The Psychological Reality of Hidden Lexical Entries
Evidence from Hebrew

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In this paper I discuss *hidden lexical entries*: forms that are assumed to be represented in the mental lexicon even though they do not exist in the actual vocabulary, in order to account for derivational gaps. This mechanism is often criticized to be an ad-hoc, unfalsifiable theoretical tool and to lack psychological reality. I argue that in view of the commonly assumed interface between the mental lexicon and the conceptual system, *hidden lexical entries* are not unfalsifiable. To demonstrate this argument, I present an experiment designed to detect the hidden existence of gaps in the transitive-unaccusative alternation.

1. Introduction: derivational gaps and hidden lexical entries mechanisms

When attempting to reach a generalization regarding word formation, one often encounters the phenomenon of sporadic derivational gaps: cases in which an assumed structure or a derivational rule predicts the existence of a word, which (for no apparent phonological or semantic reason) does not exist.

One word formation theory which explicitly addresses this issue is Halle (1973). Halle presents a lexicalist model of the mental lexicon, i.e., a model that views the mental lexicon as an active component of grammar which includes rule governed derivational relations between the entries listed in it (see also Chomsky 1970, Jackendoff 1975, Aronoff 1976, Reinhart 1996, 2002, Siloni 2002, among others). For example, according to this model, the nouns *approbation* and *proposition* are created from the verbs *approve* and *propose* in the mental lexicon by the following derivational rule ('word formation rule'):

(1) [VERB+ ation]$_N$ → [*approve*+ ation]$_N$ (*approbation*)
[*propose*+ ation]$_N$ (*proposition*)

Nevertheless, this word formation rule also predicts the existence of forms like **arrivation* and **refusation*, which are absent from in the vocabulary of English:

[*arrive*+ ation]$_N$ (**arrivation*)
[*refuse*+ ation]$_N$ (**refusation*)

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There is no particular independent reason to exclude these outputs. Therefore, a model which assumes the word formation rule in (1) must provide an account for the fact that some of this rule's potential outputs are absent from the English vocabulary.

According to Halle (1973), **refusation* and **arrivation* are cases of 'accidental gaps' between the lexicon and 'the list of actual words' in English. They are potential outputs of lexical rules that, just like existing words, are represented in the mental lexicon by a corresponding lexical entry. However, they are also arbitrarily marked [-lexical insertion], which results in their exclusion from the list of actual words by a special filter that prevents them from emerging in utterances. A simplified scheme of Halle's model of the mental lexicon is presented in figure 1 below.

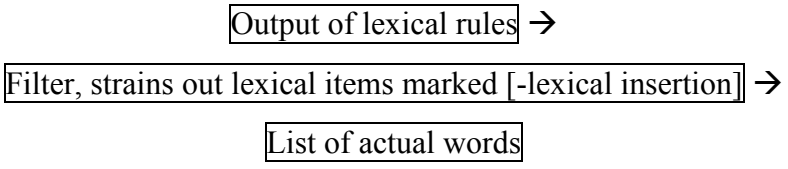

Figure 1

Another lexicalist model which addresses derivational gaps is Jackendoff (1975). According to this model, when two or more lexical items contain less independent information than a random grouping of lexical items, they are connected by a 'lexical redundancy rule', for example:

(2) Rule:
V+ ion→ a noun, the abstract result of the act of V-ing
Lexical items connected by it:
decide+ ion→ *decision*
delete+ ion→ *deletion*

However, the redundancy rule in (2) also implies that the noun *retribution* is derived from the non-existent verb **retribute* and that the noun *aggression* is derived from non-existent verb **aggress*:

**retribute*+ ion→ *retribution*
**aggress*+ ion→ *aggression*

According to Jackendoff, it is speakers' intuition that words with a predictable morphology like *retribution* and *aggression* are not basic forms, and a theory of the lexicon must reflect this intuition. Hence, in his model non-existing inputs of lexical redundancy rules like **retribute* and **aggress* are represented in the mental lexicon. However, their lexical representation is not in the form of a corresponding independent lexical entry, as an actual word would be lexically represented, but as a reference to the lexical ancestors of the forms derived from them (i.e., as part of the information coded in the entries of *retribution* and *aggression*). As a result of lacking a corresponding independent lexical entry, forms like **retribute* and **aggress* do not exist as actual words.

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1.1. Hidden lexical entries

The accounts Halle (1973) and Jackendoff (1975) provide for derivational gaps are similar in the sense that they both assume that the missing forms do exist in the mental lexicon, but are somehow prevented from appearing as actual words ([-lexical insertion] marking, lack of an independent lexical entry).

To refer this type of account for derivational gaps, I use the unifying term *hidden lexical entries*. I adopt Horvath & Siloni's (2008) terminology which separates *the mental lexicon* (a component of the grammar) from *the actual vocabulary* of a particular language (the sum of words speakers can utter) and accordingly define *hidden lexical entries* as follows:

(3) *Hidden lexical entries*: forms that do not exist in the vocabulary of a language but are assumed to have a representation in the mental lexicon.

1.2. Psychological reality?

The assumption of lexical entries that lack a corresponding vocabulary item is often perceived as an ad hoc, unfalsifiable theoretical tool (Aronoff 1976, Anderson 1992, Doron & Rappaport-Hovav 2007). Lacking a corresponding vocabulary item, these forms are always hidden in the mental lexicon and are never used in an utterance. Consequently, there appears to be no way of providing theory-independent evidence for their existence.

