TRUE TRUNCATION IN COLLOQUIAL HEBREW IMPERATIVES

OUTI BAT-EL

Tel Aviv University

There are two types of truncation that yield shortening of a morphological constituent, FAKE TRUNCATION (templatic) and TRUE TRUNCATION (a-templatic, subtractive). This article provides an analysis of true truncation in colloquial Hebrew imperatives. It is shown that true truncation cannot target a designated phonological unit, since in some forms CV is truncated and in others only V. In addition, there are cases where truncation is blocked. The framework of optimality theory adopted here allows a unified account of the data in terms of constraint interaction. It is argued that an antifaithfulness truncation constraint, which must be morphological, interacts with both faithfulness and markedness constraints. Truncation is minimized to one segment by a general antideletion faithfulness constraint, but markedness constraints may impose truncation of more than one segment. There are cases where truncation is blocked, which suggests that the truncation constraint is violable. The discussion includes regular and irregular verbs and instances of free variation.*

1. THE ISSUES. The term TRUE TRUNCATION refers here to a direct requirement of truncation in the derivation of one lexical category from another. It differs from FAKE TRUNCATION, whereby truncation is a byproduct of the imposition of templatic constraints. This article is concerned with truncated imperatives in colloquial Hebrew (hereafter TIs), which are a case of true truncation.[1]

A TI is shorter than its future base in that one or two segments are truncated from the 2nd person future prefix. The truncated material is not a morphological unit since in some cases it consists of only part of the prefix. In *ti-ʃmor/ʃmor* 'to guard.FUT/TI' the entire prefix is truncated, but in *te-xapes/txapes* 'to search.FUT/TI' only V is truncated out of the CV prefix. These examples also show that the truncated material is not a designated phonological unit, as in some cases V is truncated and in others CV. These facts are rather surprising considering documented cases of true (nontemplatic) truncation, such as Tohono O'odham perfectives, Danish imperatives, and Koasati plurals, where the truncated material seems to be a designated phonological unit. In addition to the variable truncated material, there are cases where truncation is blocked, as in *tirkod* 'to dance.FUT' and *tagdil* 'to enlarge.FUT', which are used for both future and the imperative.[2]

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[1] Hebrew at its current stage has three ways to denote imperative: (i) with the normative form, as in *ptax/pitxi* 'open! M.SG/F.SG', (ii) with the 2nd person future form, as in *tiftax/tiftexi*, and (iii) with the truncated form of the future, as in *ftax/ftexi*. The latter two are found in colloquial Hebrew in free variation. Assuming that free variation is often not entirely free, the context of these variants must be investigated either within a discourse framework or in the context of phrasal phonology. In this article I abstract away from phrasal effects and consider only TIs in isolation (see, however, §4 for free variation among the TIs).

[2] Throughout this article the future verb (FUT) is given in its 2nd person masculine singular form, unless otherwise specified. The past verb is given in its 3rd person masculine singular form, which is also used as a citation form. Stress is marked when not final and when relevant for the discussion; nonmarked stress is final.

It is necessary to question the motivation behind truncation. Clearly, truncation cannot be expressed in a purely phonological fashion, as it affects only a specific morphological category and the size of the truncated material varies. Truncation does not act like the familiar morphological processes, which usually add segmental material (with the exception of conversion, where nothing is added or deleted).

I argue that truncation is imposed by a morphological constraint (TRUNCATION), and thus deletion is an inherent requirement of the constraint. TRUNCATION does not limit the truncated material to a designated phonological unit; it just states that 'not every segment in the input has a correspondent in the output'. This statement is the negative expression of the faithfulness constraint MAXSEG, thus reflecting the inherent antifaithfulness of the constraint. Antifaithfulness constraints have been proposed in Alderete 1998 and 2001 to account for morphophonological alternations, and the analysis of true truncation provides further empirical support for the theory developed in these studies (see also Horwood 2001). I also suggest that TRUNCATION is a universal constraint, active in every language exhibiting true truncation (regardless of the size of the truncated material). The phonological shape of the output, and thus of the truncated material, is determined by the interaction of TRUNCATION with other constraints and thus can vary. MAXSEG, the faithfulness counterpart of TRUNCATION, minimizes truncation to one segment, as truncation of two segments satisfies TRUNCATION as much as truncation of one segment but has more violations of MAXSEG. Therefore the TI of *tiʃava* 'to swear.FUT' is *tʃava* (V truncation) rather than **ʃava* (CV truncation). Markedness constraints, when ranked above MAXSEG, may force truncation of two segments in cases where truncation of one segment violates some restrictions on surface representation. Therefore the TI of *tiftax* 'to open.FUT' is *ftax* (CV truncation), rather than **tftax* (V truncation), since the latter has an impermissible triconsonantal onset (see also Gafos 1998 and Kurisu 2001 for variability in morphologically conditioned processes).

Constraint interaction of this sort is at the core of optimality theory (Prince & Smolensky 1993, McCarthy & Prince 1993). The target within such a framework is not the structural description specifying the phonological elements affected by a process, but rather the structural change evaluated against the constraints. The analysis of imperative truncation developed in this article accounts not only for all cases where truncation applies but also for those where truncation is blocked (see Alderete 1998, 2001 for other cases of blocking effects). The latter cases provide evidence that the process of truncation is imposed by a violable constraint. For example, while Hebrew usually rescues impermissible clusters by epenthesis, the dominance of the base-TI faithfulness requires DEP (anti-epenthesis) to outrank TRUNCATION such that the latter is violated by the optimal candidate. Impermissible clusters in TIs cannot be amended by epenthesis, and therefore truncation is blocked. Therefore *tirkod* 'to dance.FUT' does not have a corresponding TI, since **rkod* violated the SONORITY SEQUENCING GENERALIZATION, and **rekod* violates DEP. Beyond the cases where truncation applies and does not apply, there are instances of free variation and a few cases that seem to require reference to two bases.

2. WHAT IS TRUNCATION? A phonological alternation may function as the sole cue for morphological relations (Matthews 1974, Anderson & Browne 1973, Anderson 1992; see review in Spencer 1998). For example, alternation in the position of stress expresses noun-verb relation in some English words (e.g. *cónvict*/*convíct*) and masculine-feminine relation in some nouns in the Cushitic languages Rendille (e.g. *ínam* 'boy'/*inám* 'girl'; Oomen 1981) and Afar (e.g. *dúmmu*/*dummú* 'cat.M/F'; Bliese 1981).

Similarly, vocalic alternation expresses the present-past relation in some English verbs (e.g. *sing*/*sang*) and relations between verbal classes (binyanim) in Hebrew (e.g. *gadal* 'to grow'/*gidel* 'to raise'). Apophony (or ablaut, in diachronic alternation) is the term used for morphologically conditioned vocalic alternation, and truncation is the one used for morphologically conditioned deletion (there is no term for morphologically conditioned stress shift).

As Martin 1988 and Weeda 1992 emphasize, there are two types of truncation, which I refer to here as true and fake truncation.[3]

(1) a. TRUE TRUNCATION is deletion of segmental material directly required for the derivation of one lexical category from another.
b. FAKE TRUNCATION is deletion of segmental material required by the imposition of a template.

While both types of truncation are involved in deriving words, true truncation is morphologically motivated while fake truncation is phonologically (prosodically) motivated. True truncation is a morphological application whose output does not have to fit into a specific template. The discussion below provides examples for each type of truncation.

2.1. FAKE TRUNCATION. In fake truncation, deletion of segmental material is a byproduct of the imposition of prosodic constraints. This type of deletion often falls within the category of stray erasure (Steriade 1982, Itô 1986), whereby segments not dominated by a prosodic unit are eliminated. The exclusion of a segment from a prosodic unit can be due to various prosodic constraints. For example, as argued in Itô 1986, Diola Fogny (West Africa) does not allow complex syllable margins or a coda consonant with an independent place of articulation (the coda condition); only homorganic hetrosyllabic sonorant-consonant clusters are possible in word-medial position (N_iN_i, N_iC_i, *lt*, and *rt*). Therefore the *k* in /ujuk-ja/ 'if you see' cannot be syllabified as a coda (**u.juk.ja*), nor as an onset (**u.ju.kja*), and since it is not dominated by a prosodic unit, it is eliminated by stray erasure. Similarly, segments that do not fit into the prosodic unit imposed by the constraints are eliminated in fake truncation.

Fake truncation is commonly found in hypocoristics, which have a fixed prosodic pattern sometimes accompanied by an affix. The data in 2 exhibit the most common pattern of hypocoristics in Hebrew.[4]

[3] See Weeda 1992 for an extensive study of truncation, and Stonham 1994 for a combinatorial approach to truncation and other morpholexical phenomena. The term truncation is used in Aronoff 1976 to account for the relation between forms such as *nominate*/*nominee* where the suffix *-ate* does not appear when *-ee* is added. Based on such cases Aronoff defines truncation as a rule that 'deletes a morpheme which is internal to an affix' (p. 88). The treatment of this phenomenon as truncation has been forced by the word-based theory according to which words are derived from words. More recently Aronoff (1994) withdraws from the word-based view in favor of a lexeme-base view. Within the latter view there is no truncation in *nominate*/*nominee* since *nominee* is derived directly from the lexeme /nomin-/.

[4] There are other, less common, patterns of hypocoristics, which may employ the suffix and/or the template, as well as reduplication: (i) suffix only (*mixál*/*mixáli*); (ii) template and reduplication (*dorón*/*dódo*); (iii) template, reduplication, and suffix (*ʃlómo*/*momo*); and (iv) template only (*ʃoʃána*/*ʃoʃ*). In many cases the same name can appear in several patterns (*ʃoʃána*/*ʃoʃ*/*ʃóʃi*), and if it cannot appear in a particular pattern (**ʃoʃáni*) there must be some phonological reason. When the full name is monosyllabic, as in *gad*, its hypocoristic *gadi* fits under the pattern in 2 as well as the suffix-only-pattern (i). The full names are marked for stress according to the colloquial register, abstracting away from the variation across, and sometimes within, registers.

(2) Hebrew hypocoristics: trochaic syllabic foot ending in *i*

FULL NAME	HYPOCORISTIC
gád	gádi
ʃúla	ʃúli
tíkva	tíki
símxa	símі
málka	máli
tamár	támi
smadár	smádi
t͡sipóra	t͡sípi
jasmín	jási
menáxem	méni

Evidence for truncation being a byproduct in such cases can be drawn from hypocoristics where segmental material is 'added' rather than deleted. In 3 the full name provides the hypocoristic with a CV syllable only, and since this syllable does not satisfy the prosodic template, segmental material is added via reduplication; in 3a the initial syllable of the full name is ignored because it is unstressed with a glottal in the onset, and in 3b the selection of only one syllable from the name allows a larger variety of hypocoristics.

(3) Hebrew hypocoristics with added segmental material

a. Trochaic syllabic foot ending in *i*

FULL NAME	HYPOCORISTIC
ʔadí	dídi
hilá	láli
ʔiláj	lájli

b. Trochaic syllabic foot

FULL NAME	HYPOCORISTIC
dorón	dódo (also dóri)
rút	rúru (more often rúti)
ʃlómo	mómo (also ʃlómi, mómi)

Japanese hypocoristics (Poser 1990, Mester 1990), whose form is a moraic foot plus the suffix *-tjan*, exhibit the same behavior. In most cases segmental material is truncated (*akira*/*ak-tjan*), in some segmental material is added (*ti*/*titj-tjan*/*tii-tjan*), and in others segmental material is neither added nor deleted (*gen*/*gen-tjan*).[5]

To conclude, truncation is not the target in fake truncation but rather the process involved in reaching the target; the target is to satisfy the prosodic constraints on the output. This target is satisfied more often by truncation (when the input is longer than the template, as is usually the case) but also by addition (when the input is shorter than the template), or neither.

