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VOWEL DELETION AND NONPRIMARY STRESS IN MODERN HEBREW*

Nirit Kadmon

0. Introduction

There is a rule of Modern Hebrew sentence phonology, which optionally deletes the vowel [e]. (To the best of my knowledge, this rule was first discussed in Bolozky (1977).) For example, alongside the form aní meviná otó ('I understand (fem) him'), there is a form aní mviná otó, where the e has been deleted. One of the constraints on e Deletion is that it cannot create a stress clash. For example, the string atá mevin otí ('You understand (masc) me') does not have a corresponding e-less form *atá mvin otí, with stresses on two adjacent syllables. Sometimes, a stress change makes it possible for e Deletion to apply and yield a grammatical string. For example, we do have the form áta mvin otí, where the stress on ata (isolation form: atá) has been shifted, and e Deletion has applied without creating a stress clash.

Stress changes in Hebrew affect only stresses which are very low in prominence. I will propose that there is a single rule which assigns all the secondary (that is, non-primary) stresses

in Hebrew, and that this rule plays a crucial role in creating the stress changes. I will then present an analysis of the interaction between stress changes and e Deletion.

My analysis will be couched in the general framework of Selkirk (1983) (Phonology and Syntax: The Relation Between Sound and Structure). Some basics of the theory which she assumes and develops are outlined in section 1.

1. Preliminaries: The Metrical Grid

Lieberman (1975) has proposed the **metrical grid** as a representation of the rhythmic organization of natural language, which is analogous to the description of musical rhythm. It works as follows.

Imagine a sequence of even pulses. It can be represented as x x x x x x x. Now impose a 2/4 time on this sequence. In the resulting rhythm, there are pairs of beats, in which the first beat is stronger than the second one. This can be represented as

```
x   x   x   x
x x x x x x x x.
```

Similarly, a Waltz rhythm can be represented as

```
x       x
x   x   x   x
```

x x x x x x x x. With a 4/4 time, our pulses would be divided into sequences of four beats, in which the first beat is the strongest, the second and fourth beats are the weakest, and the third beat is of intermediate strength. This can be represented

```
      x       x
      x   x   x   x
```

as follows: x x x x x x x x. In short, higher rhythmic prominence is represented by a higher column of x's. This kind of representation is called a 'metrical grid', and the horizontal lines of x's (or 'grid entries') are called 'levels'. Stress patterns of language can be represented in the same way. For example, the stress pattern

```
      x
     x  x
    x  x x
```

of represent can be represented as represent. The first grid level contains entries for three pulses, corresponding to the three syllables, the second level contains entries for the stressed syllables only, and the third level contains a single entry, aligned with the strongest syllable, the one that carries the main word stress.

For Lieberman (1975) and also Lieberman and Prince (1976) and later work in the 'metrical' tradition, the basic patterns of stress in language are represented by **metrical trees**, a phonological representation independent of the metrical grid, and the grid is used for representing further rhythmic organization.

Prince (1983) has proposed that the metrical grid be promoted to the status of the sole representation of stress patterns, and that the theory of possible stress patterns be cast in terms of the way syllables are aligned with grid entries. Selkirk (1983)

adopts this position and provides more arguments for it and further development of the theory of syllable-to-grid alignment.

Selkirk proposes a system where the grid is constructed on the basis of syntactic surface structures, augmented with information about syllabification and about intonation (intonational phrasing and pitch accents). The grid is built from the bottom up, level by level. Grid construction rules operate cyclically. The cyclic domains are syntactic constituents, and the largest cyclic domain is the Intonational Phrase (which counts as an "honorary" syntactic constituent).

In what follows, I will sometimes make reference to specific details of Selkirk's theory, but I think that the main points of my analysis are independent of these details.

2. Beat Addition

The main stress in Hebrew words is most commonly final, and sometimes penultimate. To its left, there is an alternation of unstressed and secondarily stressed syllables. The alternation is often very 'neat', as in the forms on the left in (1) below, but not always. Forms with sequences of two and even three unstressed syllables, like the variants on the right, are perfectly natural as well.^{1,2} Within the intonational Phrase, a syllable carrying a secondary stress is never adjacent to any other stressed syllable. (For some illustration, see (13) and (14) in 3.1 below.)

(1)	$\begin{array}{c} \cup \quad \backslash \cup / \\ a- \quad me\acute{s}uga \\ the-crazy \end{array}$	$\begin{array}{c} \backslash \cup \cup / \\ ame\acute{s}uga \end{array}$
	$\begin{array}{c} \cup \cup / \\ maasiyot \\ tales \end{array}$	$\begin{array}{c} \backslash \cup \cup / \\ maasiyot \end{array}$
	$\begin{array}{c} \cup \quad \backslash \cup / \cup \\ a- \quad mevugeret \\ the-adult \end{array}$	$\begin{array}{c} \backslash \cup \cup / \cup \\ amevugeret \end{array}$
	$\begin{array}{c} \backslash \cup \quad \backslash \cup / \cup \\ ve- \quad me- \quad a- \quad mikteret \\ and-from-the-pipe \end{array}$	$\begin{array}{c} \cup \backslash \cup \cup / \cup \\ vemeamikteret \end{array}$
	$\begin{array}{c} \cup \quad \backslash \cup \quad \backslash \cup / \cup \\ ve- \quad k\acute{s}e- \quad me- \quad a- \quad mikteret \\ and-when-from-the-pipe \end{array}$	$\begin{array}{c} \backslash \cup \cup \cup / \cup \quad \backslash \cup \cup \cup / \cup \\ vek\acute{s}emeamikteret \quad vek\acute{s}emeamikteret \end{array}$
	$\begin{array}{c} \backslash \cup / \quad \cup \backslash \cup / \cup \\ mevoot \quad yeru\acute{s}alaim \\ the \text{ entrance to Jerusalem} \end{array}$	$\begin{array}{c} \backslash \cup / \quad \cup \cup \cup / \cup \\ mevoot \quad yeru\acute{s}alaim \end{array}$

To account for the basic patterns of word stress, I propose the rules in (2) and (3).

operates in various different areas (e.g. music). This tendency is the kind of factor which we would expect to result in more secondary stresses in slow speech than in fast speech, as is indeed the case in Hebrew.