I argue that given the common assumption that the lexical component of language is in interface with the conceptual system (Fodor 1975, Pinker 1994, Sperber & Wilson 1997, among others), it is not unreasonable to assume that lexical encoding will have an effect on the perception of the matching concept.[1,2] Therefore, as a result of the language faculty's interaction with other components of the human knowledge, the existence of a lexical entry should be traceable even when there is no direct evidence for it.

Based on this assumption, I conducted an experiment to explore the psychological reality of hidden lexical entries. The experiment used the Hebrew transitive-unaccusative derivational alternation as a case study and its results provide evidence in favor of hidden lexical entries in this context. As a whole, this research shows that even though hidden lexical entries are missing from the physical, articulatory end of language, they are not unfalsifiable theoretical entities.

The remainder of the paper is structured as follows: in section 2 I briefly introduce the subject of unaccusative verbs and the hidden lexical entries mechanism assumed in order to account for gaps in the transitive-unaccusative derivational alternation (Chierchia 1989, Reinhart 2002, Horvath & Siloni 2008); section 3 presents an alternative way to account for these gaps and discusses the differences between the two possible approaches; section 4 is a

[1] When I use the term *concepts* in this paper, I refer to concepts in the wider sense - notions; things that a person is able to think about. I distinguish between *concepts* and *lexical items* and treat the mental lexicon as including a linguistic representation for a subset of all the things a person is able to think about, i.e. concepts. Thus, use of the term concept in this paper does not denote 'a mental primitive' and reference for a mental entity as 'concept' simply implies that it is perceivable by human beings (cf. Fodor 1975, Sperber & Wilson 1997, in which the use of this term often entails 'individual concepts' as opposed to 'complex conceptual expressions').

[2] The effect the existence of a parallel vocabulary item has on a concept is a well studied topic in psycholinguistic research regarding color terms, starting with Berlin & Kay (1969). Hays et al (1972), for example, found that color terms that have a parallel word in all languages (white, black and red) are universally more salient than color terms with parallel words in fewer languages.

summery of a distinction, made by Horvath & Siloni (2008), between two types of unaccusative verbs with no transitive alternate in the vocabulary, which enables the empirical examination of the hidden lexical entries mechanism presented in section 2; in section 5, I present a general hypothesis regarding the relation between lexical entries and the conceptual system and the predictions this hypothesis makes in the context of the transitive-unaccusative alternation; section 6 presents an experiment which tested these predictions, including a detailed description and a statistical analysis of its results; in section 7 I discuss the consequences of these results; section 8 summarizes this paper and presents its conclusion; in appendix A I suggest a way to account for derivational gaps within the framework of Distributed Morphology (Halle & Marantz 1993, Marantz 1997); appendix B includes the list of Hebrew verbs used in the experiment.

2. Case study: Gaps in the transitive-unaccusative alternation

A very general definition of unaccusative verbs (Perlmutter 1978, Chierchia 1989, Burzio 1986, Reinhart 1991, Borer 1994, Levin & Rappaport-Hovav 1995, Pesetsky 1995, Reinhart 2002, Reinhart & Siloni 2005, among others) is that they are intransitive verbs which (a) assign a theme theta-role to an internal argument, (b) lack the ability to assign accusative case and (c) in most cases, have a transitive alternate. For example:

English:

(4) a. The window broke. (unaccusative)
b. The girl /stone /wind broke the window. (transitive)

Hebrew:

(5) a. ha-kadur hitgalgel
the-ball rolled-UNACC
'The ball rolled.'
b. Roza/ha-ru'ax gilgela 'et ha-kadur
Roza/the-wind rolled-TRANS ACC the-ball
'Rosa rolled the ball.'

(6) a. ha-agartal nafal
the-vase fell-UNACC
'The vase fell.'
b. ha-tinok/kadur hipil 'et ha-'agartal
the-baby/ball fall-TRANS ACC the-vase
'The baby/the ball caused the vase fall.'

However, as demonstrated in (7)-(9) below, there are also cases in which the transitive counterpart of a certain unaccusative is idiosyncratically missing from the vocabulary of a given language; these are cases of gaps in the transitive-unaccusative alternation.

English:

(7) a. The vase fell.
b. *The wind/the girl fell the vase.

(8) a. The spot vanished.
b. *The cleaners/the detergent vanished the spot.

Hebrew:
(9) a. ha-cemax naval.
the-plant wilted
'The plant wilted.'
b. * ha-zman/ganan hinbil/nibel'et ha-cemax[3]
the-time/gardner wilt- TRANS ACC the-plant
'Time/the gardener caused the plant to wilt.'

The gaps in the transitive-unaccusative alternation discussed in this paper are sporadic. These are not cases where a form's absence from the vocabulary can be given a semantic explanation, since these gaps idiosyncratically occur in some languages while in others the alternation is complete. Consider (7)-(9) above for example. *fall* and *vanish* have a transitive alternate in Hebrew (*hipil* and *he'elim* accordingly) and wilt has a transitive alternate in Hungarian (*elhervaszt*). It seems unreasonable to argue that the semantics of a transitive lexical entry would prevent it from having a corresponding vocabulary item in one language, while a semantically identical transitive verb can be found in the vocabulary of another. There is also no phonological generalization that can provide an explanation for the absence of these transitive forms; for example, the Hebrew unaccusative *nafal* 'fall' has a transitive counterpart in the vocabulary (*hipil*) while the almost phonetically identical *naval* 'wilt' does not. [4]

2.1. A current hidden lexical entries mechanism: frozen lexical entries

The analysis of unaccusative verbs brought by Reinhart (2002) and Reinhart & Siloni (2003, 2005) is a lexicalist one. According to this analysis, unaccusative verbs are derived from transitive verbs with a Cause external theta role via the lexical operation of 'decausativization', which, as demonstrated in (10) below, eliminates the transitive entry's external theta role and its accusative case feature:

(10) Decausativization: V_{ACC} (θ_{Cause} θ_{theme}) → V θ_{theme}[5]

[3] These non-existent Hebrew verbs are presented here in CiCeC and hiC.CiC verbal templates, which are typical for Hebrew transitive verbs.