2.2. TRUE TRUNCATION. In true truncation the target is truncation, such that at least one segment is truncated from the base. True truncation is thus phonologically antifaithful, and the purpose of this antifaithfulness is to encode a contrast between two morphological categories (see Alderete 1998, 2001 for an extended discussion on the function of antifaithfulness constraints in morphologically conditioned accent shift). Three examples of true truncation are reviewed below.

In Tohono O'odham, an Uto-Aztecan language spoken in Arizona (formerly known as Papago), the perfective can be derived from the imperfective by truncating the final consonant of the imperfective (Zepeda 1983). As pointed out in Anderson 1992, when

[5] Fake truncation can also be observed in (word-based) Semitic-type templatic morphology, where deletion is sometimes required to meet templatic restriction (Bat-El 1994, 1995).

the imperfective ends in a vowel, the imperfective and perfective are identical (the last three examples in 4).

(4) Tohono O'odham imperfective-perfective verbs: truncate the final consonant

IMPERFECTIVE	PERFECTIVE	
pisalt	pisal	'to weigh'
gatwid	gatwi	'to shoot'
heʔedkad	heʔedka	'to smile'
hehem	hehe	'to laugh'
hi:nk	hi:n	'to bark'
golon	golo	'to rake'
huksan	huksa	'to scratch'
cicwi	cicwi	'to play'
wacwi	wacwi	'to bathe'
ceggia	ceggia	'to fight'

The truncated material in Tohono O'odham is limited to one consonant. The variable segmental content of the consonant does not afford analyzing the imperfective-perfective relation in terms of suffixation; that is, it cannot be the case that the imperfective is formed from the perfective by adding a consonant. And if this were the case we would not expect to find imperfectives ending in a vowel.

In Koasati, a Muskogean language spoken in the southeastern United States, there is a group of verbs that encode their singular-plural relation by truncating the final root consonant (Martin 1988, based on data from Kimball 1994). Coda truncation is accompanied by compensatory lengthening of the vowel, which could be linked to a constraint requiring roots to end in a heavy syllable.

(5) Koasati singular-plural verbs: truncate final consonant of the root

SINGULAR	PLURAL	
famot-ka-n	famo:-ka-n	'to wave'
yicof-ka-n	yico:-ka-n	'to shrivel'
ficap-li-n	fica:-li-n	'to warp'
asipat-li-n	asipa:-li-n	'to get a splinter'
akapos-ka-n	akapo:-ka-n	'to be pinched'
asikop-li-n	asiko:-li-n	'to breathe'

Unlike in Tohono O'odham (4), where the output is prosodically shorter than the input, in Koasati (5) the output and the input are prosodically identical. Nevertheless, Koasati exhibits truncation since the final root consonant in the singular does not surface in the plural.

Another group of verbs in Koasati expresses its singular-plural relation by truncating the final rhyme of the root, whether it is VC or V: (see Martin 1994 for the historical relation between the two groups). In this case the plural form is prosodically shorter than the singular.

(6) Koasati singular-plural verbs: truncate final rhyme of the root

SINGULAR	PLURAL	
tipás-li-n	típ-li-n	'to pick something off'
latáf-ka-n	lát-ka-n	'to kick something'
misíp-li-n	mís-li-n	'to wink'
fotóp-ka-n	fót-ka-n	'to pull up something'
simát-li-n	sím-mi-n	'to cut up tanned skin'
icoktaká:-li-n	icokták-li-n	'to open one's mouth'
apołó:-ka-n	apół-ka-n	'to sleep with someone'
atiní:-li-n	atín-ni-n	'to burn something'

The final example of true truncation is drawn from the Danish infinitive-imperative relation. Following Anderson 1975, Danish imperatives are formed by truncating the final schwa from the infinitive.

(7) Danish infinitive-imperative: truncate final schwa

	ROOT	NOUN		INFINITIVE	IMPERATIVE	
a.	/spill/	spilʔ	'waste'	spillə	spilʔ	'to waste'
b.	/mæ:s/	mæʔs	'bother'	mæ:sə	mæʔs	'to toil'
c.	/spel/	spel	'game'	spellə	spelʔ	'to play'
d.	/bæð/	bæð	'bath'	bæ:ðə	bæʔð	'to bathe'

Danish imperatives cannot be derived directly from the root due to the presence of the stød, 'a glottal stop which may be realized as laryngeal voicing' (Anderson 1975:48). The glottal stop appears in a final accented syllable containing a long vowel or a long postvocalic sonorant. In 7a and b the root contains a long sonorant segment, as is evident from the stød in the noun forms. The imperative in these forms could thus be derived directly from the root. In 7c and d, however, the sonorant segment in the root is short, as there is no stød in the corresponding nouns, and the appearance of a stød in the imperative is thus unexpected. But a base with a long sonorant segment is provided by the infinitive, where the addition of the schwa suffix allows lengthening of the preceding sonorant segment. Anderson thus argues that the imperative is derived directly from the infinitive by truncating the final schwa. When the schwa is truncated, the long sonorant segment is in a final accented syllable, allowing the stød to surface (*spel-ə*—Lengthening→ *spell-ə*—Truncation→ *spell*—Stød→ *spelʔ*).[6] The observation on which Anderson's analysis relies is that a phonological property found in the truncated form can be conditioned by a phonological context appearing in the input but not in the output. The same is true for various cases of truncation, as argued in Benua 1995 and 1997.

The discussion above may suggest that the property that distinguishes fake from true truncation is the designated unit: in true truncation the truncated material is phonologically defined while in fake truncation the output is phonologically defined. In this article I show that this distinctive property just happens to be true for the above mentioned languages. Colloquial Hebrew TIs do not exhibit any of these properties, as neither the truncated material nor the output is phonologically defined. Therefore, neither imposition of an output template nor reference to a phonologically (or morphologically) specified unit in the input allows a unified analysis of truncation. Nevertheless I argue that imperative truncation in colloquial Hebrew is a case of true truncation.

2.3. IMPERATIVE TRUNCATION: A CASE OF TRUE TRUNCATION. The patterns in Table 1 below show that the paradigm of imperative truncation in colloquial Hebrew does not exhibit either a designated truncated unit or an output template (see §5 for cases of free variation). The column specifying the output patterns reveals that the TIs do not share a common prosodic template and therefore cannot be a case of fake truncation as defined above. The column specifying the truncated material shows that the truncated material is not phonologically defined; there are cases where one segment is truncated

[6] The fact that the truncated material in Danish is always a schwa is just a coincidence. There are a few infinitives ending in a vowel other than a schwa that do not undergo truncation, and the imperative is thus identical to the infinitive (Thanks to the subscribers of the Linguist List for providing me with these data). Most of them are monosyllabic (*se* 'to see') or disyllabic where the first syllable is a prefix (*befri* 'to free'); in either case the final syllable is stressed. Thus, only final unstressed vowels are truncated in Danish, and only the schwa meets this condition (see §6).

	FUTURE	TI	TRUNCATED MATERIAL	OUTPUT PATTERN	
a.	te.-la.med	tla.med	V	CCVCVC	'to teach'
b.	ta.-kum	kum	CV	CVC	'to get up'
c.	ti-f.tax	ftax	CV	CCVC	'to open'

TABLE 1. Imperative truncation patterns in colloquial Hebrew.

and others where two segments are truncated. Unlike Koasati's rhyme truncation (6), it is impossible to refer to these two types of truncated material as one prosodic unit in the base; in *telamed/tlamed* (Table 1a) the truncated material is a vowel, in *takum/kum* (Table 1b) it is a syllable, and in *tiftax/ftax* (Table 1c) it is neither a vowel nor a syllable in the base (the syllabification *tif.tax* reflects the rarity of medial complex onsets in Hebrew as well as native speakers' intuition).

One could propose that imperative truncation targets the leftmost syllable node of the base, where further constraints may limit the reassociation of the consonants of this syllable. This would amount to variation among languages with respect to the designated truncated material (consonant in Tohono O'odham, syllable in Hebrew, consonant or rhyme in Koasati). Under this account, however, the fact that no language truncates a large unit like a syllabic foot would be rather surprising. Intuitively truncation should be minimal in order to allow maximal structural transparency between the base and the output, and a syllabic foot is a rather large unit. But if truncation targets phonological units, the exclusion of a syllabic foot from the inventory of the units would be formally ad hoc.

I thus argue that imperative truncation is a case of true truncation and that true truncation is accomplished via a morphological constraint. The relevant constraint does not specify a designated truncated material and is thus in force in all languages exhibiting true truncation. This constraint is antifaithful and its effect is minimized by its faithfulness counterpart; therefore, it is quite unlikely that a foot would be truncated. The variation among and within languages with respect to the truncated material is due to the position of this constraint within the language-particular constraint ranking.

3. IMPERATIVE TRUNCATION. The phenomenon discussed in this article is a case of output-output correspondence (Benua 1995, 1997), where the base is the 2nd person future form and the output is the imperative form (Bolozky 1979). Evidence for this relation can be drawn from the data in Table 2, where the TIs are also compared with the normative imperatives (NIs).[7]

The 2nd person future forms and their corresponding TIs exhibit two types of identity effect. The first involves the initial fricative in TIs like *ftax* 'open!' and *vrax* 'run

[7] Imperatives in normative Hebrew (NH) are almost identical to those in Tiberian Hebrew (TH), where the crucial difference between the languages, independent of imperatives, is the loss of length distinction (e.g. TH *dabber*/NH *daber* 'talk!', TH *baaʔer*/NH *baʔer* 'explain!'). Also, TH schwa appears as *e* or zero in NH, depending on the phonological context (TH *rəmos*/NH *remos* 'destroy!', TH *ʃəmor*/NH *ʃmor* 'guard!'). One may question whether NH is a natural language. First, most (if not all) speakers of NH adopt most of its characteristics in their postacquisitional stage. Second, NH comprises rules of TH imposed on speech of Modern Hebrew, where the phonology of the latter is significantly different from that of the former. But reference to NH is often relevant since most speakers have access to some but not all aspects of this language, and quite a few make an effort to adopt (not always successfully) some of its surface properties and lexical items. At the current stage of Hebrew there is a great degree of overlap between the normative and colloquial registers, but speakers can identify the register on the basis of the form of the words (as well as the lexicon and the syntax). Relevant for the present article is the fact that quite a few TIs are strictly colloquial, while others appear in both registers.

		2SG.M			2SG.F[a]		
	FUTURE	TI	NI	FUTURE	TI	NI	
B-I	ti-ftax	ftax	ptax	ti-ftexi	ftexi	pitxi	'to open'
B-II	ti-kanes	tkans	hi-kanes	ti-kansi	tkansi	hi-kansi	'to enter'
B-III	t-axnis	—	h-axnes	t-axnísi	—	h-axnísi	'to put in'
B-IV	te-gadel	tgadel	gadel	te-gadli	tgadli	gadli	'to raise'
B-V	tit-karev	tkarev	hit-karev	tit-karvi	tkarvi	hit-karvi	'to approach'

TABLE 2. Truncated and normative imperatives.