In stipulating that BA applies on the Intonational Phrase, I accept the position of Bolozky (1983), that BA is strictly late in the derivation, but not for the reason he gives.⁵ It is crucial for the analysis of stress changes presented in section 2 below that BA applies late in the derivation. It is compatible with this analysis, though, to let it apply early as well; it could apply on all the cyclic domains. I have decided to limit it to the Intonational Phrase, because I think this would allow for a simpler formulation of the rule assigning the main stress of the VP.

Main prominence in Hebrew phrases is always assigned to a syllable carrying a main word stress (or emphatic stress, which I will ignore). I haven't studied phrasal stress in any great detail, but it looks like there is a rule which assigns the maximal prominence in the VP to the syllable carrying the main stress of the verb. If BA applies on the Intonational Phrase only, then the input to this VP rule would not contain any secondary stresses. For example, for the sentence in (6), the input to the VP rule would have to be as in (6a).⁶

	x		x		x
	x x	x x x	x	x x x	
(6a)	yosi	[_{VP} <u>mexake</u>	[_{PP} la-	mazkira]]	
	Yosi	waits	for-the-	secretary	

Given this kind of input, the VP rule (which has to assign the main VP stress to the underlined syllable) can be formulated as assigning maximal prominence in the VP to the syllable aligned with the leftmost basic beat in the VP⁷. If BA may apply on all the cyclic domains, this formulation wouldn't work, because then the input to the VP rule might contain a basic beat to the left of the main stress of the verb, as in (6b).

		x		x
	x	x x		x x
(6b)	x x	x x x	x	x x x
	yosi	[_{VP} <u>mexake</u>	[_{PP} la-	mazkira]]
	Yosi	waits	for-the-	secretary

The rule would not be able to pick out the leftmost third level grid entry either, because there might not be one, due to the optionality of BA ((6a) is still a legitimate input for the VP rule), or because BA couldn't apply on the verb without creating a stress clash, as in (7).

				x
	x			x x
	x x x	x x x	x	x x x

(7) kulanu [VP xikinu [PP la- mazkira]]
 we all waited for-the-secretary

The VP rule would have to be formulated as assigning maximal prominence in the VP to the syllable aligned with the grid entry which is alone on its metrical level in the leftmost daughter of the VP (i.e., the main verb of the VP). This last formulation doesn't look too implausible; it is analogous to the way the English Nuclear Stress Rule is formulated in Selkirk (1983). Still, the first formulation is simpler. In the absence of a spelled-out theory of "naturalness" or markedness which could determine whether it should count as simpler to have BA apply on all the cyclic domains or on the Intonational Phrase only, it seems preferable to choose the possibility that would allow for a simpler formulation of the VP rule, and restrict BA to the Intonational Phrase.

3. Stress Changes

3.1 Data

"Stress changes" is a pre-theoretical term referring to situations where a word appears with a stress pattern different from the one it has in isolation. Bolozky (1982) presents and discusses stress changes in Hebrew, and many of the facts presented in this subsection are given there. I will refer to the stress pattern a word has in isolation as its "lexical stress", and I will use "stress shift" and "unstressing" as pre-theoretical terms standing for different kinds of deviation from the lexical stress.

In Hebrew, only stresses which are very low in prominence can undergo stress changes. These weak stresses must undergo a stress change whenever they would otherwise be clashing with another stress on an adjacent syllable. If a shift would not create a new clash, the affected stress is shifted. Otherwise, it disappears (it is "unstressed"). This is illustrated in (9)-(11) below. The judgements are for **normal** speech (as opposed to very slow or very careful), with each sentence pronounced as a **single** Intonational Phrase, and with **no** emphatic stress on atem and lanu. I have underlined stress clashes.

(8) Isolation forms: $\cup /$ $/ \cup$
 atem lanu

(9) No change: $\cup /$ $\cup /$ $\cup /$ \cup / \cup $/ \cup$ $/ \cup$
 matay atem baim kaniti lanu oxel
 when you-pl come bought-I for-us food
 ('When are you coming?') ('I bought food for us')

$\cup /$ $/ \cup$ $\cup /$ $/ \cup$ $/ \cup$
 *matay atem batem^s *u natan lanu sefer^s
 when you-pl came he gave to-us book
 ('When did you come?') ('He gave us a book')

- (10) Stress shift: $\begin{matrix} \vee / \vee & / \vee & / \vee \\ \text{meefo} & \text{atem} & \text{batem} \end{matrix}$ $\begin{matrix} \vee \vee / & \vee / & \vee / \\ \text{u natan} & \text{lanu} & \text{makot} \end{matrix}$
 from-where you-pl came he gave to-us spans/blows
 ('Where did you come from?') ('He hit/spanked us')
- $\begin{matrix} \vee / & / \vee & / \vee \\ * \text{matay} & \text{atem} & \text{batem} \end{matrix}$ $\begin{matrix} \vee \vee / & \vee / & / \vee \\ * \text{u natan} & \text{lanu} & \text{sefer} \end{matrix}$
- (11) Unstress- $\begin{matrix} \vee / & \vee \vee & / \vee \\ \text{matay} & \text{atem} & \text{batem} \end{matrix}$ $\begin{matrix} \vee / & \vee \vee & / \vee \\ \text{u natan} & \text{lanu} & \text{sefer} \end{matrix}$
 ing:

The behavior of secondary stresses is analogous to that of the weak primary stresses which undergo stress changes. Secondary stresses too never clash with a stress on an adjacent syllable (see (13a) and (14a)). A secondary stress may appear in a position where it doesn't clash with another stress, as on ma in (13b). If that's impossible, there is no secondary stress, as in (14b).⁹

- (12) Isolation forms: $\begin{matrix} \vee \vee / \vee \\ \text{bamaarexet} \end{matrix}$ $\begin{matrix} \vee \vee / \vee \\ \text{bamaarexet} \end{matrix}$
- $\begin{matrix} \vee \vee / \\ \text{yeladim} \end{matrix}$
- (13) a. $\begin{matrix} \vee \vee / \\ * \text{takala} \end{matrix}$ _____ $\begin{matrix} \vee \vee / \vee \\ \text{bamaarexet} \end{matrix}$
 something going wrong (a noun) in-the-system
- b. $\begin{matrix} \vee \vee / & \vee \vee / \vee \\ \text{takala} & \text{bamaarexet} \end{matrix}$
- (14) a. $\begin{matrix} \vee / & \vee \vee / \\ * \text{\$loša} & \text{yeladim} \end{matrix}$
 three children
- b. $\begin{matrix} \vee / & \vee \vee / \\ \text{\$loša} & \text{yeladim} \end{matrix}$

Bolozky (1982, 1983a) says that the only primary stresses which undergo stress changes are those of function words, like atem and lanu in (9)-(11) above.¹⁰ I disagree; main stresses of normal words usually don't undergo stress changes, but when they are very low in prominence, they sometimes do:

- (15) im ze lo perek $\begin{matrix} \vee / \vee \vee \\ \text{xamešesre} \end{matrix}$ az $\begin{matrix} \vee / \\ \text{ulay} \end{matrix}$ $\begin{matrix} \vee \vee / \\ \text{šešesre}^{11} \end{matrix}$
 if it not chapter 15 then maybe 16
- Isolation: $\begin{matrix} \vee \vee \\ \text{perek} \end{matrix}$

- (16) $\overset{\vee}{\underset{\vee}{\text{im}}}$ $\overset{\vee}{\underset{\vee}{\text{tavou}}}$ $\overset{\vee}{\underset{\vee}{\text{lekan}}}$ $\overset{\vee}{\underset{\vee}{\text{rega}}}$ $\overset{\vee}{\underset{\vee}{\text{ulay}}}$ $\overset{\vee}{\underset{\vee}{\text{i}}}$ $\overset{\vee}{\underset{\vee}{\text{tistakel}}}$ $\overset{\vee}{\underset{\vee}{\text{al ze}}}$
 if will-come- to-here minute maybe she will-look on it
 2nd-pl
 ('If you come here for a minute, maybe she will look at it')

Isolation: $\overset{\vee}{\underset{\vee}{\text{lekan}}}$

- (17) $\overset{\vee}{\underset{\vee}{\text{ata}}}$ $\overset{\vee}{\underset{\vee}{\text{yaxol}}}$ $\overset{\vee}{\underset{\vee}{\text{leaxzik}}}$ $\overset{\vee}{\underset{\vee}{\text{rega}}}$ $\overset{\vee}{\underset{\vee}{\text{tasal}}}$
 you-sg can to-hold minute Acc-the-basket
 ('Can you hold the basket for a minute?')

Isolation: $\overset{\vee}{\underset{\vee}{\text{rega}}}$

A natural way of pronouncing (15)-(17) is with the circled word clearly less rhythmically prominent than the two adjacent words. When pronounced in this way, it is clear that the underlined words can not retain their lexical stress, although it is hard to tell whether the stress is shifted or unstressed.^{12, 13}

3.2 Analysis

The behavior of secondary stresses is already accounted for by the rule of BA proposed in section 2. BA never assigns a secondary stress which would clash with another stress in its Intonational Phrase. It is clear why some patterns of secondary stresses that are available for isolation forms are not always available in larger phrases. Take, for example, $\overset{\vee}{\underset{\vee}{\text{yeladim}}}$ ('children') and $\overset{\vee}{\underset{\vee}{\text{šloša yeladim}}}$ ('three children'). The isolation form $\overset{\vee}{\underset{\vee}{\text{yeladim}}}$ is an entire Intonational Phrase, in which nothing clashes with the stress on $\overset{\vee}{\underset{\vee}{\text{ye}}}$. In the Intonational Phrase containing $\overset{\vee}{\underset{\vee}{\text{šloša yeladim}}}$, BA cannot assign a stress to $\overset{\vee}{\underset{\vee}{\text{ye}}}$ next to $\overset{\vee}{\underset{\vee}{\text{ša}}}$, so $\overset{\vee}{\underset{\vee}{\text{ye}}}$ must remain stressless.

I propose that the stress changes which apply to primary stresses are the combined effect of BA and the rule of Basic Beat Deletion in (18), which precedes BA.¹⁴

- (18) Basic Beat Deletion (BBD) $\overset{\vee}{\underset{\vee}{\text{x}}} \text{ --- } \overset{\vee}{\underset{\vee}{\text{x}}}$ (obligatory)

Domain of application: the Intonational Phrase

BBD is a destressing rule, in the sense of Selkirk (1983), and as such it is restricted by Selkirk's Higher Prominence Preservation Condition not to delete grid entries on levels three and above. That is, BBD can only affect stresses which enter the Intonational Phrase cycle with columns of exactly two grid entries.

