# Defective Paradigms in Derivational Morphology: Hebrew Valence Changing

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*Abstract*

This study examines the correlation between defective paradigms (gaps and irregular forms) and valence changing operations. I examine the productivity of valence changing in Modern Hebrew, manifested in the relation among prosodically distinct configurations, called binyanim. The focus here is on decausativization, an operation that derives decausative verbs by eliminating an external theta role of cause. I show that morpho-phonology can restrict the application of valence changing operations and even block possible derivations when defective verbs are concerned. The analysis provides further support for the lexicalist hypothesis and to a word-based account for Hebrew morphology.

## 1. Introduction

Different thematic realizations of the same concept are derived from the same basic entry via thematic (valence changing) operations, as illustrated in (1) and (2).

(1) a. The storm collapsed the house
    b. The house collapsed

(2) a. John combed himself
    b. John combed

The intransitive verb in (1b) is derived from the transitive one in (1a), while the reflexive verb in (2b) is derived from the transitive verb in (2a). In both cases, the syntactic valence of the verb is reduced. Thematic operations usually result in at least two predicates that denote the same concept. In Semitic languages such as Modern Hebrew (hereafter MH), thematic operations usually have a morphological manifestation (3).

(3) a. dan raxac et acmo
       dan washed Acc himself
       'Dan cleaned himself'

    b. dan hitraxec
       dan washed-Refl
       'Dan washed'

The two thematic realizations *raxac* (3a) and *hitraxec* (3b) are also morphologically distinct. That is, valence changing operations are, to a great extent, manifested in morphological processes. Thematically related verbs in MH share the same stem consonants and are represented in different vocalic patterns called binyanim (Berman 1978). The binyan determines the phonological shape of the verb, i.e. its vowels, prosodic structure and affixes (if any). The phonological shape of a verb, unlike that of a noun, is essential for determining

the shape of the other forms in the inflectional paradigm (Berman 1978, Bolozky 1978, Bat-El 1989, Aronoff 1994). The possible MH binyanim are presented in Table 1.

| Past | Present | Future |
|------|---------|--------|
| pa'al | po'el/ pa'el/ pa'ol | yi-f'a/ol |
| nif'al | nif'al | yi-pa'el |
| hif'il | ma-f'il | ya-f'il |
| pi'el | me-fa'el | ye-fa 'el |
| hitpa'el | mi-tpa'el | yi-tpa'el |

Table 1: MH Binyanim

On the one hand, the choice of a certain binyan for a verb can be predicted. On the other hand, it is subject to a great deal of variation and idiosyncrasy. Previous studies have addressed different aspects of the relations between form and meaning with regard to the verbal systems of MH (Berman 1978, Bolozky 1978, 1999, Schwarzwald 1981, Ravid 1990, Nir 1993, Bat-El 1994, Ussishkin 1999, Doron 2003, Siloni to appear). In this paper, I address the productivity of MH decausativization with regard to morpho-phonology, arguing that the latter restricts the application of valence changing, thereby creating paradigmatic defectiveness.

This paper is organized as follows. In section 2, I present the general framework of my research – the hypothesis that the lexicon is an active component of the grammar. I discuss the basic assumptions of this concept with regard to morphology, phonological representation and the application of valence changing operations. Section 3 discusses the differences between decausativization and passivization. In section 4, I analyze the unique patterns of decausativization that are manifested in verbs with two stem consonants. Section 5 consists of conclusions of my analysis and its implications.

## 2. The Notion of Active Lexicon

The notion of an active lexicon has so far been addressed independently by two points of view, a morpho-phonological and a syntactic-thematic one. This paper supports the view of an active lexicon with regard to both valence changing operations and the application of morpho-phonological processes.

This work is conducted within the framework of the lexicalist approach to word-formation, according to which words are formed by lexical rules, independent of and different from the syntactic rules of the grammar (Chomsky 1970, Halle 1973). It follows Jackendoff's (1975) full-entry theory, according to which the lexicon is a repository of information about existing words. This theory captures generalizations about morphologically and semantically related words without assuming a root is represented independently in the lexicon.

