-controlled vowel harmony, as in the well known case of Turkish.[1] As McCarthy & Prince also mention, affixes tend to avoid marked structures, so it is not uncommon to find languages where affixes have no complex onsets, consonant clusters, long vowels, or geminates, even if such structures do appear in roots.

CON, or the set of constraints that compose an optimality-theoretic grammar, contains two principal varieties of constraints: markedness constraints on the one hand, and faithfulness constraints on the other (Prince & Smolensky 1993). Effects such as the aforementioned cases of markedness dichotomies are typically handled not by segregating markedness constraints into root- versus affix-targeting constraints; rather, it is faithfulness to different morphological domains that may be used to separate the two kinds of markedness. Thus, McCarthy & Prince propose that Root-faithfulness is distinct from Affix-faithfulness, and that universally, Root-faithfulness dominates Affix-faithfulness. This is formally represented as the Root-Affix Faithfulness Metaconstraint (RAFM) as formalized in (1) above.

Let us briefly review McCarthy & Prince's analyses of some of the cases just discussed, using the RAFM. In Sanskrit, roots may contain onset clusters, but affixes may not. The RAFM accounts for this fact, as seen below:

(4) MAX-ROOT » *COMPLEX » MAX-AFFIX

The ranking in (4) disallows complex syllable margins only in affixes; since root faithfulness outranks the markedness constraint *COMPLEX, complex margins that are in roots will be faithfully parsed as such.

McCarthy & Prince also provide a ranking to explain a case of a language in which affixes display a less marked, more restricted segmental inventory than roots. Specifically, the ranking in (5) below illustrates why in Arabic, roots may contain pharyngeal segments, but affixes may not:

[1] For one analysis among many see Crothers & Shibatani (1980), which anticipates many OT-related issues in a very enlightening manner.

(5) IDENT-ROOT(Place) » *[Pharyngeal] » IDENT-AFFIX(Place)

The explanation is by now familiar: the markedness constraint against pharyngeal place features outranks identity of correspondent segments in affixes; thus, affixes will never contain pharyngeal segments, even if affixes contain pharyngeal features in their input. The markedness constraint against pharyngeal place, however, is outranked by root-faithfulness, so underlying pharyngeals in roots will surface faithfully.[2]

While the RAFM correctly predicts these three cases, I will show below that it is too strong a formulation, and that it must be restrained. In the next section, I present data from Modern Hebrew that motivate this move.

3 Modern Hebrew DVF and the RAFM

As mentioned above, MH contains a derivational process known as DVF, whereby a noun may be formed into a related verb. Two detailed accounts of DVF, Bat-El (1994) and Ussishkin (to appear) conclude that based on properties of a subset of denominal verbs there is no consonantal root involved in their derivation. This claim is rather surprising, given the overwhelming prevalence in the traditional and generative literature to treat all derivational processes in Semitic languages as root-based. By root-based, I mean that such past analyses consistently derive words from other words by extracting the consonants (i.e., the consonantal root) from one form and associating them to a template.

Bat-El (1994) and Ussishkin (to appear), however, show that MH DVF cannot be root-based. Relevant to the issues under consideration here are the data examined by Ussishkin, who shows that in the subset of biliteral denominal verbs (those with two consonants), the only way to account for an otherwise puzzling variation is to take into account the vowel quality of the base noun. Thus, DVF involves an output-output correspondence relation (à la Benua 1995, 1997, among others) mandating that every segment of the base (including the vowel) have a correspondent in the related denominal verb. Let us examine the MH data that show this to be the case.

3.1 MH biliteral denominal verbs

In MH, denominal verbs are always bisyllabic, and tend to appear in the intensive or agentive *binyan* (or verbal class) known as the *piʕel*, so named because of the vocalic melody [i…e] common to the majority of verbs in this binyan.[3] Most MH verbs contain three consonants, but some contain more or less than three. Denominal verbs also tend to have three consonants, but more and less than three consonants are attested as well. Biliteral denominal verbs, or those with only two consonants, surface in a variety of patterns. There are four possible shapes; only three of these will be discussed here.[4] These remaining three patterns can be summarized as follows:

3.1.1 Consonant doubling

Denominal verbs in this pattern double the final consonant of the base noun. This pattern is exemplified below:

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[2] As Kazutaka Kurisu points out (p.c.), these cases are typical instantiations of the emergence of the unmarked (McCarthy & Prince 1994).