[4] Also notice that these are not cases that can be accounted for by the process of 'blocking' suggested by Aronoff (1976). According to Aronoff, the existence of one word in the mental lexicon can prevent the application of a rule which creates its semantic equivalent. However, consider the cases presented in (7)-(9). There is no semantic equivalent for the transitive counterpart of *naval* 'wilt' in Hebrew, and no semantic equivalents for the transitive counterpart of *vanish* in English.

[5] Unlike the Agent external theta role, the Cause role is indifferent with regard to animacy. It could be assigned to either an animate or an inanimate argument. The difference between Agent and Cause is demonstrated in (i-iii) below. *open* and *break* assign a Cause theta role to their external argument while *eat* assigns an Agent theta role to its external argument. Consequently, (iii)a, which has an animate argument in the external position is grammatical while (iii)b, which has an inanimate argument in this position, is not:
(i) a. Max opened the door
b. The wind opened the door
(ii) a. Max broke the window
b. The stone broke the window
(iii)a. Max ate the soup

Important for the purpose of this paper is that, in order to account for derivational gaps, this analysis assumes a hidden lexical entries mechanism, namely 'frozen lexical entries'.

Reinhart (2002) and Horvath & Siloni (2007, 2008) argue that one-place unaccusatives are never basic entries and that they are always derived via decausativization. Gaps in the transitive-unaccusative alternation, like the ones demonstrated in (7)-(9) above, are not considered to be a problem for this generalization. Following Fodor (1975), they assume that lexical information is largely universal, i.e., that apart from phonological forms, the information encoded in the mental lexicon is the same for all natural languages. Therefore, according to these accounts, as long as an alternation is complete in one language or another, it exists in the mental lexicon of all speakers universally.

Reinhart (2002) and Horvath & Siloni (2008) note that all one-place unaccusative verbs have a transitive alternate in one language or another, or had one in earlier stages of a given language. Thus, a one-place unaccusative will always have a transitive alternate listed in the mental lexicon, even in languages where the transitive form does not exist as an actual vocabulary item.

For example, consider the cross-linguistic data from Horvath & Siloni in (11) below. Given the assumption above, the fact that *vanish*, and *collapse* have a transitive alternate in Hebrew and *wilt* has a transitive alternate in Hungarian, is evidence for the universal existence of these transitive forms in the mental lexicon.

(11)

collapse	**wilt**	**vanish**
Hungarian:	Hebrew:	English:
Unaccusative: *összeesik*	Unaccusative: *naval*	Unaccusative: *vanish*
No transitive alternate	No transitive alternate	No transitive alternate
Hebrew:	Hungarian:	Hebrew:
Unaccusative: *hitmotet*	Unaccusative: *elhervad*	Unaccusative: *ne'elam*
Transitive: *motet*	Transitive: *elhervaszt*	Transitive: *he'elim*

In order to account for these forms' absence from the vocabulary of some languages and following Chierchia (1989), Reinhart (2002) and Horvath and Siloni (2008) argues that their representation in the mental lexicon is 'frozen', or, in the current paper's terms, that they are hidden in the mental lexicon.

Frozen lexical entries are lexical entries that cannot be inserted into syntax in a particular language, and hence are not part of the actual vocabulary of this language. However, being represented in the mental lexicon, they can still feed lexical operations and serve as frozen input. Thus, the missing transitive alternates of one-place unaccusatives are frozen lexical entries that, as illustrated in (12), can feed the lexical operation of decausativization:

(12) Decausativization: V_{ACC} (θ_{Cause}, θ_{theme}) → V θ_{theme}
break-TRANS → break- UNACC
And also:
*fall-TRANS →fall- UNACC

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b.*The spoon ate the soup
b.* The soup ate

3. Hidden listing vs. non-existence

The word formation theories discussed above use the assumption of hidden lexical entries to account for derivational gaps. However, the assumption of the hidden existence of the missing part is not a prerequisite for explaining a gap in an alternation. It is possible to do so without assuming that a missing part of the alternation is hidden in the mental lexicon.

An alternative way to address this subject is to argue that the forms absent from a certain language's vocabulary do not exist in this particular language. This approach would argue that for English speakers, for example, the transitive alternates of *fall* and *vanish* simply do not exist: not as words in the vocabulary of the language, and not as mental-lexicon representations. [6]

In other words, a gap in the transitive-unaccusative alternation can be viewed in one of the two following ways:

A. The missing transitive alternate is listed in the mental lexicon in a hidden way and serves as input for unaccusative verb formation, but cannot be inserted into syntax.
B. These gaps occur when an existing unaccusative simply does not have a parallel transitive form in a particular language.

The various differences between these two explanations can be reduced into a single fundamental one: explanation A views the missing transitive as existing, while explanation B views it as non-existent.

Explanation B seems like the null hypothesis – a transitive form is missing from a certain language because it simply does not exist in this language. Nevertheless, if there is theory-independent evidence to justify the assumption of *hidden* lexical entries – of listings in the mental lexicon that cannot be used in an utterance – then explanation A should be preferred.

However, it seems that there is no way to distinguish a hidden lexical entry from a non-existing one. After all, what sort of evidence can suggest that a form missing from the vocabulary is actually listed in the mental lexicon?

