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**Selectivity in Early Child Grammar:  
The Case of Hebrew Verb Morphology**

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## TABLE OF CONTENTS

ABSTRACT	ii
1. INTRODUCTION	1
1.1. Inflectional Morphology	2
1.2. Previous Research on the Acquisition of Inflectional morphology	6
1.3. Hebrew Inflectional Systems	11
1.3.1. Noun and adjective inflections	11
1.3.2. Verb inflections	13
1.3.2.1. Verb stems	13
1.3.2.2. Inflectional categories	14
1.3.3. The category of <i>benoni</i>	18
1.4. Previous Research on the Acquisition of Hebrew Verb Inflections	20
1.5. Development of Morphological Knowledge	22
1.5.1. A developmental view of morphological acquisition	22
1.5.2. Productivity and selectivity in acquisition	23
1.5.2.1. Productivity	24
1.5.2.2. Selectivity	31
1.5.3. Characterizing developmental stages	37
2. DESCRIPTION OF THE STUDY	39
2.1. The Child-Subject	39
2.2. Recording Procedures	39
2.3. Significant Developmental Points	40
2.4. Transcription and Coding	41
2.5. Data Selection	42
2.5.1. Subset of data	42
2.5.2. Productivity in (S's) verb affixation	44
3. FINDINGS	46
3.1. Verb Affixation	46
3.1.1. No affixation	47
3.1.2. Variation in affixation	48
3.1.3. Early Productive affixation	49
3.2. Noun Affixation	54
3.3. Adjective Affixation	56

3.4. Data from other Hebrew-Acquiring children	57
4. DISCUSSION	60
4.1. Summary of Findings	60
4.2. The Gradual Nature of Acquisition	62
4.3. Productivity as a Criterion	62
4.4. The Role of Selectivity in Developing Productivity	64
4.4.1. Selectivity as defining the scope of productive usage	65
4.4.2. Selectivity as a principle in breaking into new grammatical systems	66
4.5. Productivity and Selectivity in the Developmental Path of Acquisition	68
4.6. The Notion of a “Bridge” into Grammatical Knowledge	69
4.7. <i>Benoni</i> Forms as a "Bridge" to Verb Inflections in Hebrew	69
4.8. Directions for Further Study	71
4.8.1. Pros and cons of case-study	71
4.8.2. Comparisons with other languages	74
4.8.3. Implications of child grammar for analysis of the Hebrew verb system	74
4.8.4. The input-output relationship	79
REFERENCES	81

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## ABSTRACT

The study considers the role of Selectivity and Productivity as principles governing the early acquisition of inflectional morphology. It documents the earliest verb inflections used by a Hebrew-acquiring child, S, with the aim of accounting for the order of their acquisition and the dominance of some inflections over others, and so to identify processes of (re) organization of inflectional knowledge.

This is a longitudinal case-study, based on weekly one-hour recordings of the speech of S, a Hebrew-speaking child, in the presence of the investigator (the boy's aunt), occasionally together with other friends and family members. The present analysis covers a period of eight months, starting from his first documented verb form. Recordings included mainly free speech, supplemented by a few more structured elicitations, such as naming and picture description.

For present purposes, the study specifies a qualitative criterion for productivity that measures S's usage of verb inflections according to their grammatical context. That is, only when his verb inflections were consistently used grammatically in the appropriate syntactic environment (requiring Subject-Verb agreement in number, gender, and/or person), was S credited with knowledge of the relevant category.

Analysis revealed that S's verb usage was divided into two periods. During the first four months of his verb productions (ages 1;04.17 – 1;08.10), the vast majority (91%) of his verbs took the form of "bare stems" (Berman & Armon-Lotem, 1997), without affixes, together with a few affixed forms that appeared to be rote-learned (MacWhinney, 1975) and that failed to exhibit what could be defined as stable, productive usage of affixation. Towards the end of this period, S's verb forms began to exhibit a certain degree of variation, since some of his verb lexemes occurred with more than one inflectional affix. From age 1;08.17 on, S's verb forms reflected **productive** usage of affixation, since his affixed forms were consistently grammatical in the linguistic contexts in which they occurred.