[a] The 2nd person plural form, whose suffix is *-u*, behaves exactly like the 2nd person feminine singular (e.g. *tiftexu*/*ftexu* 'to open.PL.FUT/TI').

away!'. The initial fricative cannot be drawn from the phonology of the language since such verbs have an alternating paradigm where a stop appears in word-initial position and a fricative in postvocalic position (e.g. *patax*/*tiftax* 'to open.PAST/FUT', *barax*/*tivrax* 'to run away.PAST/FUT'). Therefore it must be the case that the fricative in the TI is taken from the corresponding future base, where it arises via spirantization due to the preceding vowel.[8] The other identity effect involves the initial *t* in TIs like *tgadel* 'raise!' and *tkanes* 'enter!'. This *t* must also be drawn directly from the corresponding future form since there are no verbal prefixes in Hebrew that form a complex onset with the stem-initial consonant; all verbal prefixes are followed by a vowel, and therefore the *t* cannot be an imperative prefix. This is, indeed, weaker evidence, since the imperatives could be an exceptional case. Given the other evidence, however, exceptionality need not be assumed. Notice also that the normative imperatives (NIs) do not have an initial fricative or an initial *t*, but three of them have prefixes (like their corresponding past forms). In addition, the feminine NI in B-I is prosodically different from its corresponding stem in the future base, while the feminine TI is identical. On the basis of these identity effects Bolozky (1979) concludes that the 2nd person future form serves as a base for the TI.

Although the base of the TI is a fully specified surface form, the distinction between 'base' and 'stem' is crucial for the following analysis. BASE refers here to the future form, which serves as an input, including the future prefix. STEM refers to the future form without the prefix (the gender and number suffixes, *-i* for feminine and *-u* for plural, are not relevant for this distinction since the right edge of the base is not targeted by truncation). Thus, *ti-gdal* 'to grow.FUT' is a base whose stem is *gdal*.

3.1. TRUNCATION VIA AN ANTIFAITHFULNESS CONSTRAINT. Any type of segmental deletion violates the faithfulness constraint MAXSEG ('every segment in the input has a correspondent in the output', McCarthy & Prince 1995, Zoll 1996). In phonological deletion there must be some markedness constraint forcing deletion, where the ranking is MARKEDNESS ≫ FAITHFULNESS. For example, when a vowel is deleted in a two-sided open syllable (VC__CV) the constraint forcing deletion, *LL ('two adjacent light syllables are prohibited'), is crucially ranked above MAXV ('every vowel in the input has a correspondent in the output').

[8] Word-initial *f*, *v*, and *x* can be found only where there is not alternation; *f* and *v* appear mostly in loanwords (*festival* 'festival', *fílim* 'camera film'), and *x* in words with a historical *ħ*. That is, *f*, *v*, and *x* are also phonemes in the language (see Bolozky 1972). Some speakers exhibit word-initial fricatives in native verb forms other than TIs (*vikeʃ* 'to request'; normative *bikeʃ*). Such speakers have a fricative throughout the paradigm and therefore their speech is not indicative for the present argument. Evidence is drawn from speakers whose verb paradigm exhibits stop-fricative alternation (see Adam 2002 for a detailed discussion on the variation in Modern Hebrew spirantization).

In true truncation, which is a morphological deletion, there is no markedness constraint that forces deletion. There is no constraint referring to syllable structure that can enforce deletion, since all future forms have a simple onset and there is no possible markedness constraint requiring a complex onset (since a complex onset is a marked structure). There is also no constraint referring to the number of syllables in the output, since, as noted earlier, truncation results in a monosyllabic output when the base is disyllabic (*tiftax/ftax* 'to open.FUT/TI'), and in a disyllabic output when the base is trisyllabic (*titbajeʃ/tbajeʃ* 'to be ashamed.FUT/TI'). What would then be the triggering constraint? I claim that in any morphological phenomenon the trigger is inherent in the relevant morphological constraint. That is, the morphological constraint imposing truncation is the one that requires deletion, and therefore a morphological constraint is inherently antifaithful. This argument has been made in Alderete 1998 and 2001 for various cases of morphophonological alternations (see also Bat-El 2000).

The logic behind this proposal lies in the function of morphological constraints and morphology in general. The purpose of morphology is to create a contrast between lexical categories, and therefore a morphological constraint requires the output to be phonologically distinct from the input. Affixation, the most common way to encode morphological contrast, is also antifaithful since it adds phonological material to the input and thus violates DEP ('every segment in the output has a correspondent in the input'). The view of affixation as constraint driven is argued for in Russell 1995, 1999; see also Yip 1998 and Adam & Bat-El 2000. This view of morphology is compatible with the item-and-process model of morphology, where morphological phenomena are viewed as processes rather than items (see Hockett 1954, Matthews 1974, and Anderson 1992 for item-and-process vs. item-and-arrangement). Such an approach is necessary when two affixes compete for the same position, as shown in Anderson 1995, where the position of clitics is determined by clitic-positioning constraints. Anderson's approach follows his earlier treatment (within a rule-based approach) of 'morphological material as represented by relations (between word forms) or processes (by which one word form can be constructed from another' (Anderson 1992:62).

Following Alderete 1998 and 2001, morphological constraints are stated as the negative expression of their phonological faithfulness counterparts; faithfulness constraints require the preservation of phonological structure, and antifaithfulness constraints require some change. Since MAXSEG states that 'every segment in the input/base has a correspondence in the output', TRUNCATION is anti-MAX and therefore states the following (likewise, ablaut would be anti-IDENT(F) and morphologically conditioned stress shift would be anti-FAITHHEAD, etc.):

(8) TRUNCATION: NOT every segment in the input/base has a correspondent in the output
(i.e. there is at least one segment in the input/base that does not appear in the output).

What is crucial in this statement is that it does not specify the number of the truncated segments and thus does not limit truncation to one segment. Therefore all cases of true truncation are due to the force of this general constraint (where the relevant lexical category is specified for each particular case). Following 8, truncation of one segment suffices to satisfy TRUNCATION and at the same time to minimally violate its lower-ranked faithfulness counterpart MAXSEG.

3.2. THE ANALYSIS. An analysis of almost any morphophonological phenomenon in Hebrew is forced to isolate the regular verbs from the irregular ones. Due to the (often

historical) loss of one of the consonants, irregular verbs have a CVC stem in at least one of the forms in the paradigm. Regular verb stems are usually disyllabic, with the exception of B-I future and B-II past forms whose stems are CCVC.[9]

	PAST (3M.SG)	FUTURE (2M.SG)	
REGULAR VERBS	gadal	ti-gdal	'to grow'
	gidel	te-gadel	'to raise'
IRREGULAR VERBS	lakax	ti-kax	'to take'
	kam	ta-kum	'to get up'

TABLE 3. Regular vs. irregular verbs.

In all morphophonological aspects regular verbs are relatively consistent while irregular verbs exhibit various types of abnormality that are often synchronically opaque. As shown below, also in the analysis of imperative truncation, irregular verbs require constraints whose effect does not emerge in regular verbs.

REGULAR VERBS. The examples in Table 4 show that when the first syllable of the future base is CVC, the left most CV is truncated (notice that the prefix is CV or CVC).

MASCULINE		FEMININE		
FUTURE	TI	FUTURE	TI	
ti-t.for	tfor	ti-t.fe.ri	tferi	'to saw'
ti-g.zor	gzor	ti-g.ze.ri	gzeri	'to cut'
ti-v.rax	vrax	ti-v.re.xi	vrexi	'to run away'
ti-f.tax	ftax	ti-f.te.xi	ftexi	'to open'
ti-x.tov	xtov	ti-x.te.vi	xtevi	'to write'
tit.-paʃet	tpaʃet	tit.-paʃ.ti	tpaʃti	'to undress'
tit.-karev	tkarev	tit.-kar.vi	tkarvi	'to approach'
tit.-labeʃ	tlabeʃ	tit.-lab.ʃi	tlabʃi	'to dress'

TABLE 4. CV truncation.

Truncation is imposed by the universal constraint TRUNCATION (8), specified for the relevant category (thus IMPERATIVE TRUNCATION).

(9) IMPERATIVE TRUNCATION (IMPTRUNC): Not every segment in the Future base (input) has a correspondent in the TI (output).

Since the future base begins with a CVC syllable, truncation of just a V would result in an impermissible triconsonantal onset. This representation is ruled out by the constraint in 10.

(10) *[$_{\sigma}$CCC: A syllable does not have a triconsonantal onset.

Truncation of C only would result in an onsetless syllable. As all Hebrew verb forms begin with a consonant (though a glottal is often deleted), the familiar ONSET constraint must be in force.

(11) ONSET: A syllable has an onset.

The three constraints given above outrank the faithfulness constraint MAXSEG, which penalizes for every deleted segment and thus minimizes the effect of truncation.

(12) MAX SEGMENT (MAXSEG): Every segment in the input/base has a correspondent in the output.

[9] Some verbs lack a final stem consonant (*tikne* 'to buy.FUT', *tet͡se* 'to go out.FUT'). The absence of a stem-final consonant is not relevant to the present discussion since truncation does not affect the right edge of the base. Thus, *tikne* (*kana* 'PAST') is considered here regular, like *tigdal*, and *tece* (*yat͡sa* 'PAST') irregular, like *tikax*.

The tableaux below demonstrate the effect of the above constraints in selecting the optimal candidate. For ease of exposition the truncated material is enclosed in angled brackets. As in Yip 1998, the base is accompanied by the category required from the output (IMP), which activates the relevant morphological constraint (IMPTRUNC). Notice that IMP is not an abstract morpheme or a phonologically null element but rather a morphological feature independently required for syntactic purposes (for example, an imperative form cannot be preceded by a negative marker; a negative imperative phrase consists of the negative marker *ʔal* plus the future form of the verb, which differs from a negative future phrase, where the negative marker is *lo*).

(13) a. Future *tiftax*/TI *ftax* 'to open'

ti-ftax^{IMP}	ONSET	IMPTRUNC	*[$_\sigma$CCC	MAXSEG
a. tiftax		*!		
b. <t>iftax	*!			*
c. t<i>ftax			*!	*
d. ☞ <ti>ftax				**
e. <tif>tax				***!

b. Future *titkarev*/TI *tkarev* 'to approach'

tit-karev^{IMP}	ONSET	IMPTRUNC	*[$_\sigma$CCC	MAXSEG
a. titkarev		*!		
b. <t>itkarev	*!			*
c. t<i>tkarev			*!	*
d. ☞ <ti>tkarev				**
e. <tit>karev				***!

Turning now to V truncation, the examples in Table 5 show that when the first syllable in the future base is CV only the V is truncated.[10]

MASCULINE		FEMININE		
FUTURE	TI	FUTURE	TI	
ti.-ka.nes	tkanes	ti.-kan.si	tkansi	'to enter'
te.-gal.gel	tgalgel	te.-gal.ge.li	tgalgeli	'to roll'
te.-na.ʃek	tnaʃek	te.-naʃ.ki	tnaʃki	'to kiss'
te.-ma.le	tmale	te.-ma.li	tmali	'to fill'
te.-xa.bes	txabes	te.-xab.si	txabsi	'to launder'
te.-fa.ne	tfane	te.-fa.ni	tfani	'to clear'

TABLE 5. V truncation.

[10] TIs that have undergone V truncation are identical to reduced future forms, in which a vowel is deleted in casual speech (Bolozky 1979). Vowel deletion in casual speech is a general process in the language (Bolozky 1991, 1999), and the fact that CV truncation appears only in imperatives suggests that imperative truncation is an independent phenomenon.

As shown below, V truncation is derived by the same constraint ranking as CV truncation.