The effect of BBD alone is "unstressing". A "stress shift" is the result of BBD on one syllable followed by BA on an adjacent syllable. I assume that by the time of application of BBD, most of the main word stresses have acquired (at least) a third level grid entry, assigned by a previous rule. It is the

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relatively few primary stresses which have remained very low in prominence and still have only two grid entries which undergo BBD.¹⁵ Example derivations are in (19) and (20) below.¹⁶

(19) Unstressing:

Word domain rules (Demibeat Alignment and Main Stress Rule):	x x x x x x x x x x x u natan lanu sefer he gave to-us book
--	---

Phrasal rules assigning the main stresses of the NP <u>sefer</u> and of the VP:	x x x x x x x x x x x x x x u natan lanu sefer
---	---

BBD:	x x x x x x x x x x x x u natan lanu sefer
------	---

BA:	x x x x x x x x x x x x u natan lanu sefer
-----	---

BA cannot apply to any of the syllables which are still unstressed, and lanu remains completely stressless.

(20) Stress shift:

Word domain rules:	x x x x x x x x u irbic lanu he hit/spanked to-us
--------------------	--

The main VP stress rule:	x x x x x x x x x u irbic lanu
--------------------------	---

BBD:	x x x x x x x x u irbic lanu
------	--

BA:	x x x x x x x x u irbic lanu
-----	--

(BA couldn't have applied to ir or la instead, because of the stress on bic.)

The specification that BBD is obligatory accounts for the fact that stresses which are weak enough to undergo a stress change may never end up clashing with another stress. BBD applies to all the weak stresses. Some of them may then be restored by BA (e.g., the stress on u in (19) and (20) above), but not the ones which would clash with another stress (like the stress on la in (20)).

Note that it is not necessary to stipulate a movement rule to account for the stress shift. The shift is the result of two independently motivated rules, needed for secondary stress assignment and for unstressing. Using BBD for both unstressing and the stress shift captures the similarities between the two processes. (They basically occur in the same environment, the shift being "chosen" when it wouldn't create a stress clash.) Using BA both for secondary stress assignment in general and for the stress shift explains why they yield the same clashless stress patterns.

My analysis correctly predicts that in situations like in (22) below, where a clash could arise between a weak primary stress and a secondary stress, either one of the two stresses may be suppressed or shifted so as to prevent the clash.

- (21) Isolation forms: $\vee /$ \vee / \vee
 ata meakenes
- (22) $\vee /$ \vee / \vee $/ \vee$ \vee / \vee $\vee /$ $\vee \vee / \vee$
 *ata meakenes ata meakenes ata meakenes
 you-sg from-the conference
 ('You are from the conference')

The stress on ta enters the Intonational Phrase cycle with two grid levels only. After BBD applies to it, the only basic beat in the phrase is on ke, and BA may add a beat to either one of ta or me.

Under my analysis, there is no distinction between the assignment of main stresses to function words and to other words. All primary stresses come out of the word cycle with exactly two grid levels.¹⁷ This allows for a unified treatment of stress changes, wherever they occur.¹⁸

Since main stresses of normal ("lexical") words don't undergo stress changes as often as main stresses of function words do, I do have to assume that main stresses of normal words are more likely to be strengthened (to three or more grid levels) than main stresses of function words are. Unfortunately, this cannot always be attributed to differences between the syntactic configurations in which normal words and function words occur (differences which affect the assignment of main phrasal stresses). There is a limited number of syntactic positions (perhaps only subject positions) in which a function word may undergo a stress change and a normal word may not.¹⁹ For example, compare the proper name yael in (23) below with the

function word atem (isolation: atem) in matay atem batem (from (11) above)).

- (23) *matay yael baa matay yael baa Isolation: yael
 when Yael came-fem
 ('When did Yael come?')

In the context of the present analysis, this seems to indicate that rules assigning main phrasal stresses are sensitive to whether words are function words or "lexical" words. The account might go as follows, for example. The phrasal rules do not "count" a function word alone as a full phrase. An NP domain rule adds a third level grid entry to el, the most prominent syllable in the NP yael, but fails to "see" that atem is also an NP and strengthen the stress on tem.

3.3 A Rejected Alternation

A possible alternative approach would be to say that BBD is triggered by a clash. That is, it could delete all the basic beats which are clashing with another stress, instead of deleting all of the basic beats. Here are some arguments against this approach.

First, there are examples like (24).

- (24) kaniti lanu bananot Isolation: lanu
 bought-I for-us bananas

In my dialect, it is much more natural (in normal speech) to pronounce the sentence in (24) as marked than to retain the lexical stress on lanu, although a stress on la wouldn't clash with a stress on an adjacent syllable. It is not at all clear how stresses on ni and la could somehow count as clashing. Even if they could, that would be due to an ad hoc definition of a clash, needed only for BBD, and necessarily different from the definition of the clash avoided by BA (since BA can restore the stress on la; cf. kaniti lanu oxel, from (9) above).

Next, consider again ata meakenes, from (22) above. The isolation form of ata is ata, so BBD must have applied to ta. BBD couldn't have been triggered by a clash with the stress on me, since this stress wasn't there when BBD applied - it is a secondary stress, assigned by BA after BBD has applied. (BA couldn't possibly have assigned the stress on me before BBD applied to ta, because BA is clash avoiding.) Therefore, a clash can't be a necessary condition for the application of BBD.

Finally, a very theory internal point: If BBD were triggered by a clash, it couldn't be considered a destressing rule, in which case there would have to be a special stipulation that constrains it to apply only to weak basic beats.