## 2.1. Morpho-phonology in the Lexicon

The word-based approach, originally proposed in Aronoff (1976), is the notion that the lexicon consists of words rather than morphemes or roots. Aronoff's main thesis states that a new word is formed by applying Word Formation Rules (WFRs) to an already existing word. Both the new word and the existing one are members of a major lexical category. Aronoff refers to these rules as once-only rules that do not apply every time a native speaker speaks.

They serve for producing and understanding new words, which may be added to the speaker's lexicon and as redundancy rules defining morphological relations. Such a view assumes a phonological representation of words in the lexicon. This view also correlates with the framework of Lexical Phonology (Kiparsky 1982), in which phonology and morphology are the input of each other. The core of lexical phonology is that a subset of a phonological rule application takes place in the lexicon in accordance with morphological operations, and another subset takes place post-lexically. The output of a phonological process can undergo morphological processes as well as further phonological rules.

These approaches stand in sharp contrast to non-lexicalist approaches such as the Distributed Morphology (hereafter DM) approach (Halle and Marantz 1993, Marantz 1997, 2000, 2001 among others), as well as Borer's approach (2004), which postulate a theory of the grammar without lexicalist assumptions (contra to Chomsky 1970). Specifically, lexicalist approaches are opposed to the notion of Late Insertion (Marantz 1993). Late Insertion is the hypothesis that the phonological expression of syntactic terminals is provided only during the mapping of elements to a Phonological Form (PF). I will highlight the advantages of the word-based approach over late insertion.

Semitic morphology raises questions about the exact process that takes place in forming words. I adopt the theory of Stem Modification (Steriade 1988, McCarthy and Prince 1990, Bat-El 1994), which accounts for generalizations about morpho-phonological alternations by allowing for internal stem adjustments, rather than assuming the extraction of a consonantal root (Bat-El 1986). This theory accounts for the transfer of information, such as vowel quality, consonant adjacency and prosodic structure, from a base to a derived form. It also supplies a uniform account for cases of non-Semitic languages exhibiting phenomena similar to those found in Semitic languages (Bat-El 2002). Various studies have shown the lack of motivation for assuming a root-based derivation (Horvath 1981, Bat-El 1994, 2001, 2002, Heath 1987, Ratcliffe 1997, Rose 1998, Ussishkin 1999, 2000, Benmamoun 2000). In addition to the redundancy of the hypothesis of an independent entity without a surface representation, I will show cases in which a word-based approach provides a better account for the relations between the verbal forms in MH.


## 2.2. The Lexicon as a Computational Component

While valence changing operations apply cross-linguistically, languages vary with regard to operations such as reflexivization (Reinhart and Siloni 2005, Horvath and Siloni 2005). Reinhart and Siloni (2005) suggest that thematic operations can apply in the lexicon or in the syntax, according to a parametric selection. In this framework, the grammar includes an active lexicon (Levin and Rappaport Hovav 1994, 1995, Reinhart 2002, Siloni 2002), which is more than merely a list of items, and allows the application of derivational operations. The lexicon is regarded as an interface between the conceptual system and the computational system. From the thematic point of view, it contains coded concepts, along with their thematic grids, and it functions as a computational component, which can perform valence changing operations pre-syntactically. Nonlexicalist approaches reduce the operative role of the lexicon entirely, transferring all derivational procedures to syntax (Marantz 1997, 2000, 2001, Borer 1998, 2001, 2004, Doron 2003, Arad 2003, Manzini and Savoya 2004 among others). Such frameworks view the lexicon as merely a list of roots, whose argument can be manipulated only in the syntax, by merging with functional heads. I will advocate the view of the lexicon as a computational component with regard to valence changing operations.

## *3. Decausativization vs. Passivization*

Passivization is an operation that saturates the external theta role of agent (Chierchia 1989/2004, Reinhart and Siloni 2005). The external argument is no longer syntactically accessible, but it is still accessible on the level of interpretation. As shown in (4b), a by phrase can be added to the passive predicate, as the agent is still semantically accessible.