(14) Future *texabes*/TI *txabes* 'to launder'

te-xabes^{IMP}	ONSET	IMPTRUNC	*[$_\sigma$CCC	MAXSEG
a. texabes		*!		
b. <t>exabes	*!			*
c. ☞ t<e>xabes				*
d. <te>xabes				**!
e. <tex>abes	*!			***

The above analysis suggests the ranking in 15.[11]

(15) ONSET, *[$_\sigma$CCC, IMPTRUNC ≫ MAXSEG

IRREGULAR VERBS. As shown above, when the future base begins with a CV syllable the truncated material is V, and when it begins with a CVC syllable the truncated material is CV. Irregular verbs do not follow this generalization; although the future base of some irregular verbs begins with a CV syllable, the truncated material is CV rather than V. Some examples are given in Table 6 (see §4.2 for other irregular verbs).

	MASCULINE		FEMININE		
	FUTURE	TI	FUTURE	TI	
a.	ti.kax	kax	tik.xi	kxi	'to take'
	ti.gaʃ	gaʃ	tig.ʃi	gʃi	'to approach'
	ti.ten	ten	tit.ni	tni	'to give'
	te.ʃev	ʃev	teʃ.vi	ʃvi	'to sit'
b.	ta.kum	kum	ta.kú.mi	kúmi	'to get up'
	ta.ruts͡	ruts͡	ta.rú.ts͡i	rúts͡i	'to run'
	ta.sim	sim	ta.sí.mi	símí	'to put down'

TABLE 6. CV truncation in irregular verbs.

The constraint ranking in 15 accounts only for the feminine TIs in Table 6a since those are derived from a base beginning with a CVC syllable, and thus truncation of CV is expected. In all other forms in Table 6 the base begins with a CV syllable and the ranking thus selects a TI with a complex onset; the actual form, however, has a simple onset (the wrong optimal form is marked with ☛ and the actual form with √).

(16) Future *tikax*/TI **tkax*; actual form *kax* 'to take'

ti-kax^{IMP}	ONSET	IMPTRUNC	*[$_\sigma$CCC	MAXSEG
a. tikax		*!		
b. <t>ikax	*!			*
c. ☛ t<i>kax				*
d. ✓ <ti>kax				**!
e. <tik>ax	*!			***

[11] The edge at which truncation applies is determined by anchor constraints (McCarthy & Prince 1995), which require correspondence between edges in the input/base and the output. The ranking ANCHOREDGE$_i$ ≫ TRUNCATION ≫ ANCHOREDGE$_j$ ensures truncation at edge$_j$, and in Hebrew imperative truncation the ranking is ANCHORR ≫ IMPTRUNC ≫ ANCHORL.

The phonological properties relevant for the resolution of this discrepancy are (i) the position of stress and (ii) the source of the first consonant in the complex onset, that is, whether it is from the prefix or from the stem. Consider Table 7 (all properties refer to the TIs).

	1ST SYLLABLE STRESSLESS WITH COMPLEX ONSET			1ST SYLLABLE STRESSED WITH COMPLEX ONSET		
	FUTURE	TI		FUTURE	TI	
1st C from the stem	ti-t.fe.rí	tfe.rí	A	ti-t.fór ti-t.ní	tfór tní	C
1st C from the prefix	te-.xa.bés te-.xab.sí	txa.bés txab.sí	B	ta-.kúm ta-.kú.mi	*tkúm *tkú.mi	D

TABLE 7. The relevance of stress and the source of the consonant.

It appears that the onset of a stressed syllable can be complex only when both of its consonants correspond to stem segments in the base (box C); when the first consonant in the onset is from the prefix (the second is always from the stem) the TI is impermissible (box D). Such a restriction is not imposed on an unstressed syllable, which allows a complex onset whose first consonant is either from the stem (box A) or from the prefix (box B).

This generalization can be captured with Steriade's (1999) 'global correspondence condition' LEXσ́ (hereafter FAITHσ́), which requires segmental identity between corresponding stressed syllables.

(17) FAITH STRESSED SYLLABLE (FAITHσ́): Corresponding stressed syllables are segmentally identical.

As shown below, when FAITHσ́ is ranked above MAXSEG, it rules out the candidate with the complex onset (cand-c), allowing the candidate with the truncated CV (cand-d) to win.

(18) Future *tikax*/TI *kax* 'to take' (FAITHσ́ >> MAXSEG)

ti-.káx^{IMP}	ONSET	IMPTRUNC	*[$_{\sigma}$CCC	FAITHσ́	MAXSEG
a. ti.káx		*!			
b. <t>i.káx	*!				*
c. t<i>káx				*!	*
d. ☞ <ti>káx					**
e. <tik>áx	*!			*	***

FAITHσ́ is often violated, as in *titfór*/*tfór*, where the stressed syllable is CCVC in the TI but CVC in the future base. In such cases, however, the two consonants in the complex onset of the TI correspond to stem consonants. Considering all the examples given above, one can draw the generalization that segments from the stem are never truncated (recall the distinction between stem and base noted at the end of §3.1). This generalization is captured by the faithfulness constraint MAXSEGS, which is specified for stem segments (see McCarthy & Prince 1995 and Beckman 1997 for the priority of root over affix faithfulness).

(19) MAX SEGMENT STEM (MAXSEGS): Every segment in the stem of the input/base has a correspondent in the output.

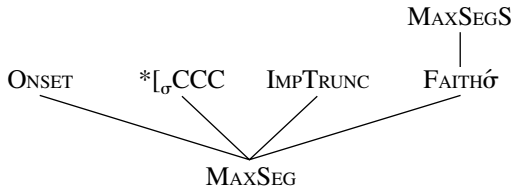
As shown below, the ranking of MAXSEGS above FAITHσ́ allows the preservation of the stem segments.

(20) Future *titfor*/TI *tfor* 'to sew' (MAXSEGS >> FAITHσ́)

ti-t.fór^{IMP}	ONSET	IMPTRUNC	*[$_{\sigma}$CCC	MAXSEGS	FAITHσ́	MAXSEG
a. tit.fór		*!				
b. <t>it.fór	*!					*
c. t<i>tfór			*!		*	*
d. ☞ <ti>tfór					*	**
e. <tit>fór				*!		***

The constraint ranking developed so far is as follows:

(21)



This constraint ranking accounts for all instances of truncation in colloquial Hebrew imperatives, but it is not sufficient for explaining cases where truncation is blocked.

4. BLOCKING TRUNCATION. There are two instances where truncation is blocked (in which case the future form is used for imperative). The first involves stems whose expected TIs contain an impermissible complex onset (4.1), arising in stems beginning with a sonorant and stems beginning with a glottal. The second is encountered in verbs where the vowel following the prefix consonant is a stem vowel (4.2); this vowel corresponds to a consonant in some irregular verbs and to a vowel in all verbs in binyan hifʔil (B-III).

4.1. IMPERMISSIBLE ONSETS. The constraint hierarchy of imperative truncation proposed above may derive TIs whose output violates markedness constraints, which are undominated in the language. In such cases the output could be amended by epenthesis, as is the case in other phenomena in the language. However, the only possible distinction between a base and its corresponding TI is truncation; that is, no segment can be added or altered. Therefore epenthesis is not manipulated in the grammar of imperative truncation, and verbs with an impermissible onset do not have a TI.

VERBS WITH A STEM-INITIAL SONORANT. Verbs with a stem-initial sonorant do not have a corresponding TI when the future base begins with a CVC syllable (the second C is a sonorant).[12]

[12] One lexical exception is *tinʃax* 'to bite.FUT', which has two TI variants, *tʃax* and *ʃax*; in both the *n* is truncated from the stem. The base of these TIs is probably the normative future form *tiʃax* (see n. 18), which does not include the stem-initial *n*.

(22)

FUTURE	TI	NI	
tinvax	*nvax	nevax	‘to bark’
tinʃom	*nʃom	neʃom	‘to breathe’
timrax	*mrax	merax	‘to smear’
timxak	*mxak	mexak	‘to erase’
tilbaʃ	*lbaʃ	levaʃ	‘to dress’
tilmad	*lmad	lemad	‘to learn’
tirkod	*rkod	rekod	‘to dance’
tirʃom	*rʃom	reʃom	‘to write down’

The verbs in 22 are expected to have a TI with an initial sonorant-C cluster (cf. *tigmor/gmor* ‘to finish.FUT/TI’), but this cluster violates the SONORITY SEQUENCING GENERALIZATION (SSG).[13] Violation of SSG is usually rescued by epenthesis, as in *lavan/levanim* ‘white.SG/PL’ (cf. *katan/ktanim* ‘small.SG/PL’ where there is no SSG violation). As shown in 22, epenthesis also rescues SSG violations in the normative imperatives (NIs), but such a procedure is not available in the grammar of imperative truncation due to the undominated faithfulness of the TI to its base. The avoidance of epenthesis is expressed by the high ranking of the anti-epenthesis constraint DEP.

(23) DEP: Every segment in the output has a correspondent in the input/base.

DEP, as well as the undominated SSG, is crucially ranked above IMPTRUNC, allowing the untruncated candidate to win.

(24) Future *tinvax*/ no TI ‘to bark’ (SSG, DEP >> IMPTRUNC)

ti-nvax^{IMP}	ONSET	*[$_\sigma$CCC	MAXSEGS	SSG	DEP	IMPTRUNC
a. ☞ tin.vax						*
b. <t>in.vax	*!					
c. t<i>nvax		*!		*		
d. <ti>nvax				*!		
e. <tin>vax			*!			
f. <ti>ne.vax					*!	
g. t<i>en.vax					*!	

Cand-d, the one that wins when the stem-initial consonant is not a sonorant (*tigmor-gmor*), is ruled out by SSG (and so is cand-c, which is ruled out anyway by *[$_\sigma$CCC).

[13] SSG violation can be found in fast speech, but not in all sequences to the same extent. For example, the onset *n*C is hardly ever found, while *m*C is not uncommon (depending also on the nature of the C). This gradient acceptability of SSG violation in complex onsets is not specific to TIs. Vowel deletion in adjectives and nouns reveals a similar variation.

[$_\sigma$mt:	matok-im	metukim	~	mtukim	‘sweet.M.PL’
[$_\sigma$mn:	manuj-im	menujim	~	mnujim	‘subscribed.M.PL’
*[$_\sigma$nt:	natuʃ-im	netuʃim		*ntuʃim	‘deserted.M.PL’
*[$_\sigma$nm:	names-im	nemesim		*nmesim	‘melted.M.PL’

Despite these violations, SSG must be posited as an active constraint in order to account for the cases where the cluster is impermissible and *e* is inserted in nonfast speech.

Cands f and g are ruled out by DEP, and the optimal form turns out to be the untruncated candidate.[14] Similar cases of blocking, which show the importance of integrating anti-faithfulness constraints in a constraint hierarchy, are introduced in Alderete 1998 and 2001.

There are, however, two feminine verbs with a stem initial sonorant that do have a corresponding TI.[15] The TIs in Table 8 are rather surprising, since they are unfaithful to the future form in both the position of stress and the additional vowel; that is, they do not conform to the undominated faithfulness of the TI.

FUTURE BASE	EXPECTED TI	NI	TI	
terdí	*rdi	redí	rédi	'to go down'
telxí	*lxi	lexí	léxi	'to go away'

TABLE 8. Apparent unfaithfulness.