3.4 A Problem

My analysis alone does not account for the fact that oto in (25) cannot undergo a stress shift.

- (25) *iṣarti oto babait iṣarti oto babait Isolation: oto
 left-I him in-the-home
 ('I left him at home')

oto must be low enough in prominence to undergo BBD: First, it does undergo a stress shift when the following word is stressed initially, as in (26).

- (26) iṣarti oto kan (kan is more prominent than both
 left-I him here syllables of oto)

Secondly, lanu in (24) (kaniti lanu bananot) is low enough in prominence to undergo BBD, and, as far as I can tell, the rhythmic structures of (24) and the grammatical form in (25) are identical. Why can't oto undergo a stress shift, then?

Recall that in the example in (24) the stress pattern lanu is much more natural than the lexical lanu.²⁰ Why? I believe that the answer to this, as well as to the question posed by (25), is that there is a preference for final stress, which makes BA assign final stress whenever that is possible (i.e., when it wouldn't create a stress clash). BA assigns a stress to the last syllable of the function word, in both (24) and (25). I think this is obligatory. The reason lanu in (24) is nevertheless marginally acceptable is analogy to more formal speech, where all lexical patterns are retained, or analogy to cases where lanu is emphatically stressed. When oto is emphatically stressed, or in formal style, oto always has final stress, so there isn't a parallel reason to accept oto in (25). I don't know what is the best way to encode the preference for final stress in the grammar.

4. e Deletion and its Interaction with Stress Changes4.1 e Deletion

In Modern Hebrew normal speech (as opposed to particularly slow or particularly careful speech), there is optional deletion of vowels which are morphologically or phonologically predictable. To the best of my knowledge, this vowel deletion was first discussed in Bolozky (1977). As a general, systematic phenomenon, the deletion is restricted to the vowel e, and in some limited morphological environments, also i. I will limit my discussion to the deletion of e, and refer to the rule deleting it as 'e Deletion' (e Del). Examples are given in (27).

- (27) a. ṣloša yeladim opt. → ṣloša yladim
 three children

- b. i \ / \ / \ / \ / \ / \ /
 mevina oti →
 she understands me i mvina oti
- c. i \ / \ / \ / \ / \ / \ /
 košeret oti →
 she ties me i košert oti
- d. \ / \ / \ / \ / \ / \ / \ / \ /
 akelev aze ('this dog') →
 the-dog the-this akelv aze

All of the deleted vowels in (27) are predictable vowels. The one in (a) is phonologically predictable - it is there to break an impermissible syllable-internal consonant cluster (yl); the ones in (b) and (c) are in affixes (verb inflection affixes); the deleted e in (d) is typical of a certain noun pattern (the "Segolate" nouns).²¹

Like Bolozky (all references), I assume that the \emptyset/e alternation in Hebrew has to be accounted for by an e deletion rule and not by an e insertion rule. There is no phonologically specifiable environment in which the insertion rule could take place. Take for example (28) and (29).

- (28) a. i \ / \ / \ / \ / \ / \ / \ /
 košert oti i košeret oti (= (27c))
 she ties me
- b. at \ / \ / \ / \ / \ / \ /
 kašart oti *at kašaret oti
 you-sg-fem tied me
- (29) a. i \ / \ / \ / \ / \ / \ / \ /
 olext elav i olexet elav
 she goes/walks to-him
- b. at \ / \ / \ / \ / \ / \ / \ /
 alaxt elav *at alaxet elav
 you-sg-fem went/walked to-him

The underlined e in (28a) and (29a) is part of the inflection for present tense (fem., sg.). Its presence can't be the result of a phonological insertion rule; such a rule would not be able to distinguish between the a examples and the b examples in (28) and (29). The presence of the e in the a examples and its absence in the b examples (typical of the past tense) are morphological facts which have to be memorized by the speaker.

As noted in Bolozky (1977), e Del is constrained to yield a string which is properly syllabifiable (across a word boundary). Compare the e-less versions in (27) above with the e-less versions in (30). The latter cannot be syllabified without violating constraints on syllable structure in Hebrew.

- (30) a. $\begin{array}{l} \check{\text{š}}\check{\text{l}}\check{\text{o}}\check{\text{š}}\check{\text{i}}\check{\text{m}} \quad \check{\text{y}}\check{\text{e}}\check{\text{l}}\check{\text{a}}\check{\text{d}}\check{\text{i}}\check{\text{m}} \\ \text{thirty children} \end{array}$ * $\check{\text{š}}\check{\text{l}}\check{\text{o}}\check{\text{š}}\check{\text{i}}\check{\text{m}} \quad \check{\text{y}}\check{\text{l}}\check{\text{a}}\check{\text{d}}\check{\text{i}}\check{\text{m}}$
- b. $\begin{array}{l} \text{at} \quad \check{\text{m}}\check{\text{e}}\check{\text{v}}\check{\text{i}}\check{\text{n}}\check{\text{a}} \quad \check{\text{o}}\check{\text{t}}\check{\text{i}} \\ \text{you-sg-fem understand me} \end{array}$ * $\text{at} \quad \check{\text{m}}\check{\text{v}}\check{\text{i}}\check{\text{n}}\check{\text{a}} \quad \check{\text{o}}\check{\text{t}}\check{\text{i}}$

From now on, I will only discuss examples where the e to be deleted is predictable, and the syllabification requirement is met.

4.2 The Anti-Clash Constraint on e Deletion

e Del may result in a neat alternation of stressed and unstressed syllables, as in (27) above, or create a sequence of unstressed syllables, as in (31).²² It never results in a stress clash, as illustrated by the contrast between the a and the b examples in (32) and (33).