Notice that within a model which assumes only two types of unaccusative verbs – (1) derived from a transitive entry with a corresponding word and (2) derived from a frozen (hidden) transitive entry – the assumption of hidden lexical entries would indeed be unfalsifiable. Within such a model, any linguistic behavior typical to the second type will not provide a meaningful insight regarding the existence of hidden lexical entries of the transitive alternate. This is because there would be no way of telling if the behavior an unaccusative verb with no transitive alternate in the vocabulary is the result of its having a hidden transitive alternate or of not having a transitive alternate at all.

4. Two types of unaccusatives without a transitive alternate (Horvath & Siloni 2008)

A contrast between unaccusatives which have a hidden transitive alternate and unaccusatives which have no transitive alternate at all is given by Horvath & Siloni (2008), who provide a starting point for a research devoted to identify hidden lexical entries. This is since it predicts

[6] In appendix B I argue that this is how the non-lexicalist model of Distributed morphology (Halle & Marantz 1993, Marantz 1997) can account for derivational gaps and present a suggestion for such an account within this framework.

a hidden existence of a lexical entry to have particular observable implications that should be absent if the form is not at all listed in the mental lexicon.

Following Jaeggli (1986), Horvath & Siloni (2008) note that, crosslinguistically, unaccusatives with no transitive alternates in the vocabulary never have a corresponding verbal passive form, while there are such unaccusatives with an adjectival passive alternate. Some examples for unaccusatives that have a corresponding adjectival passive are:

(13) English
arrive, *faint*, *fall*, *vanish*

(14) Hebrew
nirkav / hirkiv 'got
naval 'wilted'

(15) Hungarian
kialszik 'extinguish',
elhunyik 'pass away / die'
összeesik 'collapse'

These unaccusative verbs, which Horvath & Siloni (2008) name the 'arrive class', have transitive alternates in other languages (see (11) above for a partial demonstration). Their transitive alternates are only idiosyncratically absent from the vocabulary of certain languages. This leads Horvath & Siloni (2008) to conclude that arrive class unaccusatives have frozen (hidden) transitive alternates.

The second class of unaccusatives with no transitive alternate in the vocabulary is a group of verbs Horvath and Siloni name the 'appeal class', which consists of two-place object-experiencer verbs. Appeal class verbs have a nominative argument that is generated internally (a theme) (Belletti & Rizzi 1988, Pesetsky 1995) and an experiencer, which (in most cases) is an object bearing oblique case (Pesetsky 1995). For example (Hebrew and English):

(16) *ha-ra'ayon xamak mimeni*
the-idea escaped from+me
'The idea escaped me.'

(17) *ze medaber elay*
it talks to+me
'It appeals to me.'

Unlike verbs in the arrive class, for which we can find a transitive alternate in the vocabulary of one language or another, appeal class unaccusatives do not have transitive counterparts in any language (Reinhart 2002). Also unlike the arrive class, they never appear to be morphologically derived and never have an adjectival passive counterpart (Pesetsky 1995). In addition, the appeal class is a crosslinguistic phenomenon. In languages where these verbs exist, they roughly refer to the same concepts. In other words, for this class of unaccusatives there is no crosslinguistic evidence to support the existence of frozen transitive alternates.

Based on these observations, Horvath & Siloni (2008) conclude that appeal class unaccusatives are crosslinguistically not derived. They have no corresponding transitive entry, not even a frozen one.[7]

[7] Horvath & Siloni suggest that the operation forming adjectival passives applies in the mental lexicon and requires transitive entries as input. This can account for the correlation between the lack of crosslinguistic evidence for transitive entries and the absence of adjectival passive alternates. For further details see Horvath and Siloni (2008).

5. Predictions: The GABLE hypothesis

In light of the fact that the mental lexicon is commonly assumed to have an interface with the conceptual system, I will now present a general hypothesis regarding the connection between lexical encoding and the salience of concepts.

(18) GABLE (graded accessibility by lexical encoding) (Fadlon 2008):

The relative salience level of a concept is affected by its lexical encoding.

(a) The existence of a word in the vocabulary of a language X is an accessibility enhancer for the concept it represents.

(b) The existence of a lexical entry (visible or hidden) is also an accessibility enhancer for the concept it represents.

According to the GABLE hypothesis a concept with a corresponding vocabulary item will be more accessible than a concept without one and a concept with a corresponding lexical entry will be more accessible than a concept without one. In other words, it predicts a difference between hidden and non-existent lexical entries. Thus, provided with a method designed to measure the accessibility levels of concepts, the GABLE hypothesis can be used to detect the existence of hidden lexical entries.

Returning to our case study, given Horvath and Siloni's distinction, there are three possible types of unaccusative verbs:

(i) Derived, with a transitive alternate in the vocabulary (*break*)
(ii) Derived, with a frozen transitive alternate (*fall, vanish*)
(iii) Underived, with no transitive alternate at all (*appeal, escape*)

These three types of unaccusatives are related to the following three types of logically possible transitive concepts:

(I) Transitive concepts with a corresponding vocabulary item (*making something break*)
(II) Transitive concepts with a corresponding frozen lexical entry (*making something vanish*)
(III) Transitive concepts with no lexical entry at all, not even a frozen one (*making something escape the mind of someone*)

With regard to (i)-(iii) and (I)-(III) the GABLE hypothesis makes two predictions. First, if frozen lexical entries are psychologically real, the GABLE hypothesis predicts a three-way contrast. If type (ii) unaccusatives indeed have a hidden transitive alternate, in contrast with type (iii) unaccusatives, the GABLE hypothesis predicts that type (I) transitive concepts, with two accessibility enhancers (vocabulary item and lexical entry) will be more accessible than type (II) transitive verbal concepts, with one accessibility enhancer (a hidden lexical entry). In turn, type (II) concepts should be more accessible than type (III) transitive concepts, which have no accessibility enhancers.