[3] There do exist verbs in the *piʕel* binyan where the vowels are not [i…e], due to markedness constraints. Such cases complicate the analysis to be presented here, and are dealt with below.

[4] The fourth pattern is the only pattern involving a reduplicative morpheme (as argued in Ussishkin (to appear)), and is therefore morphologically more complex than the other three patterns. For this reason, I set it aside.

(6) Consonant doubling

Base	*Gloss*	*Related denominal verb*	*Gloss*
dam	'blood'	dimem	'to bleed'
xam	'hot'	ximem	'to heat'
xad	'sharp'	xided	'to sharpen'
cad	'side'	cided	'to side with'
sam	'drug'	simem	'to drug, to poison'
kar	'cold'	kirer	'to chill, to cool'

3.1.2 [j]-forms

[j]-forms are those denominal verbs whose medial consonant is the palatal glide [j]. Examples follow in (7):

(7) [j]-forms

Base	*Gloss*	*Related denominal verb*	*Gloss*
ʔiʃ	'man'	ʔijeʃ	'to man'
ʔir	'city'	ʔijer	'to urbanize'
tik	'file'	tijek	'to file'
bul	'stamp'	bijel	'to stamp'
xut	'thread'	xijet	'to sew, to tailor'
kur	'melting pot, furnace'	kijer	'to mold, to model'

3.1.3 [v]-forms

[v]-forms are similar to [j]-forms: here, [v] appears as the medial consonant of the denominal verb, as seen in (8):

(8) [v]-forms

Base	*Gloss*	*Related denominal verb*	*Gloss*
sug	'kind, type'	siveg	'to classify, to sort'
zug	'couple, pair'	ziveg	'to match, to pair'
ʃuk	'market'	ʃivek	'to market'
kod	'code'	kived	'to code, to encode'
hon	'capital, wealth'	hiven	'to capitalize'
tox	'inside, center, midst'	tivex	'to mediate, to arbitrate'

3.2 Analysis of DVF: Ussishkin (to appear)

The first analysis of DVF to systematically account for the variation illustrated in (6)-(8) above appears in Ussishkin (to appear), where each of the three biliteral patterns is related to the form of the base noun. As shown in (6), consonant doubling takes place when the vowel of the base is the low vowel [a], while [j]-forms and [v] forms occur in verbs whose related bases have either a high vowel ([i] or [u]) or a mid, round vowel ([o]). If a base noun has the vowel [i], its related denominal verb will be a [j]-form; this is also sometimes true if the base noun has the vowel [u]. Of course, an obvious exception to the generalization regarding the vowel [u] are some of the [v]-forms in (8) whose base nouns have [u]. Ussishkin (to appear) analyzes this as an emergent OCP effect; the details of the analysis will not be reviewed here due to space limits. Finally, denominal verbs whose base nouns have the vowel [o] appear as [v]-forms.[5]

Ussishkin's is the first analysis to claim that the stem vowel in the input to a derivational process in MH influences the shape of the resulting output. This seems a radical move, given the nature of nonconcatenative systems whose (consonantal) root-and-pattern morphology has been extensively argued for (e.g., McCarthy 1979, 1981, and assumed by most analysts). Without access to the base vowel and its quality, however, it is impossible to predict which of the three above patterns a denominal verb will appear in.

Another novel component of Ussishkin's analysis is its departure from the traditional *templatic* analysis, following work in the Prosodic Morphology program of McCarthy & Prince (1999), Prince (1997) and Spaelti (1997). Rather than specify a bisyllabic template into which every denominal verb must fit, output-oriented constraints whose existence in MH is independently motivated work together to produce the templatic effects.[6]

Given that DVF is not root-based but is, rather, stem-based, certain correspondence-theoretic constraints are immediately required. Here I briefly review the OT analysis set forth in Ussishkin (to appear). Given an input to DVF consisting of both the base noun in its entirety in addition to the two vowels /*i*…*e*/ which mark the verbal morphology, we have the following constraints:

(13) INTEGRITY (McCarthy & Prince 1995:372)
No element of the base has multiple correspondents in the output.
("No copying/doubling")

INTEGRITY is violated if any input segment is copied in the output, specifically in cases of consonant doubling (see (6) above).