(4 )   a. John melted the ice.
         b. The ice was melted by John.

Decausativization (also labeled lexical binding in Levin and Hovav-Rappaport 1995) derives decausative predicates, by fully eliminating an external theta role of cause (Reinhart 1996, 2002). Like passivization, the predicate's valence is reduced and the verb loses its accusative case. However, unlike passivization, the reduced argument is no longer accessible on the level of interpretation. A by phrase cannot follow the decausative predicate (5b) as the external argument is reduced and is no longer accessible in comparison to the case of passivization (4b).

(5)    a. John/The sun melted the ice
         b. The ice melted *by John/the sun.

Following Reinhart and Siloni (2005), I assume that decausativization (as well and reflexivization and reciprocalization) in MH applies in the lexicon, in contrast to passivization that applies in the syntax (Horvath and Siloni 2005).

It is crucial to distinguish between the operations of valence changing and the morphological processes that manifest them. While I adopt the claim that these are two independent mechanisms in the grammar, I argue for a clear correlation between the two. Laks (2006, 2007) shows that lexical and syntactic operations have different morpho-phonological behavior. Passivization and decausativization are different in MH with regard to morpho-phonology. Passivization has a rather steady and predictable morphological pattern, manifested in melodic overwriting, whereby the vowels of the active verb change into *u-a*.

| Base | | Derived form | |
|---|---|---|---|
| hišlix | 'throw' | hušlax | 'be thrown' |
| tipel | 'handle' | tupal | 'be handle' |

Table 2: MH Passivization

The morphology of decausativization, which is manifested in a change of binyan, is much less predictable. There are several possibilities of output binyanim and there is no one-to-one relation between input and output forms (Table 3).

| Base | | Derived form | |
|---|---|---|---|
| a. rigeš | 'make X excited' | hitrageš | 'become excited' |
| b. hirgil | 'make X get used to' | hitragel | 'get used to' |
| c. hirdim | 'put to sleep' | nirdam | 'fall asleep' |

Table 3: MH Decausativization

As shown in Table 3, it is impossible to provide a full prediction of the binyan of derived decausative verbs. When the base transitive form is *pi'el*, the derived decausative verb is usually formed in *hitpa'el* (Table 3,a). However, when the base is *hif'il*, the derived counterpart is sometimes formed in *hitpa'el* (Table 3,b) and in other cases in *nif'al* (Table 3,c). Although there are some common relations between the binyanim with regard to lexical operations, this morphology is much less predictable in comparison to the one of syntactic operations, i.e. passivization.

Lexical and syntactic operations also differ with regard to productivity. Passivization can apply almost freely for every given transitive verb. In contrast, lexical operations are less productive. There are many transitive verbs that are possible input for lexical operations, but do not undergo these operations. For example, the transitive verb *cavat* 'pinch' has no reflexive counterpart (e.g. \**hictabet* 'pinch oneself').

Assuming that decausativization and passivization apply in different components of the grammar, the lexicon and the syntax respectively, the above generalizations about their morpho-phonology show that each component has a different morpho-phonology. This supports the claim that morphology is an independent component of the grammar that interacts separately with the lexicon and the syntax. The unique patterns of decausativization I discuss in 4 provide further evidence for the unique character of the morpho-phonology in the lexicon.