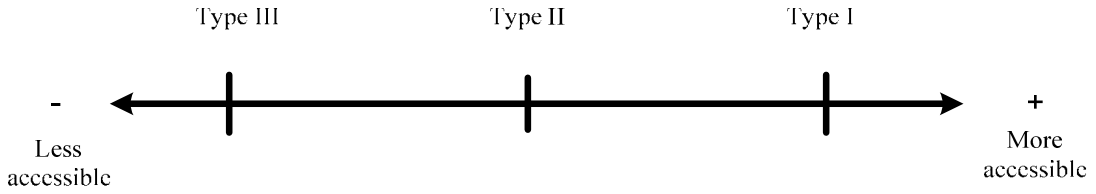

Figure 2

The observation of a three-way contrast, in which concepts with a corresponding lexical entry are distinguished from concepts with no lexical representation at all, would be consistent with explanation (A) above, which uses the notion of hidden lexical entries to explain gaps in the transitive-unaccusative alternation. In contrast, a three-way contrast would be inconsistent with explanation (B), which only distinguishes between forms with a corresponding vocabulary item and forms without one.

The Second prediction the GABLE hypothesis makes in this context, is that if frozen lexical entries are not psychologically real, a two-way contrast should be observed. If type (ii) unaccusatives do not have a hidden transitive alternate and are identical to type (iii) unaccusatives with regard to lexical encoding, the GABLE hypothesis predicts that type (I) transitive concepts (two accessibility enhancer*s*) should be more accessible than type (II) and (III) transitive concepts (no accessibility enhancers). In other words, the accessibility levels of type (II) and (III) are not expected to be different.

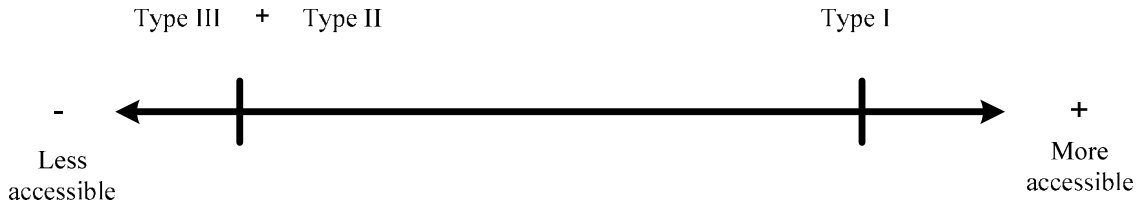

Figure 3

The observation of a two-way contrast would be inconsistent with a theory like explanation (A) that relies on the mechanism of hidden lexical entries, since such a theory predicts a three-way contrast. However, a two-way contrast would be consistent with explanation B which predicts a two-way contrast between unaccusatives with a corresponding transitive in the vocabulary (word) and unaccusatives without one.

6. Experiment

The following experiment was designed to measure the relative salience levels of type (I), (II) and (III) transitive concepts once a speaker is exposed to the their unaccusative verbal variant.

6.1. Participants

Participants included 20 adult native Hebrew speakers, 10 male and 10 female, with an education level of 13 years or more. Participants' age ranged between of 19 and 29 (mean age 24.1). None had any relevant prior linguistic education.

6.2. Stimuli

The stimuli consisted of 8 unaccusative verbs with a corresponding transitive in the vocabulary (type i); 7 unaccusative verbs with no transitive alternate in the vocabulary, but with a parallel adjectival passive alternate (which, following Horvath & Siloni 2008 was taken to suggest they have a frozen/hidden transitive alternate) (type ii); and 6 unaccusative verbs with no transitive alternate, no adjectival passive alternates and no known cases of transitive alternates in the vocabulary of languages other than Hebrew (type iii).[8]

6.3. Task

For each of the 21 unaccusative verbs, a very short story was composed. The stories included scenarios that established the status of a participant as the causer of some event through relevant content. In each story the event was only labeled towards the end of the vignette, using a sentence with one of the unaccusative verbs ('the unaccusative sentence'). The very last sentence of the story described an outcome of the event ('the outcome sentence').

Subjects were then asked to give a 1 (least acceptable) to 8 (most acceptable) rating to describe the extent to which they perceive the causer of the event to be 'the executer of a specific action' that resulted in whatever the 'outcome sentence' described. The rationale behind this task was that the more accessible the transitive concept of the relevant event is for speakers, the higher they will rate its causer as the 'the executer of a specific action'. Examples (19) and (20) are translated examples of short stories and stimuli sentences composed around the unaccusatives *hipil* 'fall', a Hebrew type (i) unaccusative, and *xamak me-* 'escape (the mind of)', a type (iii) unaccusative.

(19)

John and Mary are twins. They are a bit similar and a bit different. John, for example, is a clumsy boy who always drops stuff and Mary is not clumsy at all. In fact, teasing John about his clumsiness is Mary's very annoying habit. Last week they were on their way to Grandma's house for a holiday dinner. John carried the cake and his sister Mary carried a glass dish that contained some fish. The dish was cold, slippery and heavy. Mary felt how it began to slip out of her grip.

*The dish **fell** on the sidewalk. John gloated.*

*On a scale of 1-8, how acceptable/conceivable for you is to consider Mary as the executer of **one specific action** that resulted in the gloating of John?*

In order to grade Mary's role as the executer of an action which led to John's gloating, subjects must activate the transitive concept parallel to the unaccusative *fall* – 'the concept of making something fall'. The more accessible this concept is for them, the higher they should rate Mary as the causer.