- (31) $\begin{array}{l} \check{\text{a}}\check{\text{s}}\check{\text{a}}\check{\text{f}}\check{\text{a}} \quad \check{\text{a}}\check{\text{m}}\check{\text{e}}\check{\text{d}}\check{\text{u}}\check{\text{b}}\check{\text{e}}\check{\text{r}}\check{\text{e}}\check{\text{t}} \\ \text{the-language the-spoken} \\ \text{'the spoken language'} \end{array}$ $\xrightarrow{\text{opt.}}$ $\begin{array}{l} \check{\text{a}}\check{\text{s}}\check{\text{a}}\check{\text{f}}\check{\text{a}} \quad \check{\text{a}}\check{\text{m}}\check{\text{d}}\check{\text{u}}\check{\text{b}}\check{\text{e}}\check{\text{r}}\check{\text{e}}\check{\text{t}} \end{array}$
- (32) a. $\begin{array}{l} \check{\text{i}} \quad \check{\text{o}}\check{\text{l}}\check{\text{e}}\check{\text{x}}\check{\text{e}}\check{\text{t}} \quad \check{\text{e}}\check{\text{l}}\check{\text{a}}\check{\text{v}} \\ \text{she walks to-him} \end{array}$ $\xrightarrow{\text{opt.}}$ $\begin{array}{l} \check{\text{i}} \quad \check{\text{o}}\check{\text{l}}\check{\text{e}}\check{\text{x}}\check{\text{t}} \quad \check{\text{e}}\check{\text{l}}\check{\text{a}}\check{\text{v}} \quad (=29\text{a}) \end{array}$
- b. $\begin{array}{l} \check{\text{i}} \quad \check{\text{o}}\check{\text{l}}\check{\text{e}}\check{\text{x}}\check{\text{e}}\check{\text{t}} \quad \check{\text{e}}\check{\text{n}}\check{\text{a}} \\ \text{she walks (to)here} \end{array}$ * $\begin{array}{l} \check{\text{i}} \quad \check{\text{o}}\check{\text{l}}\check{\text{e}}\check{\text{x}}\check{\text{t}} \quad \check{\text{e}}\check{\text{n}}\check{\text{a}} \end{array}$
- (33) a. $\begin{array}{l} \check{\text{b}}\check{\text{e}}\check{\text{m}}\check{\text{e}}\check{\text{š}}\check{\text{x}} \quad \check{\text{a}}\check{\text{y}}\check{\text{o}}\check{\text{m}} \\ \text{during the-day} \end{array}$ $\xrightarrow{\text{opt.}}$ $\begin{array}{l} \check{\text{b}}\check{\text{e}}\check{\text{m}}\check{\text{e}}\check{\text{š}}\check{\text{x}} \quad \check{\text{a}}\check{\text{y}}\check{\text{o}}\check{\text{m}} \end{array}$
- b. $\begin{array}{l} \check{\text{b}}\check{\text{e}}\check{\text{m}}\check{\text{e}}\check{\text{š}}\check{\text{x}} \quad \check{\text{a}}\check{\text{š}}\check{\text{a}}\check{\text{n}}\check{\text{a}} \\ \text{during the-year} \end{array}$ * $\begin{array}{l} \check{\text{b}}\check{\text{e}}\check{\text{m}}\check{\text{e}}\check{\text{š}}\check{\text{x}} \quad \check{\text{a}}\check{\text{š}}\check{\text{a}}\check{\text{n}}\check{\text{a}} \end{array}$

The anti-clash constraint which affects e Del is not a global constraint on Hebrew stress patterns. In the same syntactic environments where e Del can't create a clash, stress clashes which are not created by e Del are allowed to surface, as in (34). (Compare (34) with (32b) above.)

- (34) $\begin{array}{l} \text{at} \quad \check{\text{a}}\check{\text{l}}\check{\text{a}}\check{\text{x}}\check{\text{t}} \quad \check{\text{e}}\check{\text{n}}\check{\text{a}} \\ \text{you walked (to)here} \end{array}$ $\begin{array}{l} \text{at} \quad \check{\text{a}}\check{\text{l}}\check{\text{a}}\check{\text{x}}\check{\text{t}} \quad \check{\text{a}}\check{\text{l}}\check{\text{a}} \\ \text{you walked further} \end{array}$

Therefore, the anti-clash constraint can't be a filter on some level of the derivation; such a filter would fail to distinguish between examples like the ones in (34) and examples like * $\check{\text{i}} \quad \check{\text{o}}\check{\text{l}}\check{\text{e}}\check{\text{x}}\check{\text{t}} \quad \check{\text{e}}\check{\text{n}}\check{\text{a}}$ (from (32b)). Similarly, the facts could not be dealt with

by positing an e insertion rule triggered by a stress clash, because such a rule would also fail to make that distinction. (And, moreover, *at áláxét énă/álă is ungrammatical.) In the light of this, it seems that the anti-clash constraint has to be analyzed as a condition on the application of a rule.

4.3 e Deletion and Stress Changes (Data)

As noted in Bolozky (1977), sometimes a stress change makes it possible for e Del to apply and yield a grammatical string. Examples are in (35)-(38) below. e Del cannot apply to the a examples to yield the b examples, because that would create a stress clash, but the c examples, where a stress change has occurred, are fine.