During the productive period described above, 73% of S's affixed verb forms were in the *benoni* 'medial' or intermediate category, which serves for words in all three major lexical classes – nouns, adjectives, as well as verbs – both Present-tense (expressing both immediate and extended present) and Participial (Berman, 1978). The present study suggests that this preference for a subset of affixes, much like S's earlier favoring of bare stems, can be defined as "selective", in the sense that it does not reflect the type frequency of the available forms in the ambient language, which has a richly varied range of inflectional affixes, particularly but not only in the category of verbs. Rather, this reliance on a small subset of relevant items suggests that these items are selected as representing a relatively unmarked or neutral categorical status as well as morphological properties. I propose that these forms serve as a "bridge" (Berman, 1983; Ravid, 1997) to fully paradigmatic acquisition of other forms in a given category.

Such selectivity is, in fact, selectivity in productivity, claimed here to characterize the acquisitional process of breaking into new grammatical systems, as proceeding through continuous re-organizing and enlarging of the child's existing knowledge base (Karmiloff-Smith, 1991, 1992). The present study further suggests that the process of early grammatical acquisition can be characterized by the interaction between Productivity and Selectivity, as two "overriding" principles. That is, acquisition is both selective and therefore gradual and protracted, but also productive and thus achieved through application of generalizations to increasingly larger sets of items.

## **1. INTRODUCTION**

The present study deals with the acquisition of early verb morphology by a Hebrew-acquiring child, S. Its goal is to document and account for the order of occurrence of inflectional morphology in his speech. Focusing on his verb inflections, it aims to identify re-organization in S's morphological knowledge that can be taken as indicative of a transition from one developmental stage to another. To this end, the study considers the issue of productivity in the acquisition of morphological categories, and attempts to set criteria for identifying productive use of affixes.

In order to account for the occurrence of certain affixes before others and for their predominance at a certain period of time, the study considers developing morphological knowledge in terms of the principles of productivity and selectivity. It also relies on the concept of a "bridge" to knowledge by means of a subset of items selected for productive use that enable children to break into a new complex morphological system.

The developmental orientation to language acquisition adopted here leads to the hypothesis that productive use of verb affixation system in Hebrew will be acquired gradually. Initially, only a subset of items will be acquired, followed by a gradual expansion of the set of items used productively in a given grammatical category. The items favored in the early stages of acquisition will be not only morphologically simpler but also less marked or more neutral than other items in a given category.

This introductory chapter starts by an overview of notions in inflectional morphology and of the system of Hebrew verb inflections in research on linguistics and language acquisition, as background to the conceptual framework of this study in terms of the developmental principles of productivity and selectivity.

## 1.1. Inflectional Morphology

Below follow definitions of basic terms in Morphology that provide relevant background to the present study. Different approaches may assign these terms different definitions, therefore, I specify here in what sense I am going to use them.

Morphology is the domain of linguistics that deals with the internal structure of words (Lyons, 1968; Spencer, 2003), traditionally revolving around morphemes.<sup>1</sup> A morpheme is the classic elementary unit in morphological analysis (Anderson, 1992), traditionally defined as a minimal unit of meaning (Hockett, 1958), or as a linguistic form that does not bear phonetic-semantic resemblance to any other form (Bloomfield, 1933). The base morpheme to which other morphemes are attached (by processes of affixation as described below) is termed stem or root more or less interchangeably, often differing from one scholar or one period to another (Aronoff & Fudeman, 2005, Bloomfield, 1933). Because of the special status of the (consonantal) root in a Semitic language like Hebrew (Shimron, 2003), the present study uses the term “stem” for the base form of words.

I deal here with two main types of concatenative affixes that can be added to the stem: Prefixes that are added before the stem (for example: *unfair*), and Suffixes that are added after the stem (for example: *fairness*).<sup>2</sup>

A morpheme is considered by some to be the basic unit of the word, analogously to the word as the basic unit of a sentence (Andersen, 1992). However, morphology is

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<sup>1</sup> "Word" here is an inclusive term used to refer to word-forms, lexemes, and lexical units in general (Cruse, 2001), as further specified later in this section.

<sup>2</sup> Two other types of affixes are Infixes that are added in the middle of the stem (for example, the Tagalog infix *um* in *s-um-ulat* 'one who wrote', from: McCarthy & Prince, 1993: 101-105) and Circumfixes, that are divided into two parts, one attached to the front of the word and the other to the end (for example, the Indonesian *ke-...-an* in the noun *ke-besar-an* 'bigness, greatness', from: MacDonald, 1976: 63) (Aronoff & Fudeman, 2005). Some scholars treat the stem-internal vowels of a language like Hebrew as “infixes” (e.g., for the root *h-l-k* – *holex* present tense ‘walks’ versus past tense *halax* ‘walked’, or for *d-b-r* *diber* ‘(he) spoke’, *dubar* ‘was spoken’, *dibur* ‘speech’), but this term is not applied here, since only some stem-internal vowel patterns represent grammatical categories like present versus past tense. (For example, in a noun like *šulxan* ‘table’, the vowels *u* and *a* in the pattern *CuCaC* are as arbitrary as are the two vowels in an English word like *vowel*).