(20)

Danny was very happy he was elected to be the chairman of the prom's decoration committee. He was excited about the chance to finally express his creative side. Unfortunately, as the date approached, Danny found it very difficult to come up with a

[8] For a full list of unaccusative verbs used in the experiment see appendix A.

good enough decorating idea. It was about two days before prom night when Danny made himself sit in his room and think real hard. After sitting there for nearly two hours, it seemed to him that this method might be working and that an idea should pop up very soon. But – alas! in the exact moment he felt an idea getting structured in his mind, his sister shouted from the other room: 'Danny, would you be a dear and make me a sandwich?'

The idea ***escaped*** *Danny's mind. It was now completely empty.*

On a scale of 1-8, how acceptable/conceivable for you is to consider Danny's sister to be the executer of ***one specific action*** *that resulted in the emptiness of his mind?*

In order to grade Danny's sister's role as the executer of an action which led to Danny's mind being empty, subjects must activate the transitive concept parallel to the unaccusative *escape* – 'the concept of making something escape the mind of someone'.

The GABLE hypothesis predicts that for each unaccusative, if the relevant transitive concept has a parallel vocabulary item in Hebrew, it should be more salient than transitive concepts without a parallel vocabulary, and that if the relevant transitive concept does not have a parallel vocabulary item, but does have a parallel lexical entry (a hidden lexical entry) it should be more salient than a concept with no representation in the mental lexicon at all. These different salience levels should positively correspond with the acceptability ratings that subjects give to the causers of the events described by the unaccusative verbs.

6.4. Procedure

Each subject participated in a short, one on one, training session which included two items. Subjects that did not show a full understanding of the judgment they were asked to give were excluded from the experiment.

The experiment was performed using a Power-Point slide show and an answer form. The first slide included the first story. Only in the next slide, after pressing the ENTER key, did the subject encountered the 'unaccusative sentence', the 'outcome sentence' [9] and the task. This separation was maintained in order to ensure that it is the unaccusative's verbal concept subjects was considering while answering and not any other verbal concept mentioned in the story. Also for this purpose, subjects were instructed that once they have moved on to the next slide they cannot go back to any previous one. In addition, the unaccusative verbs appeared in boldface.

[9] Outcome sentences were used as mediators between the event described by the target unaccusative and the tasks for two reasons. First, a task which includes a direct question regarding the event described by the unaccusative would have to include the linguistic counterpart of the transitive concept whose salience we wish to measure (*how acceptable/conceivable is it for you to consider Mary as causing the dish to fall?*). This might interrupt the purpose of the experiment, since it could make all three types of transitive concepts highly accessible, which would blur the differences between them. Second, the use of outcome sentences as mediator differentiates the task from simple content questions. In order for subjects to concentrate on giving the intuitive judgment they were asked to give, it was important that they will not feel as though they are being quizzed on the content of the short story they have just read.

6.5. Results

A t-test for correlated samples, performed on a list of 20 mean ratings (one average per subject) showed that the mean ratings for the group of type (i) unaccusatives were significantly higher than the mean ratings for the group of the type (ii) unaccusatives (one-tailed: $t(19)=6.12$, $p<0.0001$), and that the mean ratings for the group of type (ii) unaccusatives are significantly higher than the mean ratings for the group of type (iii) unaccusatives (one tailed: $t(19)=3.12$, $p=0.003$).

The same pattern was revealed by a Wilcoxon signed-rank test comparing speakers' median acceptability rating for each verb type: type (i) unaccusatives were rated significantly higher than type (ii) unaccusatives (one tailed: $W(17)= 0$, $p<0.0001$), and type (ii) unaccusatives are significantly higher rated than type (iii) unaccusatives (one tailed: $W(17)=31$, $p=0.017$).