- (35) a. \checkmark / \checkmark / \checkmark / \checkmark /
 ata mevin oti Isolation: ata
 you-sg-masc understand me
- b. *ata mvin oti
- c. / \checkmark / / \checkmark / (shift)
 ata mvin oti (adapted from Bolozky (1977), p. 132)
- (36) a. \ \checkmark / \checkmark / \checkmark / \checkmark /
 mimatay ata mevin oti kol kax tov
 since-when you understand me so well
- Isolation: \checkmark /
 ata
- b. *mimatay ata mvin oti kol kax tov
- c. \ \checkmark / \checkmark / \checkmark / (unstressing)
 mimatay ata mvin oti kol kax tov
- (37) a. \checkmark / \checkmark / \checkmark / / \checkmark / \checkmark /
 ani xozeret ena axar kax Isolation: ena
 I return-fem (to)here afterwards
- b. \checkmark / \checkmark / / \checkmark / \checkmark /
 *ani xozert ena axar kax
- c. \checkmark / \checkmark / \checkmark / \checkmark / (shift)
 ani xozert ena axar kax
- (38) a. \checkmark / \checkmark / \checkmark / / \checkmark / / \checkmark /
 ani xozeret ena texef Isolation: ena
 I return (to)here immediately
- b. \checkmark / \checkmark / / \checkmark / / \checkmark /
 *ani xozert ena texef

c. ani xozert ena texef (unstressing)

A similar pattern arises when e Del "threatens" to create clashes involving secondary stresses, as illustrated in (39) below (an extension of (33b)).

- (39) a. bemešex ašana Isolation: ašana²³
 b. *bemešx ašana
 c. bemešx ašana

4.4 Analysis

Given the analysis of stress changes developed in 3.2 above, the interaction between e Del and stress changes can be accounted for by adding the following two claims: (i) e Del **follows** BBD; (ii) There is a condition on the application of e Del, that it may not create a stress clash, where a clash is defined as in (4), repeated below (i.e., it is the same notion of clash which is relevant to BA). e Del, then, is as in (40).

- (40) e Deletion Delete the vowel e.²⁴ (optional)
 Condition: May not create a stress clash.²⁵
 Domain of application: the Intonational Phrase

- (4) Stress Clash: Two grid columns on adjacent syllables are clashing if and only if they both have second level grid entries.³

I have mentioned three facts about e Del which are not in (40): it follows BBD, it has to result in a syllabifiable string, and it only deletes e's which are phonologically or morphologically predictable. These facts are likely to be derived from independent principles of the grammar. Otherwise, they should be stipulated as additional conditions on the application of e Del. My analysis is illustrated by the following derivations of (35c), (38c) and (39c). As the reader can easily verify, the ordering of BA after e Del is not crucial; being optional, BA could just as well precede e Del.^{26, 27}

- (41) Word domain rules (Demibeat x x x
 Alignment and Main Stress Rule): x x x x x x
 ata mevin oti

The main VP stress rule: x
 x x x
 x x x x x x
 ata mevin oti

BBD: x
 x
 x x x x x x
 ata mevin oti

e Del: x
 x
 x x x x x
 ata mvin oti

BA: x
 x
 x x x x x
 ata mvin oti

(BA can't assign a stress to ta instead, because of the stress on mvin. Of course, e Del didn't **have** to apply, since it is optional. If it hadn't, BA could have assigned a stress to ta, to derive (35a) (áta mévin ótí). BA **would** have done that, in fact, because of the preference for final stress discussed in 3.4 above.)

(42) Word domain rules: x x x x
 x x x x x x x x x
 ani xozeret ena texef

Rules assigning main stresses
 of phrases: x
 x x
 x x x x x x x x x
 ani xozeret ena texef

BBD: x
 x x
 x x
 x x x x x x x x x
 ani xozeret ena texef

e Del: x
 x x
 x x
 x x x x x x x x
 ani xozert ena texef

BA: x
 x x
 x x
 x x x x x x x x
 ani xozert ena texef

(BA can't apply to any of the syllables of ena, and this word remains completely stressless. If e Del hadn't applied, BA could have assigned a stress to e, to derive (38a) (aní xozéret ená texéf).)

	x x
	x x x x x x
(43) Word domain rules:	bemešex ašana
	x x
	x x
Rules assigning main stresses of phrases:	x x x x x x
	bemešex ašana
BBD:	inapplicable
	x x
	x x
e Del:	x x x x x
	bemešx ašana
BA:	inapplicable

(If e Del hadn't applied, BA could have assigned a stress to a, to derive (39a) (bemešex ašana).)

4.5 A Rejected Alternative

Bolozky (1983a) proposes a different account of the interaction between vowel deletion and stress changes. He too has three rules, corresponding to my BA, BBD, and e Del, but his vowel deletion rule precedes the destressing rule, and it is not constrained not to create a stress clash. For example, Bolozky (1983a) derives (35c) as follows (I will use my own terms for the rules). We start with átá mévin óti. e Del (allowed to create a clash!) gives átá mvin óti. Then, BBD gives átá mvin óti, and, finally, BA gives átá mvin óti. The surface form can't contain a clash, because the clash avoiding BA cannot assign a stress to ta.

The account of Bolozky (1983a) doesn't work for cases where e Del results in a clash between two main word stresses which can't be destressed. For example, it fails to rule out (44b).

(44) a.	v /	v /	v /	b.	v /	/	v /
	axi	mevin	oti		*axi	mvin	oti
	my-brother understands me						

Examples like (44) show that it is impossible to get away with referring to a stress clash only in the description of BA, as Bolozky has tried to do.

Is it possible to retain the rule ordering of Bolozky (1983a) and say that e Del may create a clash (in its immediate

output), provided that the clash is eliminated later in the derivation? Yes, but it would mean that the stress condition on e Del is a constraint which involves more than one level of the derivation.

My analysis, where e Del may not create a stress clash, succeeds in ruling out (44b), without positing an undesirable constraint: The source for (44b) would have been (44a), and neither of BBD, BA and e Del can apply to axi and mevin in this form (the stresses on xi and vin being too strong to undergo BBD). Of course, if e Del may not create a stress clash, it must follow BBD (otherwise, stress changes could not enable e Del to apply).