(14) MAX-C (McCarthy 1995, McCarthy & Prince 1995:370)
Every consonant of the base has a correspondent in the output.
("No deletion of consonants")

(15) MAX-V-S(TEM) (McCarthy & Prince 1995:370, Gafos 1995)
Every base vowel has a correspondent in the output.
("No deletion of stem vowels")

(14) and (15) force realization of every element of the stem, or base noun. As is evident from the data, (14) is satisfied by all denominal verbs, but (15) is violated in cases of consonant doubling, where the vowel of the base noun has no correspondent in the related denominal verb. In these cases, the base noun contains the vowel [a], which is never realized in the related denominal verb. Continuing our survey of the constraints employed in the analysis of DVF, we find in (16) below a constraint forcing realization of every affixal vowel.

(16) MAX-V-A(FFIX) (McCarthy & Prince 1995:370, Gafos 1995)
Every affixal vowel of the input has a correspondent in the output.
("No deletion of affix vowels")

[5] As noted in Ussishkin (to appear), there do exist base forms with [e] whose related denominal verbs are not totally predicted by the account presented therein. Under the analysis, such forms are expected to surface as consonant doubling outputs. While this is true for some base forms with [e], others have related denominal verbs with a medial [j].

[6] See Ussishkin (to appear) for an account that is much more detailed than that summarized here. The prosodic constraints that conspire to enforce the bisyllabic 'template' are the same constraints responsible for metrical structure in Hebrew (Ussishkin 1999, to appear; see Graf 1999 for a detailed OT account of metrical structure in MH nouns).

If in the input to DVF there appear three vowels (two from the verbal morphology, /*i*…*e*/, and one from the base noun), and outputs are restricted to a bisyllabic template on the surface, one of the vowels must either delete or be realized in a position other than the syllabic nucleus. This is the crux of the problem, and it is well illustrated in the cases of consonant doubling. Disregarding for the moment the mechanism that decides which consonant gets copied in such cases here are some potential surface candidates for an illustrative example form, *dimem* 'to bleed' from *dam* 'blood.'[7]

(17) *dimem* 'to bleed' from *dam* 'blood'

dam + i e	[σσ]	MAX-V-A	MAX-V-S	INTEGRITY
a. damem		*!		*
b. dimam		*!		*
c. damime	*!			*
☞ d. dimem			*	*

Turning to the issue of which consonant is copied in such cases, I will summarize here the account presented in Ussishkin (to appear). This account is an alternative to the autosegmental spreading approach of McCarthy (1979, 1981), and draws on the correspondence-theoretical Anchoring constraints of McCarthy & Prince (1995). Anchoring is formally defined as follows:

(19) ANCHOR-R(IGHT)/L(EFT) (McCarthy & Prince 1995:371)
$\forall x, y, [(x = \text{Edge}(S_1, R/L)) \ \&\ (y = \text{Edge}(S_2, R/L))] \rightarrow [x\Re y]$

The logical expression in (19) states that if some segment x is at the right (or left) edge of a string S_1 (which can be viewed as the input), and if some segment y is at the right (or left) edge of another string S_2 (the output), then x and y stand in a correspondence relation. This constraint is satisfied when a segment at the right (or left) edge of the input has a correspondent at the same edge of the output. Ussishkin (to appear) develops a new type of Anchoring constraint based on (19). This new constraint is called Strong-Anchoring. The left- and right-edge Strong Anchoring constraints for MH are presented below:

(17) S(TRONG)-ANCHOR-L(EFT)
$\forall x, y, [(x = \text{Edge}(S_1, L)) \ \&\ (x\Re y)] \rightarrow [y = \text{Edge}(S_2, L)]$