## 4. Unique Patterns of Decausativization

Examining the relations among MH binyanim shows that there is no one to one relation between them with regard to decausativization. This is even more prominent with regard to the unique group of transitive verbs I discuss in this section. Some transitive verbs demonstrate an intriguing morphological behavior with regard to decausativization. This is a group of verbs with irregular morphological patterns. Most of them are stems with only two consonants. Such verbs have different morphological manifestation in the possible output binyanim when decausativization applies. As shown in Table 4, when a transitive verb has the prosodic shape of heCiC, its decausative counterpart can be formed in several different templates. Some are formed by reduplication of the second stem consonant in binyan *hitpa'el* (Table 4, a) while others occur in irregular templates such as *niCoC*, *naCoC*, *niCaC* and *CaC* (Table 4,b-f). The relations between the transitive and decausative verbs in Table 4 are due to historical reasons. It is impossible to explain, for example, why the decausative *counterpart of hecil* 'rescue' (Table 4, c) is *nical* and not \**nacol,* while the decausative counterpart of *hefic* 'disseminate' is *nafoc* and not \**nifac*. Both transitive verbs *hecil* and *hefic* share the same prosodic structure and vocalic pattern of *heCiC* and there are no phonological or semantic factors that could account for these differences. I assume that the transitive verbs in Table 4 are listed as basic entries in the lexicon, while the decausative verbs are listed as their sub-entries, as they are derived by a thematic operation that reduces their syntactic valence. This is crucial with regard to the monosyllabic verbs in (Table 4, e-f), *na'* 'move' and *met* 'die'. The standardly assumed direction of derivation for these verbs is from the morphologically simple form to the more complex one. In this case, the from that is not morphologically complex (e.g. *met*) is assumed to be the base form, while the morphologically complex  form, which takes the prefix *he-*, is assumed to be derived from it. While this is indeed the case in most relations between Hebrew verbs (see Table 3), I contend that the direction is different in the case of (Table 4, e-f). The thematic-semantic relation between *hemit* 'cause X to die' and *met* 'die' is identical to the relation between *hecil* 'rescue' and *nical* 'get rescued'. There is no reason to postulate a different direction of derivation simply because of the morphology of the

verbs. I argue that as long as the operation takes place in the lexicon, the morphological system has access to all lexical forms. Consequently, it can derive one form from the other, applying to the basic entry listed in the lexicon, in accordance with the relevant thematic operation.

| Template | Transitive Base | | Derived Decausative Form | |
|---|---|---|---|---|
| a. Reduplication | he'ir | 'wake X up' | hit'orer | 'wake up' |
| b. niCoC | hezik | 'damage' | nizok | 'get damaged' |
| | hezin | 'nourish' | nizon | 'become nourished' |
| c. niCaC | hecil | 'rescue' | nical | 'get rescued' |
| | hecit | 'ignite' | nicat | 'become ignited' |
| d. naCoC | hefic | 'disseminate' | nafoc | 'become disseminated' |
| e. CaC | he'if | 'fly X' | 'af | 'fly' |
| | heni'a | 'move X' | na' | 'move' |
| f. CeC | hemit | 'casue X to die' | met | 'die' |

Table 4: Decausativization of defective verbs with irregular morphology

The formation of the verbs in Table 4 is also exceptional and unproductive in terms of innovation. Such templates rarely occur in new verbs that enter the language. I assume such forms are lexicalized and their formation is not a part of the morphological component in the lexicon.

What about other transitive verbs that can be decausativized? Since the morphology of verbs in Table 4 in not productive, it is not attested in other forms. There are two groups of such verbs, each of which demonstrates different patterns.

The first group consists of verbs that undergo decausativization manifested by melodic overwriting (Table 5). The vocalic pattern of the verbs changes into *u-a*, similarly to the formation of MH passive verbs. As mentioned in section 3, the formation of passive verbs is relatively productive, as almost every transitive verb can turn into a passive one by overwriting its vocalic pattern. This type pf morphology is considered simple and transparent as in applies quite freely and does not manipulate the prosodic structure of the base form. Due to this high transparency and morphological simplicity it applies mainly in the syntax (Laks 2006). However, it can also apply in the lexicon when there is no other productive way to form predicates by valence changing. The transitive verbs in Table 5 have no decausative alternates that are formed in one of the templates in Table 4. The verb *hesit* 'divert', for example, could theoretically have a decausative alternate such as *\*nasot*, *\*nisot* or *\*sat* 'become diverted'. However, since the formation of such forms is not a part of the speakers' morphological mechanism, it fails to create such forms in addition to the existing ones in Table 4. Alternatively, the morphological component applies a simpler strategy that is highly common in the language, i.e. melodic overwriting, with the vocalic pattern used for passivization. This results in the unification of form of passive and decausative counterparts of some verbs. The verb *huvax* 'be/become embarrassed', for instance, can be interpreted as both passive and decausative.