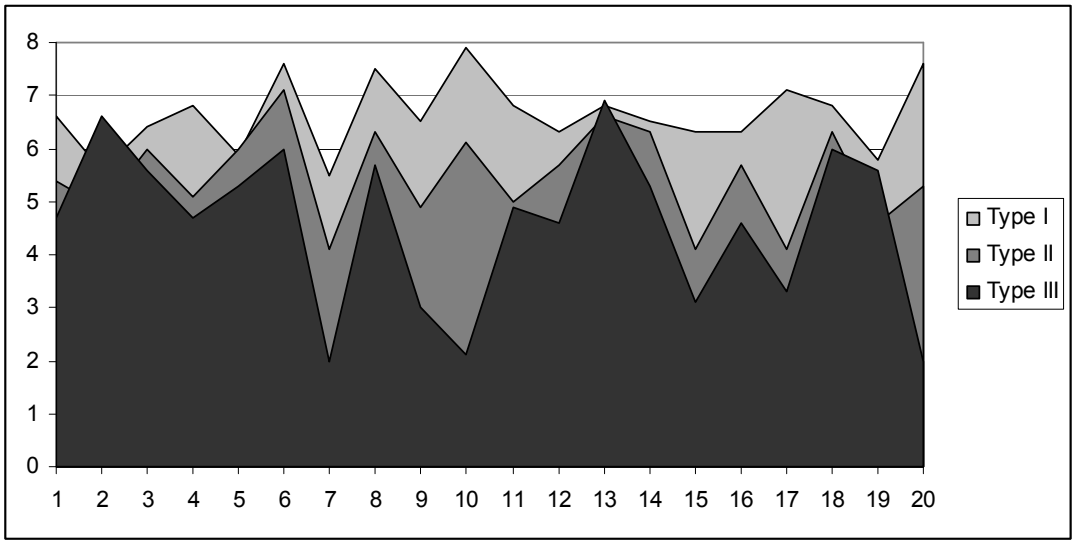

Chart 1: means of ratings per subject

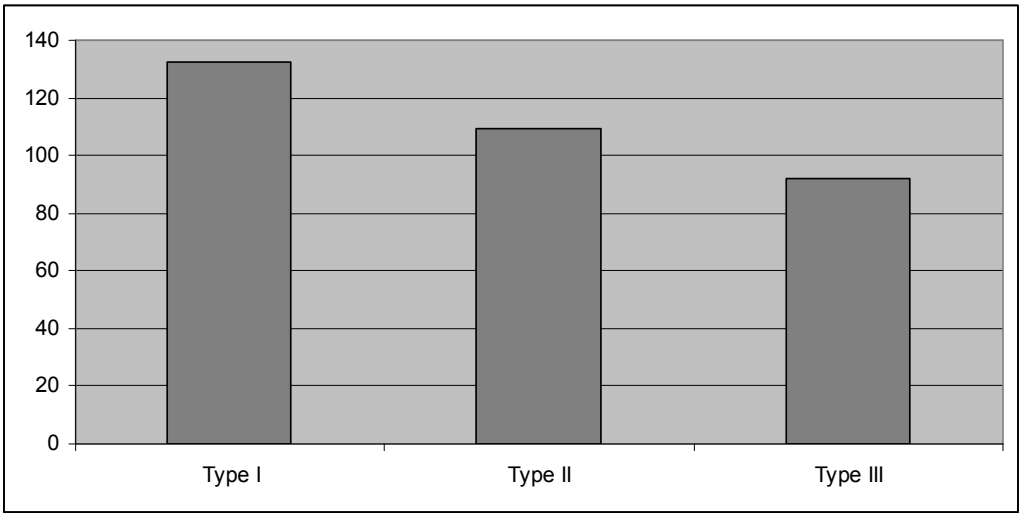

Chart 2: sums of average ratings

7. Discussion

As demonstrated above, a statistical analysis of the results found the ratings for type (I) concepts significantly higher than the ratings for type (II) concepts, and the latter significantly higher than the ratings for type (III) concepts. In other words, subjects graded causers of events described by type (i) unaccusatives higher than causers of events described by type (ii) unaccusatives, and causers of events described by type (ii) unaccusatives higher than causers of events described by type (iii) unaccusatives. These results are in accordance with the GABLE hypothesis's prediction given the assumption that frozen lexical entries are psychologically real: namely, a three-way contrast between type (I), type (II) and type (III) transitive verbal concepts.

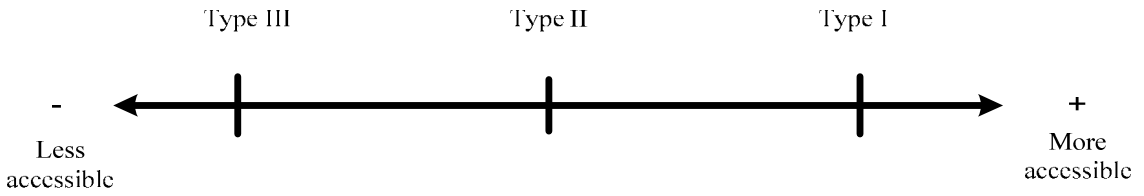

Figure 4

Considering the pattern of salience observed, it is clear that some property, uniquely possessed by type (II) transitive concepts renders them more accessible than type (III) transitive concepts, even though both types lack a corresponding word in the vocabulary of Hebrew. This is evidence in favor of explanation A, which uses a hidden lexical entries mechanism to explain gaps in the transitive-unaccusative alternation, and against explanation B, which does not.

Explanation B cannot account for the significant difference found between type (II) and type (III) transitive concepts. Recall that according to this type of theory, derivational gaps occur when a part of a derivational alternation simply does not exist in a particular language. Consequently, as far as explanation B is concerned, type (II) and type (III) transitive concepts are the same. They both lack a corresponding vocabulary item as well as a mental lexicon representation.

On the other hand, according to the hidden lexical entries mechanism assumed by explanation A (Reinhart 2002, Horvath & Siloni 2008), while type (II) transitive verbal concepts are listed in the mental lexicon in a hidden way (idiosyncratically marked as unable to be inserted into syntax), type (III) verbal concepts are not listed at all. As a result, under the assumption that the lexical encoding of a concept has an effect on that concept's perception, this explanation predicts that the salience levels of type (III) concepts will be lower than the salience levels of type (II) concepts. As stated, this prediction is consistent with the results of the current experiment.

8. Summery and conclusion

This paper has shown that the assumption of hidden lexical entries is not unfalsifiable. Keeping in mind that distinct faculties of human knowledge interact with one another, it is easy to see that even though hidden lexical entries are not used in utterances, there is a way to tap into their psychological reality. According to the GABLE hypothesis, the lexical encoding

of a concept has an effect on its salience level. As a result, the existence of a hidden lexical entry can be revealed through an estimation of its parallel concept's salience level.

With regard to the case study of gaps in the transitive-unaccusative alternation and the particular hidden lexical entries analysis of frozen lexical entries (Reinhart 2002, Horvath & Siloni 2008), the GABLE hypothesis predicts that transitive concepts related to unaccusatives with a transitive counterpart in a speaker's vocabulary will be more accessible than transitive concepts related to unaccusative that are derived from frozen lexical entries, and that latter will be more accessible than transitive concepts related to underived unaccusatives. The results of the current experiment are consistent with these predictions, thus providing evidence in favor of this particular mechanism and against the alternative account (explanation B).