(18) S(TRONG)-ANCHOR-R(IGHT)
Let C_f = the rightmost consonant of a string:
$\forall x, y, [(x = (S_1, C_f)) \ \&\ (x\Re y)] \rightarrow [y = \text{Edge}(S_2, R)]$

Given the fact that rightmost consonants are copied while leftmost consonants are not (see (6) above), it is clear that these two constraints are ranked as follows:

(19) *Ranking compelling copying of rightmost consonant*

S-ANCHOR-L » S-ANCHOR-R

[7] In what follows, the constraint [σσ] is meant as an abbreviatory device for the constraints that drive the templatic nature of output. It is not meant to be taken literally, however, as a templatic constraint.

As the following tableau illustrates, this ranking forces the final consonant to copy. Note that ANCHOR-R is necessary as well.

(20)

dam + i e	S-ANCHOR-L	ANCHOR-R	S-ANCHOR-R	INTEGRITY
a. dime		*!		
b. didem	*!			*
☞ c. dimem			*	*

This explains the copying of the final consonant. Now we are faced with the question of why it is the case that the base-final consonant may have two correspondents in the related denominal verb, while the vowel of the nominal base has none. Recall tableau (17) and the ranking MAX-V-A » MAX-V-S. This ranking is what forces loss of the base vowel [a] in the denominal verb; given the templatic effect observed, one of the input vowels must be lost because there are three vowels in the input, while only two syllables are permitted in the output. The ranking MAX-V-A » MAX-V-S is not problem-free, though. It conflicts directly with the RAFM, because according to the RAFM affix faithfulness is subordinate to stem (root) faithfulness.

My claim, therefore, is that the theory of Head Dominance (Revithiadou 1999) is needed to explain the facts we have reviewed. We will see that Head Dominance provides a satisfying account for the Hebrew DVF data, and that therefore this approach is needed in order to constrain the effects of the RAFM.

4 Head Dominance

In her dissertation, Revithiadou (1999) proposes to analyze lexical accent systems using the theory of Head Dominance. This theory is based on the proposal that morphological headedness influences prosodic structure and that marked morphological heads in a sense "want" to become prosodic heads. This desire can conflict with the normal prosody of the language, and provides a scenario in which several possible elements are competing for prosodic headedness.

The principle of Head Dominance states that faithfulness to morphological heads outranks general faithfulness. An important issue, then, is what constitutes a morphological head. Revithiadou (1999) convincingly argues that derivational affixes are morphological heads. In this way, stems and derivational affixes are distinct from inflectional affixes (di Sciullo & Williams 1987, Scalise 1986, Zwicky 1985). This distinction indeed seems motivated and supported by the fact that derivational affixes are crucial in determining morphosyntactic features, such as syntactic category and case. This leads to the ranking below:

(21) Head Dominance (Revithiadou 1999:5)

HEADFAITH » FAITH

Through this ranking, Revithiadou is able to analyze lexical accent systems, such as those of Greek and Russian, and provide an explanation for apparent stress anomalies in such languages. Under the theory of HD, these anomalies are actually the manifestations of lexical accent and its preservation. Such lexical accents, when they occur on a derivational morpheme, are preserved even if this requires deleting a lexical accent from a stem.

I propose to extend HD to DVF in Hebrew. Although we are not dealing here with a system of accent, the theory naturally extends itself to the problematic case of consonant doubling verbs in which the base vowel is lost in favor of affixal vowels. Recall the situation above, repeated in the tableau below for convenience.

(22) *dimem* 'to bleed' from *dam* 'blood'

dam + i e	[σσ]	MAX-V-A	MAX-V-S	INTEGRITY
a. damem		*!		*
b. dimam		*!		*
c. damime	*!			*
☞ d. dimem			*	*

In (22) it is the ranking MAX-V-A » MAX-V-S (outlined in (22) by a heavy black line) that is problematic with respect to the RAFM, which contradicts this ranking. This is because the RAFM requires stem (root) faithfulness to outrank affix faithfulness, which clearly derives the wrong results in DVF cases like (22).