| Transitive Base | | Decausative Derived Form | |
|---|---|---|---|
| hetiš | 'weaken' | hutaš | 'become weakened' |
| hecif | 'flood' | hucaf | 'become flooded' |
| hesiax | 'distract' | husax | 'become distracted' |
| hesit | 'divert' | husat | 'become diverted' |

Table 5: Melodic overwriting in decausativization

This unification of the two types of verbs is attested in some regular verbs as well. There is a group of decausative verbs with a passive morphology, e.g. *huksam*, derived from *hiksim* 'charm' and *hufta*, derived from *hifti'a* 'surprise'. Both transitive verbs *hiksim* and *hifti'a* do not have derived counterparts in any of the binyanim that are typical for decausativization (e.g. *\*niksam, \*hitkasem, \*nifta, \*pata, \*hitpate'a*). Landau (2002) argues that they have only a decausative interpretation and labels them 'fake-passives', while Meltzer (2005) suggests that they are ambiguous and also share a passive meaning. Such verbs, as well as the ones in Table 5 can have a passive meaning when their external argument is interpreted as an agent.

Another group of verbs demonstrates blocking of decausativization. The verbs in Table 6 do not have a decausative counterpart, neither by changing their vocalic pattern as shown in Table 5, nor by applying the irregular morphology in Table 4. I argue that their irregular morphology blocks the application of decausativization. Examining their thematic grids does not explain why they do not undergo this operation, as there is no observed difference with other verbs that undergo this operation. This results in defectiveness of the transitive-decausative derivational paradigm.

| Transitive Base | | Decausative Derived Form |
|---|---|---|
| he'ik | 'oppres' | *ni'ok,     *hit'okek,     *'ak, *hu'ak |
| heni | 'dissuade' | ------- |
| he'iv | 'darken' | ------- |
| hecik | 'hasle' | ------- |
| hegen | 'protect' | ------- |
| hexiš | 'speed up' | ------- |

Table 6: Morphological blocking of decausativization

Examine, for example the verb *he'ik* 'oppress'. Conceptually, there is no reason for it not to have a decausative counterpart that would denote 'become oppressed'. This could be performed either by forming such a verb in one of the irregular templates in Table 4, such as *\*ni'ok* (as applies in *nizok* 'get damaged') or by overwriting its melodic pattern with *u-a*, resulting in *hu'ak*. However, none of the alternatives is applied and the result is a lexical gap within the transitive-decausative paradigm. One question that this defectiveness arises is whether such gaps have any impact on the language. Do speakers ever have to confront the absence of a decausative form, or are there other means of expressing this? I believe speakers need to use a decausative alternate of 'oppress' to the same extent that they need to use decausative verbs that do exist. I see no reason why verbs such as *hutaš* 'become exhausted' or *nizon* 'become nourished' exist, while decausative counterparts of *hecik* 'hasle' or *heni* 'dissuade' are absent. In both cases, speakers can use the transitive verb to express the same concept, but the language mechanism forms decausative alternates only for some of them.

As shown, morpho-phonology can block lexical thematic operations that apply in the lexicon; this is one of the unique properties of the lexicon and its morpho-phonology. The productivity of lexical operations is lower than that of syntactic operations, which are hardly exposed to gaps. One of the questions I raise is what determines whether an entry would undergo a lexical operation or not. To some extent, it is arbitrary. For example, I see no reason, neither phonological nor semantic-syntactic, why the transitive verb *kilel* 'curse' has no reciprocal counterpart \**hitkalel* 'curse each other' or why the verb *histir* 'hide' has no decausative counterpart although its morphology is regular. However, the reason for low productivity is not totally arbitrary. I contend that in the cases which are not arbitrary, morpho-phonology is involved.