I suspect that these two feminine TIs are derived not from the corresponding future bases but rather from their masculine TI counterparts *red* and *lex*. In all cases discussed above the feminine and the corresponding masculine future bases begin with the same syllable, and therefore the constraint ranking that blocks the derivation of a TI affects them both. Only in these two forms does the feminine future base (*ter.di* and *tel.xi*) begin with a CVC syllable while the masculine (*te.red* and *te.lex*) begins with a CV syllable. The two TIs in Table 8 are thus forced in by paradigmatic pressure. Not every verb has a TI, but the moment it has one, the TI paradigm must be full; that is, it must include both a feminine and a masculine TI (Bat-El 2001). There are two other feminine verbs, *tirt͡si* 'you.F.SG will want' and *tilvi* 'you.F.SG will borrow', that look like those in Table 8; however, these verbs do not have corresponding TIs **rét͡si* and **lévi* respectively. Despite the surface similarity to the verbs in Table 8, *tirt͡si* and *tilvi* are not expected to have a TI since their masculine counterparts, *tirt͡se* and *tilve*, also begin with a CVC syllable and thus do not have a TI either. That is, there is no paradigmatic pressure to force in TIs that are not faithful to their base.

VERBS WITH A STEM-INITIAL GLOTTAL. Future verb forms with a stem-initial glottal stop have three variants. The glottal stop appears only in careful speech characterizing the normative register (25a). In casual speech identifying the colloquial register the glottal stop is deleted (25b), and the resulting two adjacent vowels are often reduced to one vowel (25c).

(25)	a. VʔV	b. VV	c. V	
	taʔarog	taarog	tarog	'to kill'
	taʔaroz	taaroz	taroz	'to pack'
	teʔajem, taʔajem	teajem, taajem	tajem	'to threat'

Following Bolozky 1979 I refer to the forms without the glottal stop (25b and c) as reduced future forms.

[14] DEP blocks truncation also in verbs with a stem-initial historical pharyngeal fricative, such as *taxlom* 'to dream.FUT'. The expected TI **xlom* is not wellformed due to the impermissible *x*C cluster. Such clusters are usually rescued by an epenthetic *a*, as in *xeder/xadarim* 'room.SG/PL' (cf. *kéter/ktarim* 'crown.SG/PL' where there is no *x* in the initial onset), but never in TIs. Notice that the *x*C cluster is accepted in *xtov* 'write!' (from *tixtov*), where the *x* is derived from *k*. The distinction between the two surface *x*'s is made with reference to the paradigm; in *tixtov* the *x* is alternating (cf. the past form *katav*), while in *taxlom* it is constant (cf. the past form *xalam*).

[15] The TIs in Table 8 can have final stress (like the NIs) within a phrase such as *lexí mipó* 'get out of here', where stress shift is due to rhythmic stress.

FUTURE	REDUCED FUTURE	TI	
taʔasof	ta(ʔ)sof	*ʔasof / *tʔasof	‘to collect’
taʔaroz	ta(ʔ)roz	*ʔaroz / *tʔaroz	‘to pack’
taʔarog	ta(ʔ)rog	*ʔarog / *tʔarog	‘to kill’
taʔaros	ta(ʔ)ros	*ʔaros / *tʔaros	‘to demolish’
taʔavod	ta(ʔ)vod	*ʔavod / *tʔavod	‘to work’
taʔavor	ta(ʔ)vor	*ʔavor / *tʔavor	‘to pass’
taʔafox	ta(ʔ)fox	*ʔafox / *tʔafox	‘to turn’
teʔajem	teajem, ta(ʔ)jem	*ʔajem / *tʔajem	‘to threaten’
taʔazov	ta(ʔ)zov	ʔazov / *tʔazov	‘to leave’
taʔat͡sor	ta(ʔ)t͡sor	ʔat͡sor / *tʔat͡sor	‘to stop’

TABLE 9. Reduced future and illformed TIs.

As shown in Table 9, most verbs with a stem-initial glottal do not undergo truncation; the TI of these verbs is usually identical to the reduced future form with the short vowel (25c). Only the last two future bases in Table 9 have a corresponding TI (although some speakers may accept a TI for a few other verbs).[16]

Future bases beginning with a CV syllable have a corresponding TI with a complex onset (e.g. *texapes*/*txapes* ‘to search.FUT/TI’). The expected initial *tʔ* onset in Table 9 is not permissible due to a general constraint in the language prohibiting a glottal stop within a complex syllabic position (i.e. *[$_{\sigma}$ʔC, *[$_{\sigma}$Cʔ, *ʔC$_{\sigma}$], *Cʔ$_{\sigma}$]).[17]

(26) *ʔ-IN-COMP: A glottal stop does not appear in a complex syllabic position.

The addition of *ʔ-IN-COMP to the constraints proposed above allows an output with a single consonant in the onset.

(27) Future *taʔazov*/TI *ʔazov* ‘to leave’

ta-ʔazov^{IMP}	*ʔ-IN-COMP	ONSET	MAXSEGS	IMPTRUNC	MAXSEG
a. taʔazov				*!	
b. <t>aʔazov		*!			*
c. t<a>ʔazov	*!				*
d. ☞ <ta>ʔazov					**

As noted above, however, the optimal form in 27, which is identical to the normative imperative, is rather rare, found only in a few verbs.

I suggest that the base of the TI in such cases is one of the reduced forms of the future (25b or c), as these are the forms used in colloquial speech. As shown in 28, where any of the reduced forms serves as input, the output is identical to the reduced

[16] The source of the glottal stop varies. It corresponds to a historical *ʕ* (currently produced only by a relatively few speakers) or a historical glottal stop. It also corresponds to (a historical) *h*, which often surfaces in normative speech. In the normative register B-I verbs with a historical glottal stop have *e* before and after the glottal stop (e.g. *teʔeroz* ‘to pack.FUT’, *teʔesof* ‘to collect.FUT’). The merger of *ʔ*, *ʕ*, and *h* into *ʔ* renders this vowel opaque and even speakers who pronounce the glottal stop often fail to preserve the *e*.

[17] The prohibition of a glottal stop in a complex syllable margin could be perceptually motivated. The release of the tightly closed glottis required for the production of the glottal stop can be overshadowed by the more perceptually accessible release of the supralaryngeal place of articulation of an adjacent stop or the turbulence generated at the constriction of an adjacent fricative.

future form with the short vowel (the vowel in the base in 28b is a stem vowel, since forms such as *te?ajem/teajem* ~ *tajem* 'to threaten.FUT' show that hiatus resolution is accomplished by deleting the prefix vowel).

(28) Future (reduced) *taazov* ~ *tazov*/TI *tazov* 'to leave'

a.

taazov^{IMP}	ONSET	MAXSEGS	IMPTRUNC	MAXSEG
a. taazov			*!	
b. <t>aazov	*!			*
c. ☞ t<a>azov				*
d. <ta>azov	*!			**

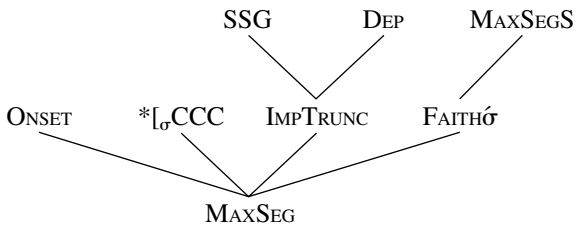
b.

tazov^{IMP}	ONSET	MAXSEGS	IMPTRUNC	MAXSEG
a. ☞ tazov			*	
b. <t>azov	*			*!
c. t<a>zov		*		*!
d. <ta>zov		*		*!*

Regardless of whether the base has a long or short vowel, the output is identical to the base with the short vowel. In other verbs with a stem-initial glottal, such as *tit?amet͡s* 'to make an effort.FUT', truncation is not blocked, since it is the reduced future base *titamet͡s* that undergoes truncation, resulting in *tamet͡s* (the expected **ttamet͡s* is ill-formed due to the OCP).

To conclude, impermissible clusters cannot be amended by epenthesis due to the undominated base-TI faithfulness expressed here by the high ranking of DEP. When the stem-initial consonant is a sonorant, there is no TI available, as SSG does not allow a sonorant-C cluster. The two exceptional cases in 25 are derived from their masculine counterparts through paradigmatic pressure. A C*?* cluster is also impermissible, but in this case the reduced form without the glottal serves as the base, and the output is identical to one of the reduced forms. A revised version of the constraint hierarchy is given in 29.

(29)



4.2. THE MULTIPLE BASE HYPOTHESIS. Two other types of verbs do not undergo truncation: irregular verbs whose stem-initial consonant appears in the past form but not in the future, and all verbs in binyan hif?il (B-III). I argue that under certain conditions reference to the past form is activated, allowing identification of the source of the vowel

following the future prefix (i.e. whether it is from the prefix or the stem). If the vowel in the future base is identified as a stem vowel, and it corresponds to a vowel or a glide in the past base with the same value for [high], it cannot be truncated.

IRREGULAR VERBS. While irregular verbs usually undergo imperative truncation (see §3.2), there are a few that do not. These verbs are characterized in paradigmatic terms; the initial consonant of the past (and participle) stem does not appear in the future base. The consonants that tend to vanish are the coronal sonorants *j*, *n*, and *l* (see n. 21 for *ʔ*).[18]

(30)

PAST 3M.SG	FUTURE 2M.SG	
jarak	tirak	'to spit'
jarad	tered	'to descend'
lakax	tikax	'to take'
natan	titen	'to give'

As shown in Table 10, some of these verbs have a corresponding TI, while others do not (the question mark indicates inconsistency among speakers).

TI-yes			TI-no		
FUTURE	TI		FUTURE	TI	
a. *i* in base-initial syllable			c. *i* in base-initial syllable		
titen	ten	'to give'	tiraʃ	*raʃ	'to inherit'
tisa	sa	'to travel'	tinak	*nak	'to suck'
tikax	kax	'to give'	titsor	*tsor	'to create'
tigaʃ	gaʃ	'to approach'	tirak	*rak	'to spit'
tipol	pol ?	'to fall'	tiʃan	*ʃan	'to sleep'
b. *e* in base-initial syllable					
tered	red	'to descend'			
teʃev	ʃev	'to sit'			
tetse	tse	'to go out'			
teda	da ?	'to know'			

TABLE 10. Truncation in irregular verbs.

The TIs in Table 10a and b are derived by the ranking given above; however, the absence of a TI in 10c must be explained. The past forms, added in Table 11, may shed light on this inconsistency.[19]

The generalization drawn from Table 11, summarized in Table 12, shows that it is the correspondence between the consonant in the past base and the vowel in the future base that determines whether or not the verb has a TI. This generalization suggests that it is necessary to have access not only to the future base but also to the past base in order to determine whether the future form has a corresponding TI. Similar instances of correspondence of one output to two bases have been referred to in the recent

[18] The disappearance of the first stem consonant is found only in B-I verbs (compare B-I *jalad/teled* 'to bear a child.PAST/FUT' vs. B-IV *jiled/tejaled* 'to deliver a child.PAST/FUT'). In addition, with the exception of *j*, which always vanishes in the future forms of B-I verbs, all other consonants disappear only in some lexical items (mostly basic). That is, in contrast with the verbs in 30, where the first consonant of the past form does not appear in the future, there are verbs where all consonants appear throughout the paradigm (*navax/tinvax* 'to bark.PAST/FUT', *lamad/tilmad* 'to learn.PAST/FUT'), and a few others in free variation (*naʃax/tinʃax* ~ *tiʃax* 'to bark.PAST/FUT', *naga/tiga* ~ *tinga* 'to touch.PAST/FUT').

[19] Due to the opacity of the vowels in irregular verbs, the *e* in the first syllable of the future forms in Table 10b freely alternates with *i*, as in *tered* ~ *tired* (where *tered* is also the normative form). Nevertheless, the distinction between the future forms in Table 10a and b is preserved since only those in Table 10b allow free variation, that is, *titen* (Table 10a) never surfaces as **teten*.