However, an appeal to HD resolves the problem. This is because the verbal morphology of the MH *piʕel* binyan (or verbal class), /*i…e*/, is a derivational morpheme and is therefore the morphological head of the denominal verb. /*i…e*/ signifies the syntactic category (verb) of the resulting form, so its status as a morphological head is exactly along the lines of Revithiadou's proposal. As such, it is subject to HD, implemented through the ranking in (21). Let us define each of the two constraints in the ranking.

(23) HEADFAITH
A segment sponsored by a head in S_1 has a correspondent in S_2; likewise, a segment sponsored by a head in S_2 has a correspondent in S_1. In addition, featural specifications between between corresponding segments in a head are identical in S_1 and S_2.

(24) FAITH
A segment in S_1 has a correspondent in S_2; likewise a segment in S_2 has a correspondent in S_1. In addition, featural specifications between corresponding segments are identical in S_1 and S_2.

In the case at hand, namely denominal verbs with consonant doubling, these constraints act to explain why the base vowel [a] is not realized. This base vowel belongs to the stem, but the vowels /*i…e*/ belong to the morphological head and therefore faithfulness to these vowels outranks general faithfulness.

Let us explicitly illustrate the analysis. The following tableau shows how the optimal form, which deletes the base vowel [a], is selected.

(25) *dimem* 'to bleed' from *dam* 'blood'

dam + i e	[σσ]	HEADFAITH	FAITH	INTEGRITY
a. damem		*!	*	*
b. dimam		*!	*	*
c. damime	*!			*
☞ d. dimem			*	*

Here, the constraints HEADFAITH and FAITH have replaced the constraints MAX-V-A and MAX-V-S respectively. We are now no longer forced to resort to a ranking which contradicts the RAFM. In addition, these two constraints are more general than the two constraints MAX-V-A and MAX-V-S. This is a benefit of the HD analysis, and is further underscored by the fact that another potential candidate, **dajem*, is not selected as optimal.[8] In **dajem*, the base vowel [a] has been preserved and the affixal vowel /i/ has been realized as the glide [j]. However, /i/ cannot be realized as [j] because this incurs a violation of HEADFAITH. /i/ must be realized as a syllabic nucleus, while its realization as a syllabic margin [j] violates HEAD-IDENT-μ, a type of HEADFAITH constraint.[9]

The question then arises as to why denominal [j]-forms and [v]-forms can realize the entire base, including the vowel. This is for strictly phonological reasons: high and round vowels in the bases of such forms can be realized as glides ([j] and [v]), and therefore can appear in the related denominal verbs without violating the stem size restriction of two syllables. Furthermore, since these segments are not part of the morphological head, they do not violate HEADFAITH by surfacing as non-nuclear segments, even though their input correspondents are nuclear. We have seen, then, that McCarthy & Prince's (1995) RAFM is too strong as a univeral ranking, and that it may be dominated by additional faithfulness constraints which predict the existence of exceptions to the RAFM. Of course, this is not an unexpected or unsurprising outcome given the principles of OT, most notably the core concept of constraint ranking. The class of consonant doubling denominal verbs has given us empirical reasons to extend Revithiadou's (1999) theory of Head Dominance beyond accentual systems into the domain of nonconcatenative morphology.

5 Some complications

Given the HD account presented above, we expect that MH verbs of the *piʕel* binyan always contain the vocalic melody [i…e]. This is actually not the case: our investigation is complicated by the existence of some exceptions to this prediction. Consider first the denominal verbs in (26).