The results of the experiment constitute a step toward showing that the inclusion of hidden lexical entries in a theory of the lexicon is more than a useful theoretical tool; the next step is a cross-linguistic research. It is important to remember that even though derivational gaps are a universal phenomenon, they have language specific manifestations; for instance, the set of type (ii) unaccusatives is not the same across languages. Therefore, relevant independent evidence from other languages is essential in probing the psychological reality of hidden lexical entries.

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Appendix A: Hebrew unaccusatives used in the experiment

Type (i) Unaccusative	**Transitive (Cause external theta role)**
hitkavec 'shrank'	*kivec*
nafal 'fell'	*hipil*
hitkamet 'got wrinkled'	*kimet*
hitlaxlex 'got dirty'	*lixlex*
nigmar 'was finished'	*gamar*
nisb̆ar 'broke'	*sb̆avar*
nisraf 'got burnt'	*saraf*
nirtav 'got wet'	*hirtiv*

Type(ii) unaccusatives	**Adjectival Passive**
hirkiv 'got rotten'	*rakuv*
*kamas*ˇ 'withered'	*kamus*ˇ
naval 'wilted'	*navul*
daha 'faded'	*dahuy*
hexmic [10]'turned sour'	*xamuc*
hexlid 'became rusty'	*xalud*
hitrofef 'loosen'	*rafuy*

Type (iii) unaccusatives

medaber ('el)'appeals (to)'
mešane (le)'matters (to)'
xamak (me) 'escapes from'
xaser (le) 'misses (to)'
xore (le) 'unpleasing (to)'
maca xen (be-einey) 'appeals (to the eyes of)'

[10] '*hexmic'* is ambiguous between 'turned sour' (an unaccusative) and 'made-pickle' (a transitive). Nevertheless, the second is not the transitive alternate of the first.

Appendix B: derivational gaps and non-lexicalist approaches

The need for a mechanism which deals with gaps in an alternation is not exclusive to lexicalist models. Rather, every theory that assumes derivational relations (especially universal ones) between different realizations of the same concept should include such a mechanism.

Consider for example the English unaccusatives *break* (which has a transitive counterpart with a Cause external argument in the vocabulary), and *fall* (which does not). A theory that views *break* as derivationally related to its transitive counterpart would have to account for the case of *fall* in one of the two following ways:

(a) Argue that this derivational relation applies in the case of *break*, but does not apply in the case of *fall*, and provide a language specific explanation for this difference.
(b) Assume the existence of *fall's* transitive counterpart and provide an explanation for its absence from the vocabulary of English.

In the remainder of this section I suggest a way to deal with derivational gaps within a non-lexicalist model of grammar, namely Distributed Morphology (Halle & Marantz 1993, Marantz 1997).

According to the non-lexicalist model of Distributed Morphology the mental lexicon consists of 3 disjoint non-computational lists of atomic elements:

i. List 1 ('narrow lexicon') - atomic 'roots' unspecified for lexical category and atomic bundles of grammatical features able to be combine only by syntax. For example, an unaccusative form and a transitive form of the same verbal concept (the Hebrew *nafal* 'fall' and *hipil* 'made-fall'*)* are not listed separately. They are both represented by the root which encodes the broad concept related to them ('falling').
ii. List 2 (the 'vocabulary') - phonological forms for terminal nodes from syntax. List 2 items compete for insertion and the most highly specified item that doesn't conflict in features with the terminal node 'wins'.
iii. List 3 (the 'encyclopedia') - special meanings of particular roots relative to the syntactic contexts in which they appear.

The Assumption that distinct thematic instantiations of the same root are derivationally related is inherent to Distributed Morphology. Consequently, derivational gaps are a phenomenon this model must address. If an unaccusative and a transitive form of the same verbal concept are different syntactic manifestations of the same root, this model cannot disregard cases of gaps in this alternation. At the same time, the account such a model would give for derivational gaps cannot be a hidden lexical entries mechanism. It cannot include the assumption that the arbitrarily missing parts of the alternation are listed in the mental lexicon in a hidden way. This is since list 1 includes unspecified roots and not verbs of any type, and list 3 includes forms, i.e., only items with corresponding phonological forms can be listed in it. Also, due to the arbitrary and sporadic nature of these gaps, their exclusion from utterances cannot be marked in list 3. This is since there seems to be no semantic generalization to explain their absence from the vocabulary. Nonetheless, there is a way to account for derivational gaps within this framework.

Let us take a closer look at list 2. This component of the disjoint mental lexicon determines the connection between terminal nodes and their phonological realization. Therefore, it is obviously a language-specific list. Even though it is has an interface with phonology, it is not necessarily governed by phonological rules. Being a listing of forms, there is no reason to assume all that list 2 related phenomena must be phonologically motivated. In other words, in this stage of the derivation certain forms can be arbitrarily ruled out from utterances.

Therefore, within the framework of Distributed Morphology, one can argue that in the case of a gap in an alternation, a form suitable for insertion at a certain terminal node is missing from a language's list 2, rendering this terminal node unable to be assigned a form and thus excluded from utterances of this language. Accordingly, in English, the terminal node crated from the root that encodes the broad concept of 'falling' and the grammatical features responsible for unaccusativity, would have a suitable list 2 item, while the terminal node created from the same root and the grammatical features responsible for transitivity would not.[11]

This account is a type (B) explanation, since it is only able to distinguish between possible members of an alternation with a parallel form (word) and possible members of an alternation without a parallel form. As shown, this type of accounts is inconsistent with the results of the experiment presented in section 6 above.

[11] Notice that for such an account to hold, the form *fall* should be marked as suitable for insertion only at unaccusative terminal nodes.