TI-yes			TI-no		
PAST	FUTURE	TI	PAST	FUTURE	TI
a. past form with stem-initial *n* or *l*			c. past form with stem-initial *j*		
natan	titen	ten	jaraʃ	tiraʃ	*raʃ
nasa	tisa	sa	janak	tinak	*nak
lakax	tikax	kax	jat͡sar	tit͡sor	*t͡sor
nigaʃ	tigaʃ	gaʃ	jarak	tirak	*rak
nafal	tipol	pol ?	jaʃan	tiʃan	*ʃan
b. past form with stem initial *j*					
jarad	tered	red			
jaʃav	teʃev	ʃev			
jat͡sa	tet͡se	t͡se			
jada	teda	da ?			

TABLE 11. Reference to past form.

		FUTURE BASE	
		e in the 1st σ	*i* in the 1st σ
PAST BASE	stem-initial *j*	TI - yes (T.11b)	TI - no (T.11c)
	stem-initial *n* or *l*	N/A	TI - yes (T.11a)

TABLE 12. Generalization.

literature as MULTIPLE CORRESPONDENCE (Burzio 1998 for Italian) or SPLIT BASE (Steriade 1999 for English and French). Reference to multiple bases is an extra burden on the grammar, and therefore, as Steriade emphasizes, the question to be asked is: What activates such an increased correspondence?

I argue that reference to the past form is due to the unexpected number of syllables in the future base. Verb stems in Hebrew are usually disyllabic, and future forms, which always include a syllabic prefix, are usually trisyllabic (or quadrisyllabic when the feminine or plural suffix is included). In irregular verbs, however, the future base is disyllabic. It is the reduced number of syllables in the future base that activates the multiple base hypothesis, since it leads speakers to question the source of the first syllable in the base. The consonant in the onset of the first syllable of the future base is always *t* and is easily recognized as the future prefix. The vowel, however, varies without a coherent phonological context (e.g. *taruts͡*, *tered*, *tirak*) and could as well be a stem vowel (recall that identifying the stem segments is crucial for MAXSEGS). To verify the source of this vowel speakers refer to the past form. If the first consonant in the past stem does not appear in the future form, this consonant is taken as the correspondent of the vowel following the future prefix and the vowel is thus considered a stem vowel. When the first stem consonant of the past form appears in the future base, the vowel following the prefix consonant is considered a prefix vowel.

(31) Future-Past segmental correspondences in stem-initial position

a. Past stem C doesn't appear in future base; future base 1st V is a stem V

FUTURE	PAST	
t-$i_i$rak	$j_i$arak	'to spit'
t-e_iʃev	j_iaʃav	'to sit'
t-$i_i$ten	$n_i$atan	'to give'

b. Past stem C appears in future base; future base 1st V is a prefix V

FUTURE	PAST	
ta-kum	kam	'to get up'
ta-sim	sam	'to put'
ti-gdal	gadal	'to grow'

The grammar distinguishes between the two types of C-V correspondence, the one that shows truncation (*j–e* and *n/l–i*) and the other that does not (*j–i*).[20] I propose that the distinction is made by an IDENT constraint requiring identity in the value of the feature [high] between the stem-initial consonant of the past form and the corresponding vowel in the TI (see Ussishkin 1999, 2000 for another case of C-V correspondence in Hebrew).

(32) IDENT[high]C-V (PAST): Corresponding consonant and vowel have identical value for [high].

Note that IDENT specifies consonant-vowel correspondence (rather than vowel-vowel) and refers to the base of the past form. This is the only constraint specified for the past form (marked with P); all other constraints refer to the future base (not marked).

Since the correspondence is between surface forms (output-output), I assume a fully specified feature matrix that includes [+high] for the glide and [−high] for *n* and *l*. When a C-V pair does not violate IDENT the other constraints determine the optimal output.

(33) *j - i* correspondence: Future *tirak*/Past *jarak*/no TI 'to spit'

F-ti.rák^{IMP} P-ja.rák	IDENT(P) (*i - j*)	ONSET	MAXSEGS	IMPTRUNC	FAITHσ́	MAXSEG
a. ☞ ti.rák				*		
b. <t>i.rák		*				*!
c. t<i>rák			*		*!	*
d. <ti>rák			*			*!*

When the C-V pair violates IDENT (*j-e* and *n/l-i*) the same ranking as in 33 selects the truncated candidate with the simple onset.

(34) *j - e* correspondence: Future *tered*/Past *yarad*/TI *red* 'to descend'

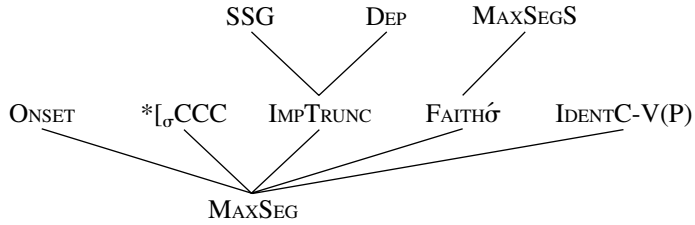
F-te.réd^{IMP} P-ja.rád	IDENT(P) (*j - e*)	ONSET	MAXSEGS	IMPTRUNC	FAITHσ́	MAXSEG
a. te.réd	*			*!		
b. <t>e.réd	*	*!				*
c. t<e>réd			*		*!	*
d. ☞ <te>réd			*			**

[20] The group of verbs showing C-V correspondence is rather small, consisting mostly of basic verbs. It is thus possible, as Charles Kisseberth pointed out to me, that the generalization made by the linguist is not indicative of the speakers' grammar; it might also be the case that the verbs that do not have a TI are lexically exempt from truncation. If this is the case, why they are exempt? One may suggest that the normative imperatives (NI) play a role here. In the NIs of the verbs that do not have TIs, the stem-initial *j* resurfaces (e.g. *tirak/jerak* 'to spit.FUT/NI'), and since the NI is not faithful to the base, it is not acceptable as a TI (see §4.1). However, NIs where the initial consonant resurfaces are hardly ever used in the normative register, and it is quite unlikely that speakers would have access to them. Therefore the input of the normative register in this case is rather doubtful. I thus claim that the analysis provided below does represent the native speaker's

To conclude, the unexpected number of syllables in the future base activates reference to an additional base, the past form. The multiple base hypothesis resolves the apparent inconsistency in the presence of a TI. The correspondence between the first consonant of the past form and the vowel in the TI candidates is evaluated by IDENT. Truncation is blocked when IDENT is respected (33), but applies when IDENT is violated (34).[21]

The constraint ranking below includes the additional constraint.

(35)



BINYAN HIF?SIL. As Bolozky observed (1979), verbs in binyan hif?il (B-III) do not undergo truncation.

MASCULINE		FEMININE		
FUTURE	TI	FUTURE	TI	
tazkir	*zkir	tazkíri	*zkíri	'to remind'
tafsik	*fsik	tafsíki	*fsíki	'to stop'
takim	*kim	takími	*kími	'to raise'
tapil	*pil	tapíli	*píli	'to drop'
take	*ke	taki	*ki	'to hit'
tavi	*vi	taví(ʔ)i	*ví(ʔ)i	'to bring'

TABLE 13. No TI in B-III.

Notice that there is nothing wrong with the surface structure of these TIs; **ke* looks like *t͡se* 'go out!' (from *te͡tse*), **kim* looks like *sim* 'put!' (from *tasim*), and **fsik* is not very different from *ftax* 'open!' (from *tiftax*). The question then is why B-III verbs do not have TIs.

Bolozky notes that only *te* and *ti* prefixes are affected by truncation while *ta* of B-III is not. To this should be added the *to* prefix appearing in a couple of B-III verbs that also resists truncation (e.g. *torid/*rid* 'to put down.FUT'). It is not clear whether Bolozky attributes the absence of truncation in B-III verbs to the vowel quality (i.e. only [-back] vowels are truncated) or to the binyan (i.e. all binyanim except B-III allow truncation). It seems that the absence of a TI cannot be attributed to the quality of the vowel in the first syllable because *ta*, found in a few B-I verbs, is freely truncated (e.g. *takum/kum* 'to get up.FUT/TI'). In addition, there is no obvious reason why *a* is preserved

grammar (at least at some stage; it is possible that later on speakers abandon it because of its great complexity and mark the verbs as lexical exceptions).

[21] There are two verbs with a stem-initial glottal corresponding to *o*, *ʔaxal/toxal* 'to eat.PAST/FUT' and *ʔa(h/ʔ)av/to(h/ʔ)av* 'to love.PAST/FUT'. The *ʔ/o* correspondence does not violate IDENT since both segments are [-high], and therefore these verbs lack TIs, as in 33. IDENT is not violated also under the assumption that glottals lack place features, since the constraint is relevant only for existing features. However, there is also one case of *ʔ/h e* correspondence, *ʔ/halax/telex* 'to go.PAST/FUT', which is also expected to lack a TI but does not; the TI *lex* is commonly used. The problem could be resolved by specifying IDENT for both [high] and [back]. The corresponding segments in the pair *ʔ/o* respect IDENT since they have the same values for both [high] and [back], but the corresponding segments in *ʔ/h / e* violate IDENT since they do not have the same value for [back].

out of all vowels, since in other instances in the language it is freely deleted or altered, certainly more than *i*, which is the most stable vowel in the morphophonology of the language (cf. *jarad/jarda* 'to descend.PAST.M/F' vs. *horid/horída* 'to put down.PAST.M/F').

The absence of truncation in B-III verbs must then be attributed to some property of the binyan. I argue that the relevant property of B-III is not the quality of the vowel following the prefix consonant but rather its source; this vowel is a stem vowel, and due to the dominance of MAXSEGS it cannot be truncated. The question is how speakers identify the source of this vowel.

All B-III future bases, like the future bases discussed above, are disyllabic (or trisyllabic with a suffix), while the most common bases, as noted earlier, are trisyllabic. The unexpected number of syllables in the future base activates reference to the past form, to verify whether the vowel in the first syllable is a stem vowel. All B-III past forms begin with *hi* (a few with *ho* or *he*), which is often considered a prefix. I argue that while the *h* is a prefix the vowel following it is a stem vowel to which the vowel in the first syllable in the future base corresponds.[22] Since it has a correspondent it must be a stem vowel and so is the vowel in the past form. The two corresponding stem vowels pass freely through IDENT, since this constraint refers specifically to C-V correspondence. C-V correspondence is limited to IDENT[high] since the language does not allow any C-V alternation except *j-i* (and possibly *h/ʔ-a* which is not relevant here). V-V correspondence is not restricted by a highly ranked IDENT constraint since vocalic alternation is quite common universally as well as specifically in Hebrew (*a-e* in *tigdal/tigdeli* 'to grow.FUT.M/F' and *i-a* in *higdil/higdálti* 'to enlarge.PAST.3M.SG/1SG').

As shown in 36, none of the candidates violate IDENTC-V(P), but they all violate the high-ranked constraints to the same degree; the low-ranked constraints thus select the optimal candidate.