(26)	*Base*	*Gloss*	*Related denominal verb*	*Gloss*
	rom	'height'	romem	'to raise, to glorify'
	ʔot	'sign'	ʔotet	'to signal'
	xok	'law'	xokek	'to create a law'
	kod	'code'	koded	'to code, to encode'

The denominal verbs in (26) appear to violate HD because the base vowel [o] is preserved in the denominal verbs at the expense of the binyan vowel /i/. Such cases have been pointed out previously (e.g., McCarthy 1979), where it has been assumed that in fact these forms involve a separate binyan, the *poʕel* binyan, whose input vowels are /*o*…*e*/. If this is the case, then the problem disappears. Historically, McCarthy (1979) notes, such forms result from a confusion between true biliterals (forms with two root consonants) and so-called hollow verbs, which are really triliteral but involve a medial glide. At some point in the development of the language, the argument proceeds, the glide was lost and the hollow forms were reanalyzed as biliteral. However, given the existence of cases where the same root appears in both the *piʕel* binyan and the *poʕel* binyan, we are thus

[8] Thanks to Diana Archangeli for pointing out this candidate to me.
[9] As both Kazutaka Kurisu and Jaye Padgett point out, a potential competing analysis exists: one in which we utilize the constraint REALIZEMORPHEME (RM; e.g., Samek-Lodovici 1993, Gnanadesikan 1997, Rose 1997, Walker 1998, Kurisu to appear a, b). Under this approach, RM states that each morpheme in the input must have some phonological realization in the output. This analysis fails, however, given the nature of the affixal morpheme /*i e*/ becaue this morpheme contains two segments. Thus, a high-ranking RM constraint would not rule out forms like **dimam* and **damem,* given that part of the input /*i e*/ surfaces in these failed candidates.

dealing with dual lexical entries. In other words, in order to preserve the contrast between two historically different roots, the *poʕel* binyan is maintained as a separate lexical entry. McCarthy (1979) cites pairs such as *ħonen* 'to have pity' ~ *ħinnen* 'to make pleasing', and *sibbeb* 'to turn' ~ *sobeb* 'to go round' in Tiberian Hebrew. This argument should be further examined and developed but essentially frees us of the problem associated with forms such as those in (26).

Another complication arises due to phonotactic constraints in MH which affect vowels. There is a productive process of vowel lowering in the environment of guttural consonants. These consonants include *r*, and historical *ħ* and *ʕ*, although in the modern language the latter two have either neutralized with other consonants (*ħ* → *x*) or been lost (*ʕ* → *ʔ* (→ ∅)). Still, these lowering effects are pervasive, as seen in the following denominal verbs.[10]

(27)

Base	*Gloss*	*Related denominal verb*	*Gloss*
mar	'bitter'	merar	'to embitter'
kar	'cool'	kerar	'to chill'
luax	'table'	livax	'to tabulate'
duax	'report'	divax	'to report'

This effect occurs not only in denominal verbs but in all verbs, as the following examples show.

(28)

Verb	*Gloss*
mina(ʔ)	'to motorize
berar	'to clarify'
gilax	'to shave'
ʃiga(ʔ)	'to madden'

The verbs in (28) are all *piʕel* verbs, yet their vocalism is altered from /i…e/ due to the lowering effects induced by adjacent gutturals. It is clear from such data that HEADFAITH is outranked by the markedness constraints requiring vowel lowering. A full analysis is beyond the scope of this paper, but this suggestion paves the way for a principled account in which Markedness outranks Faithfulness.

6 Conclusion

In this paper I have argued that the Root-Affix Faithfulness Metaconstraint of McCarthy & Prince (1995) is too strong as an absolute statement. Modern Hebrew DVF has provided clear evidence that this is the case and demands an explanation for the fact that in consonant doubling denominal verbs stem vowels may be deleted in favor of affixal vowels. The motivation behind deletion in the first place is the templatic effect; the explanation behind the choice of what to delete comes from the theory of Head Dominance (Revithiadou 1999).

I have extended head dominance to the case of Hebrew, showing that relatively high-ranking HEADFAITH predicts the facts observed in denominal verbs. What we have seen is that other kinds of faithfulness constraints may dominate ROOTFAITH, which predicts exceptions to the RAFM. This research continues to provide an intriguing line of inquiry into the conflicts encountered by faithfulness when prosodic morphology imposes size restrictions on surface forms. Semitic languages provide a useful testing ground for

[10] The generalizations regarding lowering are somewhat more complex, but this description is sufficient for our purposes here.

theories designed to explain such conflicts, given the well known templatic nature of these languages. Through further work we can pursue a greater understanding of these effects, and perhaps even unify them with similar phenomena in other language families.

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