FOOTNOTES

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¹I partly disagree with Bolozky (1982) about the available patterns. See Kadmon (1983) for more detail. I am still convinced that sequences of three **completely** stressless syllables (equally low in prominence) do occur, a claim disputed in Bolozky (1983c).

²The diacritics, in (1) and throughout this paper, mark relative prominence in the word, rather than in a larger domain. I am using hyphens to indicate the prefixes.

³Basic beats on two syllables separated by several word and phrase boundaries, but not an Intonational Phrase boundary, should count as clashing, since BA can't create such sequences of basic beats. (I am using 'boundaries' metaphorically.) If there are silent demibeats at the boundaries (see Selkirk (1983)), BA ignores them. Therefore, if disjuncture in Hebrew should be represented on the grid by silent demibeats (maybe it shouldn't), then the definition of a clash has to refer to adjacency on the string of syllables, and not on the grid. See discussion and data in Kadmon (1983).

⁴The requirement that BA not undo the effect of the Main Stress Rule should follow from some version of the universal Textual Prominence Preservation Condition of Selkirk (1983).

⁵Bolozky's reason is that he wishes to avoid derivations where secondary stresses are assigned, then destressed, and then assigned back again at the same place and by the same rule. I think there is nothing a priori wrong with this kind of

not a Grid Euphony rule. Either the class of destressing rules should be extended to include rules like the Hebrew BA, or else the Hebrew BA is a post cyclic rule.

¹⁵I know of two factors which strengthen primary stresses (to three or more grid levels): the rules assigning the main prominences in phrases (like the VP rule mentioned in section 2), and the rule or convention assigning high prominence to syllables carrying a pitch accent. (The latter explains the fact (noted by Bolozky) that emphatically stressed ("highlighted") function words, i.e., function words with a pitch accent, cannot undergo stress changes.) Further research is needed in order to determine whether more factors are involved in strengthening the stresses which can't undergo a stress change.

¹⁶The columns of three or more grid entries might end up higher than indicated, depending on the way main phrasal stresses are assigned.

¹⁷Note that it is impossible to say instead that primary stresses which can undergo stress changes come out of the word cycle weaker than other primary stresses, since there is no syntactically or morphologically definable class of words which rule(s) applying on the word domain could recognize as the class of words that are to be assigned weaker stresses.

¹⁸In 3.3 below, I give examples of main stresses of function words undergoing a stress change although a failure to do so would not result in a stress clash. Bolozky (1983c) claims that main stresses of normal ("lexical") words are different, in that they only undergo stress changes under clash. I disagree with this claim. I find Bolozky's examples of such stresses undergoing a stress change **not** under clash (assigned two question-marks by him) just as good as the examples of these stresses undergoing a stress change under clash. Therefore, I think there should be a unified account of the stress changes applying to all stresses.

¹⁹In other positions where function words undergo stress changes, there isn't a normal word to compare to. For example, lánú, the function word indirect object of u irbíc lánú, undergoes a stress shift, but any "lexical" indirect object would be preceded either by a full preposition or by a prefixal one. In the first case, it would not be in the same position as lanu, and could not be contrasted with it. In the second case, there wouldn't be any stress to undergo a stress shift, since prefixes don't have lexical stress.

²⁰There are some dialectal variations here. I am referring to my own dialect, which, I am told, is typical of speakers from Tel-Aviv.

²¹See Bolozky (1983b) for an extensive discussion of which e's are the "predictable" ones, that may be deleted.

²²Bolozky (1977) assumes that e Del yields a neatly alternating stress pattern, but Bolozky (1983a,b) agrees with me that it can yield less regular patterns as well, as long as it doesn't create a stress clash.

²³If this is the only isolation pattern, (39c) is a case of "unstressing". See fn.9.

²⁴For all I know, the grid column of the syllable which contains the deleted e (a syllable which is eliminated by e Del) remains in the grid and has no phonetic effect. If a clash is defined in terms of syllable adjacency (see fn.3), the syllable-less column would be irrelevant to stress clashes.

Or, the grid column might disappear because of some convention. This is particularly plausible if Hebrew doesn't have silent demibeats (see fn.3).

An alternative formulation of the rule of e Del would have it delete a grid column, instead of deleting a vowel. In that case, there might be a convention which gets rid of the "naked" e after it has lost its grid column. (If the convention applies only to e, that could explain why other vowels are not affected - deleting their grid column would result in an ill formed representation containing a naked vowel.) The rule would then be a stress rule. Formulating e Del as a stress rule was suggested to me by Scott Myers, and, independently, by Junko Ito and Armin Mester.

I am not convinced that this formulation has any real advantages. One might argue that it is desirable to exclude segmental rules which affect grid structure. But if the grid column of the deleted e remains, then e Del does not affect grid structure. As for excluding conditions on segmental rules which make reference to grid structure, that is not generally possible. There are segmental rules other than the Hebrew e Del which are sensitive to stress (e.g., the English vowel reduction).

²⁵Or, equivalently: May not delete an e from the second
 x x
 x x x
 syllable in the configuration $\sigma \sigma \sigma$.

²⁶In an earlier version of this paper, I have claimed that BA precedes e Del. I am grateful to an anonymous UMOP reviewer and to Bolozky (1983c) for pointing out to me that that was not a necessary assumption.

Bolozky (1983c) argues that there are reasons to order BA after e Del, but I believe that his arguments are inconclusive.

²⁷As usual, some of the columns with a third level grid entry may be higher than indicated. (See fn.16.)

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