(36) Future *tazkir*/Past *hizkir*/no TI 'to remind'

F-taz.kír^{IMP} P-hiz.kír	IDENT(P)	ONSET	MAXSEGS	IMPTRUNC	FAITHσ́	MAXSEG
a. ☞ taz.kír				*		
b. <t>az.kír		*				*!
c. t<a>zkír			*		*!	*
d. <ta>zkír			*		*!	**

Before concluding this section, I offer two exceptions. There are three B-I verbs whose future form is identical to that of some B-III verbs in prosodic structure and vocalic pattern. The B-I verbs, unlike the B-III verbs, are expected to have a corresponding TI since all consonants in the past form surface in the future (the B-I verb *kam/*

[22] Also, the past forms of B-II start with a prefix (e.g. *nigmar* 'to finish', *nixnas* 'to enter'). However, since the future form of B-II is usually trisyllabic (*tigamer*, *tikanes*), reference to the past base is not activated. In the irregular B-II verb *tigaʃ* 'to approach', the past form *nigaʃ* does play a role (historically *nigaʃ* < *niggaʃ* < *ningaʃ*). Speakers consider the *n* prefix as a stem consonant corresponding to the *i* in the future. The *n*/*i* correspondence violates IDENT, and therefore the TI is *gaʃ*.

takum/kum 'to get up.PAST/FUT/TI'). However, while the verb in line a of Table 14 has a TI, those in b and c, like B-III verbs, do not.

		FUTURE	PAST	TI	
B-I	a.	tasim	sam	sim	'to put'
	b.	taʃir	ʃar	—	'to sing'
	c.	tariv	rav	—	'to quarrel'
B-III	d.	tapil	hipil	—	'to drop'
	e.	tavin	hevin	—	'to understand'

TABLE 14. Identical B-I and B-III future forms.

One may claim that the B-I verbs in Table 14b and c do not have a TI because the expected TIs **ʃir* and **riv* are homophonous with the nouns *ʃir* 'song' and *riv* 'quarrel' respectively. I believe, however, that it is rather unlikely that extraparadigmatic forms may have a blocking effect, that is, that nouns can block the formation of homophonous imperatives. Another possible explanation involves the unique representation of B-III future (as well as past and participle) forms. B-III verbs are the only verbs whose final syllable has a high front vowel, of course with the exception of the three B-I verbs in Table 14. It is thus possible that the future forms in Table 14b and c are interpreted as B-III forms and thus do not have a corresponding TI.[23] If this is the case, it must be assumed that the past form is disregarded and the multiple base hypothesis is not activated. It is possible that on the basis of past experience with the multiple base hypothesis speakers generalize that all future bases whose final stem syllable has an *i* do not have a corresponding TI. On the basis of this generalization, the multiple base hypothesis is ignored when such a verb appears. If this is the case, *sim*, the TI of *tasim* (Table 14a), must be lexicalized. Notice that in order to arrive at such a generalization, speakers have to activate the multiple bases hypothesis at some earlier stage.

5. FREE VARIATION. Two types of free variation are exhibited by the TIs. One type is found in some trisyllabic future bases beginning with a CV syllable. Such verbs have been shown to truncate just the vowel (e.g. *tekabel/tkabel* 'to receive.FUT/TI'). A variant with a CV truncation is also available in this case (*tekabel/kabel*). This type of variation raises problems for MAXSEG, which minimizes the number of truncated segments and would thus select *tkabel* over *kabel*. I argue that this variation is due to the intervention of the normative register, and suggest that the low ranked constraint **COMPLEX* is crucially unranked with respect to MAXSEG.

The other type of free variation appears in verbs with a stem-initial sibilant such as *tisgor* 'to close.FUT', which in addition to the expected TI *sgor* (CV truncation) also allows *tsgor* (V truncation). The latter variant seems to violate **[$_\sigma$CCC*, which accounts for the fact that the TI of verbs such as *tigmor* 'to finish.FUT' is *gmor* rather than **tgmor* (see Watson 1999 for a similar case in Arabic). However, the *t* + sibilant cluster undergoes coalescence, resulting in an affricate (where only t͡s is a phoneme in the language), and the affricate + consonant cluster does not violate **[$_\sigma$CCC*. This case of

[23] Sporadic deviations from the paradigm are found elsewhere in the verbal system of colloquial Hebrew. The verb meaning 'to be afraid', for example, has a B-I past form (*paxad*) but B-IV future and participle forms (*tefaxed* and *mefaxed* respectively). More dramatic is the merger of two pairs of verbs in normative Hebrew into one suppletive pair in colloquial Hebrew. From the normative past-future pairs *ʔamar/jomar* (B-I) and *higid/jagid* (B-III), both meaning 'to say', colloquial Hebrew retained the pair *ʔamar* 'PAST'/*jagid* 'FUT' (though children often use the pair *higid/jagid*).

variation is due to the crucial nonranking of MAXSEG with UNIFORMITY, where the latter prohibits coalescence.

Crucial nonranking was first introduced in Prince & Smolensky 1993 (51, n. 31) as a conceivable situation and was later adopted as the mechanism for free variation (see references and discussion in Kager 1999:404–407). A grammar including crucially unranked constraints is a grammar with partial ranking (see Anttila 2002 and references therein). Notice that CRUCIAL NONRANKING (marked in the tableaux with a broken line) is significantly different from NONCRUCIAL RANKING (marked with a dotted line). When A and B are crucially unranked, A ≫ B and B ≫ A provide two different optimal candidates and both are available in the language in free variation. When A and B are noncrucially ranked there is no evidence for their ranking, and A ≫ B and B ≫ A provide the same optimal candidate.

5.1. BICONSONANTAL ONSET ~ MONOCONSONANTAL ONSET. When normative imperatives (NIs) appear in colloquial speech they usually intrude on the unity of the register; that is, speakers can identify the NIs as not belonging to the register. Not all NIs are intruding, however. The distinction between intruding and tolerable NIs is based on the extent to which the NIs are dissimilar from their TI counterparts.

As shown throughout the discussion, a TI is faithful to its corresponding future base (with the exclusion of the truncated material), such that it is better not to have a TI than to allow an epenthetic vowel (see §4.1). All the NIs in Table 15a are unfaithful to their bases either morphologically (with a different prefix, as in *tiʃava*/*hiʃava*), segmentally (by the stop/fricative alternation, as in *tiftax*/*ptax*), or prosodically (by addition and deletion of vowels, as in *tigmeri*/*gimri*). Due to their protruding unfaithfulness these NIs do not appear in colloquial speech, as these alternations are identified as part of the normative register. The NIs in Table 15b are faithful to the future base in all the properties mentioned above. They differ, however, from their TI counterparts only in the initial onset; the NI has a simple onset while the TI has a complex onset. In this case the use of an NI in the colloquial register is not intruding, probably because the colloquial register has other TIs with simple onsets (see Table 6).

a. Intruding NIs

BINYAN		FUTURE	NI	TI	
B-I	M	tiftax	ptax	ftax	'to open'
	F	tiftexi	pitxi	ftexi	
B-II	M	tiʃava	hiʃava	tʃava	'to swear'
	F	tiʃav(ʔ)i	hiʃavʔi	tʃavi	
B-III	M	tagdil	hagdel	—	'to enlarge'
	F	tagdíli	hagdíli	—	
B-V	M	titnaʃek	hitnaʃek	tnaʃek	'to kiss'
	F	titnaʃki	hitnaʃki	tnaʃki	

b. Tolerable NIs

B-IV	M	tekabel	kabel	tkabel	'to receive'
	F	tekabli	kabli	tkabli	

TABLE 15. Intruding and tolerable NIs.

One may suggest that imperative forms like *kabel* 'accept!' (Table 15b) are 'borrowed' from the normative register and are lexically listed in the colloquial register. If this is the case all variants with a simple onset would be expected to have an initial stop in verbs with stop/fricative alternation (e.g. *biker*/*tevaker* 'to visit.PAST/FUT'), since there is no word-initial fricative in the normative register. This, however, is not the

case: the variant with the simple onset always has a fricative when the future form has a fricative.[24] The presence of a fricative in the variants with the simple onset suggests that it is not a case of a lexicalized NI, but rather a derived TI. Had it been a lexically listed NI, the initial consonant would have been a stop (as noted in n. 7, speakers have access to at least some forms of the normative register).

FUTURE		NI		TI		
M	F	M	F	M	F	
texabes	texabsi	kabes	kabsi	txabes ~ xabes	txabsi ~ xabsi	'to launder'
texase	texasi	kase	kasi	txase ~ xase	txasi ~ xasi	'to cover'
tevarex	tevarxi	barex	barxi	tvarex ~ varex	tvarxi ~ varxi	'to bless'
tefazer	tefazri	pazer	pazri	tfazer ~ fazer	tfazri ~ fazri	'to scatter'

TABLE 16. Free variation: [CCV ~ [CV

The analysis proposed above cannot account for the variant with the simple onset: MAXSEG does not allow such a form to be optimal since the candidate with the complex onset (the other variant) violates it to a lesser extent. It seems that due to the intervention of the NIs with simple onsets in the colloquial register the constraint *COMPLEX plays a minor role in the grammar of truncated imperatives.

(37) *COMPLEX: A complex syllabic position is prohibited.

(38) Free variation: Future *texabes*/TI *txabes ~ xabes* 'to launder'

a. MAXSEG >> *COMPLEX: TI *txabes*

texabes^{IMP}	ONSET	IMPTRUNC	MAXSEG	*COMPLEX
a. texabes		*!		
b. <t>exabes	*!		*	
c. ☞ t<e>xabes			*	*
d. <te>xabes			**!	

b. *COMPLEX >> MAXSEG: TI *xabes*

texabes^{IMP}	ONSET	IMPTRUNC	*COMPLEX	MAXSEG
a. texabes		*!		
b. <t>exabes	*!			*
c. t<e>xabes			*!	*
d. ☞ <te>xabes				**

[24] The only clear case of a listed TI is *bo* 'come!', which should have been **vo* had it been derived, since its base is *tavo* 'to come.FUT'. The same is true for the feminine (and plural) form *bó(ʔ)i* (**vó(ʔ)i*), whose base is *tavó(ʔ)i*.

*COMPLEX is ranked at the bottom of the hierarchy, crucially below IMPTRUNC, to allow TIs such as *gmor* 'finish!' (from *tigmor*). It is crucially unranked with another low-ranked constraint, MAXSEG, allowing two optimal candidates, one with a complex onset and another with a simple onset.

There is no free variation in *ftax* ~ **tax* 'open!' (from *tiftax*) since the *f* is a stem segment and its truncation is thus blocked by MAXSEGS. It is thus crucial for *COMPLEX to be dominated by MAXSEGS. *COMPLEX must also be dominated by IMPTRUNC; otherwise truncation in *tiftax* would be blocked.[25]

The ranking of *COMPLEX with respect to MAXSEG is not relevant for verbs with a stem-initial coronal stop, such as *tedaber* 'to talk.FUT'. In this case, while the crucial nonranking provides two variants, the undominated OCP rules out **tdaber* because of the impermissible adjacent consonants with identical place and stricture features (clusters with identical place but not stricture, such as in *tsaper* 'tell!', are acceptable; see Padgett 1991).