When the base form is a "non-defective" verb (Table 3), there are not many cases where it does not have a decausative counterpart. In this case, there is an active morphological mechanism that can derive another verb from it, hence the derivation is productive. In contrast, when the base is a defective verb, the morphological system fails. It does not derive other new verbs like *hit'orer* 'wake up' or *nicat* 'be ignited', since their derivation is based on a non-active morphology. This is supported by the fact that such morphology is not attested in verb innovation and in the formation of verbs in child language. 'Regular' decausatives are thus formed by (semi-)productive rules and 'irregulars' are lexically listed, whereby some irregulars simply have nothing listed.

The analysis of the data demonstrates that a word-based derivation provides a better account for such cases, by allowing the grammar to be as economic as possible. Root-based theories could account for the formation of defective verbs in two ways. One possibility would be to assume that a root is stored independently in the lexicon and is mapped into binyanim, resulting in morph-phonological alternations. Postulating the existence of a root as an entity is problematic by itself, as previous studies have shown (see section 2.1). Putting this problem aside, such an approach would have to account for the separate morphological processes that would form each template of the defective verbs separately, since such derived verbs occur in various templates. In addition, defective verbs are identified by their paradigmatic relations (not all stem consonants appear in all the forms in the paradigm), and thus the root itself is not sufficient to predict the unique behavior of the verb. Moreover, the root-based approach would have to assume several constraints that block the application of these processes in case there is no derived form (e.g. *he'iv, heni* (Table 6)). The same problem holds for non-lexicalist approached such as Distributed Morphology, as the latter views the lexicon as merely a list of roots and rely on the base of a consonantal root for word formation. Such approaches assume that morpho-phonology applies post-lexically and would fail to explain why certain verbs do not undergo decausativization. Another option is assuming the extraction of a consonantal root from existing defective verbs and mapping it to a binyan. Such an approach does not seem to explain which part of the root is extracted from each verb, as the surface representation of decausative defective verbs sometimes contains a bi-consonantal stem (e.g. *hecil* 'get rescued' ), while in other cases they have three consonants (e.g. *hit'orer* 'wake up'). Which root is extracted from a verb as *he'ir* 'wake', whose decausative counterpart is formed by a reduplication of the consonant /*r*/? Assuming root extraction cannot predict why some roots are mapped to one template, while other roots are mapped to another one. In contrast, in a word based derivation, defective verbs are not formed by any morphological process. Both basic and derived entries are stored in the lexicon as thematically related entries. Other defective verbs that are candidates for decausativization either undergo melodic overwriting, which is a rather productive morphological process, or have no decausative counterparts at all. In case a transitive verb has a regular morphology, its decausative alternate can be derived by transparent and productive morphological processes (see Table 3). A word-based account suggests an explanation to why some morphological

processes are active and others are not, while a root based derivation cannot predict such differences. Such an analysis provides further support for lexicalist approaches for word formation.


## 5. Conclusions

The morphology of decausativization demonstrates three distinct patterns with regard to defective verbs. These patterns of irregular morphology and morphological blocking reveal the role of morpho- phonology as part of an active lexicon and its intertwinement with thematic operations. It provides an account for the gaps and irregularities within derivational paradigms. The analysis also gives rise to a surface-based account, in which forms are derived from actually occurring words (Aronoff 1976), rather than a system in which forms are derived by relating to an abstract stem that never occurs in isolation on the surface (Ussishkin 1999, 2005). If we assumed that such decausative verbs are derived on the base of roots, there would be no reason for their relatively low productivity.

The analysis reveals the effect of morpho-phonological criteria on thematic operations. This interaction seems to be unique to the lexicon, as it is not attested in syntax. The analysis lends support for the unique type of morpho-phonology that applies in the lexicon. It supports the position of morphology as an independent component (Aronoff 1976, Anderson 1977, Scalise 1984, 1988, Perlmutter 1988, Borer 1991, Booij 1996 among others) that interacts with the lexicon.

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