5.2. SIBILANT + C ONSET ~ AFFRICATE + C ONSET. When the stem of the future base begins with a consonant cluster the initial CV of the base is truncated (*ti-ftax/ftax* 'to open.FUT/TI'); minimal truncation of V is impossible in this case due to *[$_{\sigma}$CCC, which prohibits triconsonantal onsets (**tftax*). However, as observed in Bolozky 1979, when the stem begins with a sibilant, either CV or V is truncated. The *t* + sibilant sequence is phonetically an affricate, and as Bolozky notes, this is the reason why V truncation is also possible in such a case. The entire cluster has one value for voicing, determined by the rightmost obstruent in the cluster. Some examples are given in Table 17 (S stands for a sibilant; the output of voicing assimilation is given in square brackets). Out of the three affricates only *t͡s* is a phoneme in the language; the other two, *t͡ʃ* and

FUTURE	TIs (in free variation)					
	[CCV...			[CSCV...		
tizrok		zrok		tzrok	[d͡zrok]	'to throw'
tizdarez		zdarez		tzdrez	[d͡zdarez]	'to hurry'
tizkor	[tiskor]	zkor	[skor]	tzkor	[t͡skor]	'to remember'
tislax		slax		tslax	[t͡slax]	'to forgive'
tisgor	[tizgor]	sgor	[zgor]	tsgor	[d͡zgor]	'to close'
tistalek		stalek		tstalek	[t͡stalek]	'to walk away'
tiʃmor		ʃmor		tʃmor	[t͡ʃmor]	'to guard'
tiʃbor	[tiʒbor]	ʃbor	[ʒbor]	tʃbor	[d͡ʒbor]	'to break'
tiʃkax		ʃkax		tʃkax	[t͡ʃkax]	'to forget'

TABLE 17. Free variation with sibilants.

[25] There is also no free variation in *tlabeʃ* ~ **labeʃ* 'get dressed!' although the *t* is part of the prefix. This is the TI of the B-V verb *titlabeʃ* where the prefix *tit-* is composed of the future prefix *ti-* and the derivational prefix *t-* identifying the binyan. As Edit Doron suggested to me, the derivational *t* can be viewed as a stem segment, since it appears throughout the tense paradigm of this binyan (*hitlabeʃ–mitlabeʃ–titlabeʃ*). It could also be the case that since the addition of *COMPLEX arises due to the intervention of the NIs, **labeʃ* cannot be a TI of B-V since it is very dissimilar to its corresponding NI *hitlabeʃ*. It should also be noted that there are two B-II verbs that behave like B-IV verbs in allowing free variation: *tikanes* 'to enter.FUT' whose TI *tkanes* has the variant *kanes*, and *tiza(h)er* 'to beware.FUT', whose TI *tza(h)er* has the variant *za(h)er*. On the one hand, the B-II TIs with the simple onset are unexpected since they are very different from their NI counterparts *hikanes* and *hizaher* (e.g. the B-II verb *tiʃava* 'to swear.FUT' whose TI is *tʃava*, not **ʃava*). On the other hand, the extension of variation to B-II verbs might be due to the fact that the future forms of B-IV and B-II are distinguished only in the height of the prefix vowel (B-IV *tekanes* 'to gather.FUT' vs. B-II *tikanes* 'to enter.FUT').

d͡ʒ, appear as phonemes only in a few loan words (e.g. *t͡ʃips* 'chips', *garad͡ʒ* 'garage'). When the stem-initial sibilant is the phoneme *t͡s* there is no phonetic distinction between *tt͡s*C and *t͡s*C; that is, from *tit͡srax* 'to scream.FUT' we get only *t͡srax*.

Since the *t* + sibilant cluster is phonetically an affricate, forms exhibiting V truncation undergo coalescence, yielding a TI with an initial affricate + consonant cluster (*tisgor* → *tsgor* → *t͡s*gor); this cluster does not violate *[$_\sigma$CCC since it has only two consonants. Coalescence, however, violates the anticoalescence faithfulness constraint UNIFORMITY (McCarthy & Prince 1995).

(39) UNIFORMITY (UNIFORM): No element in the output has multiple correspondents in the input/base.

Although all the features of the *t* + sibilant cluster are preserved in the output, UNIFORM is violated since the output has one consonant (an affricate) that corresponds to two consonants in the base (*t* and S).

As shown in 40, a crucial nonranking between UNIFORM and MAXSEG accounts for the free variation.

(40) Free variation: Future *tislax*/ TI *slax* ~ *t͡slax* 'to excuse'

a. MAXSEG >> UNIFORM: TI/ *t͡slax*

tislax^{IMP}	ONSET	IMPTRUNC	*[$_\sigma$CCC	MAXSEG	UNIFORM
a. tislax		*!			
b. <t>islax	*!			*	
c. <ti>slax				**!	
d. t<i>slax			*!	*	
e. ☞ t͡<i͡>slax				*	*

b. UNIFORM >> MAXSEG: TI/*slax*

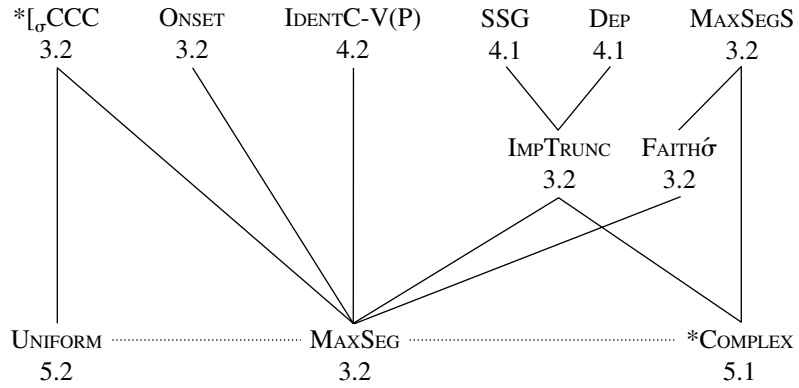
tislax^{IMP}	ONSET	IMPTRUNC	*[$_\sigma$CCC	UNIFORM	MAXSEG
a. tislax		*!			
b. <t>islax	*!				*
c. ☞ <ti>slax					**
d. t<i>slax			*!		*
e. t͡<i͡>slax				*!	*

Two candidates survive the high-ranked constraints, cand-c, which undergoes CV truncation, and cand-e, which undergoes V truncation. When MAXSEG outranks UNIFORM (40a) the candidate with the fewer truncated segments (cand-e) is selected, since it has fewer violations of the higher-ranked MAXSEG. When UNIFORM outranks MAXSEG (40b) the candidate that respects UNIFORM (cand-c) is selected. Notice that the rankings *[$_\sigma$CCC ≫ UNIFORM forces coalescence in 40a, since the higher-ranked *[$_\sigma$CCC rules out the candidate with the triconsonantal onset (cand-d). Similarly, *[$_\sigma$CCC ≫

MAXSEG forces CV (rather than V) deletion in 40b. The fact that only *t* + sibilant clusters undergo coalescence can be accounted for by undominated markedness constraints prohibiting other types of affricates.

In 41 I provide the final ranking of the constraints relevant for the grammar of imperative truncation, indicating the section in which each constraint is presented.

(41) Constraint ranking (final version)



6. CONCLUSION AND DISCUSSION. The purpose of this study was to provide a formal analysis of imperative truncation in colloquial Hebrew, and the article achieved this goal by accounting for all instances of truncation as well as all instances where truncation is blocked. The analysis within the framework of optimality theory provided a unified account by introducing TRUNCATION as a morphological constraint. The interaction of this constraint with phonological constraints accounts for the variable, and at the same time limited, truncated material (CV truncation, V truncation, and no truncation).

I suggest that all cases of true truncation should be viewed as the outcome of the ranking TRUNCATION ≫ MAXSEG, including those in Tohono O'odham (4) and Danish (7) where only one segment is truncated. This view has been independently proposed in Horwood's analysis of truncation (Horwood 2001). MAXSEG is a family of constraints, where each member of the family can be specified for segmental properties (Zoll 1996). Thus, the fact that only consonants are subject to truncation in Tohono O'odham does not require specifying TRUNCATION for consonants, as the ranking MAXV ≫ TRUNCATION ≫ MAXC ensures that vowels are preserved at the cost of violating TRUNCATION. In Danish the final segment in the base is always a vowel and therefore dissecting MAXSEG is not relevant. But only unstressed vowels are truncated in Danish (see n. 6), a fact that may suggest that FAITHHEAD outranks TRUNCATION. In Koasati, the root of both singular and plural forms ends in a heavy syllable. A high-ranked markedness constraint ROOTFINALHEAVY may thus be assumed (though further evidence is required for a thorough analysis; see alternative proposals in Horwood 2001 and Kurisu 2001). In verbs where the entire rhyme is truncated (6), ROOTFINALHEAVY would rule out the candidate with a final light syllable (*tipas-* → **tipa-*), and a constraint penalizing for long vowels, say *V:, would rule out the candidate with the lengthened vowel (*tipas-* → **tipa*:-). The latter constraint is crucially ranked above MAXSEG, allowing the candidate with the two truncated segments (*tipas-* → *tip-*) to win. In verbs where only the coda consonant is truncated (5), *V: is ranked below MAXSEG, and therefore ROOTFINALHEAVY is satisfied by compensatory lengthening (*famot-* → *famo*:-) rather than by truncation of two segments (*famot-* → **fam-*). Thus, the distinction

between the two types of verbs in Koasati is in the ranking of *V: and MAXSEG (I leave out the question of the appropriate approach to lexically specified distinction; for a recent discussion see Anttila 2002).

The advantage of the approach advocated here is that there is no direct reference to the truncated material; TRUNCATION does not specify the truncated material and is therefore responsible for all cases of true truncation within and across languages. A crosslinguistic generalization obtained by not specifying the truncated material is that the truncated material is minimal, such that there are no languages that truncate, for example, a syllabic foot. A serial derivation approach targeting the truncated material (e.g. Lombardi & McCarthy 1991) would require some ad hoc restriction on the maximal unit that can be truncated. The constraint thus reflects the nature of true (a-templatic) truncation to be minimal, allowing a limited degree of variability within and across languages.

The truncation constraint is activated by a morphological feature (here IMP) independently required in the grammar for syntactic purposes, and therefore the abstract morpheme TRUNC proposed in Benua 1995, 1997 is rendered superfluous.[26] Truncation is a 'pure' process conditioned by the morphology, and a morphological condition does not entail the presence of an affix. Moreover, since constraints are violable, truncation can be blocked, as shown in §4 (and indeed, Benua does not consider the faithful candidates). In order to get a blocking effect within Benua's approach it is necessary to add a violable constraint FAITHTRUNC. Such a constraint diverges from the original purpose of faithfulness constraints to preserve phonological identity, since TRUNC does not carry phonological material. Such a constraint also gives rise to the duplication problem, which is encountered in other treatments of morphological processes as units (McCarthy & Prince 1995 for example, specifies the Tagalog infix *um* in the input as well as in an alignment constraint).

The proposal that true truncation is activated by a morphological constraint is consistent with Russell's (1995, 1999) argument that all morphological processes, including affixation, are introduced by constraints. This approach captures the interaction between phonology and morphology but at the same time draws the required distinction between these two functions in the grammar. Both phonological and morphological processes are introduced by constraints, and as claimed in Martin 1988, whatever can be done by the phonology can also be done by the morphology (see also Alderete's proposal (1998, 2001) that every faithfulness constraint has an antifaithfulness counterpart). That is, morphological and phonological constraints use the same terminology. However, while phonological constraints either ignore faithfulness (markedness constraints) or respect faithfulness (faithfulness constraints), morphological constraints do not ignore and do not respect faithfulness; they are inherently antifaithful.

The view I take here thus draws a distinction between phonology and morphology. Although phonology and morphology interact by virtue of constraint interaction, and although morphological and phonological constraints use the same terminology, morphology is a component by itself (Aronoff 1994) because it has its own constraints; all and only the morphological constraints are antifaithful. By being inherently antifaithful, morphological constraints serve their purpose in creating paradigmatic contrast.

[26] Alderete (1998, 2001) assumes also that when an antifaithfulness constraint accompanies affixation, it is the subcategorization frame of the affix that activates the constraint, that is, the independently required morphological features.

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Dept. of Linguistics
Tel Aviv University
Tel Aviv 69978
Israel
[obatel@post.tau.ac.il]

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