not considered here to be merely a matter of superficial morpheme concatenation, but a unique meeting ground between syntax, on the one hand, and phonology, on the other, in what Aronoff (1994, p. 9) describes as "the complex process by which abstract morphosyntactic representations are realized morphophonologically". Moreover, this complexity derives not only from formal or structural factors, but also reflects the abstract nature of the categories involved in morphological representations and the alternating relations between them. Besides, structurally, not all morphological processes involve concatenating morphemes. For example, in Semitic languages like Arabic and Hebrew, morphological processes may be realized by changes in the vocalic pattern of the stem.

The notion of a "word", the unit that typically sets the boundaries for morphological analysis and crucially relevant for the present study, is even more complex and difficult to define – even though it is intuitively the basic building block of language (Anderson, 1985; Berman, 2001). A key term relevant to words and the relations between them is the Lexeme. According to Aronoff (1994), a lexeme is a "sign" that has its own meaning and syntax. Spencer (2003) defines a lexeme as a complex representation that links a meaning with a set of grammatical words, which are associated with corresponding Word-Forms, the linguistic elements that are realized on the surface. Spencer considers any form-meaning pair as a "sign", with the lexeme a prototypical example of a sign, hence an essentially abstract construct. As a result, lexemes are inherently unspecified for the variable categories that are encoded by inflections (e.g., number or gender on nouns, tense or aspect on verbs), but they nonetheless contain sufficient information for these categories to be realized morphophonologically (Aronoff, 1994). A Lexeme is thus an abstract unit that may be linked to several surface forms; for example: the lexeme *JUMP* can be linked to the

Past tense form *jumped*, the Present tense form *jumps* and the Future tense form *will jump*.<sup>3</sup> These forms are generally taken as not representing separate lexical entries, since they all share the same lexeme and differ only in their Inflection.

The present study focuses on the acquisition of inflectional system Hebrew of verbs. Morphological processes are traditionally divided into Derivational and Inflectional. While derivational processes create new lexical entries, and can even change the lexical category (e.g., *run* ~ *runner*), inflectional processes mark a form in relation to other elements in the same grammatical environment. That is, inflections encode morphosyntactic information, such as Tense, Number, Gender, and other abstract syntactic categories, without changing the core lexical meaning of the form (e.g., *they run* ~ *she runs*, *a run* ~ *two runs*) (Aronoff & Fudeman, 2005; Bybee, 1985; Lyons, 1968). Bloomfield (1933) relates to inflection as an "outer layer" and to derivation ("word-formation") as an "inner layer"; he contrasts them on the basis of "parallelism" of the underlying and resultant forms, saying that in inflectional as against derivational relations, related forms are more predictable from one another (e.g., the inflectional relations between *climb* and *climbed* are more predictable than the derivational relations between *climb* and *climber*).<sup>4</sup> A set of inflected forms typically defines a grammatical Paradigm, which in turn is related to the notion of a lexeme since any given paradigm as a whole can be represented by a single form, or what may be considered an "underlying word". That is, both inflection and derivation represent relations between words, but only inflectional paradigms include different word-forms that are equally related to the same lexeme.

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<sup>3</sup> Upper case letters are used to represent lexemes, in order to distinguish them from word-forms, in this case, specific forms of verbs.

<sup>4</sup> And see, too, Berman (1993) for why the so-called *binyan* verb-patterns of Hebrew need to be considered as derivational rather than inflectional systems in the language.

Inflectional and derivational operations do not differ formally, since both are realized by the same types of structural units (roots, stems, affixes) and operations (affixation, vowel changes, epenthesis, etc.). Thus, both linear affixation as well as non-concatenative operations apply to inflectional as well as derivational processes (Anderson, 1988; Aronoff & Fudeman, 2005). A key difference between the two is that inflectional morphology tends to represent more regular form-meaning matchings (for example, the English inflectional suffix *-ed* nearly always stands for past tense, or participle, but the derivational category of, say, agent nouns may be represented by various suffixes or by syntactic conversion). As a result, inflection is also more productive, in the sense that it applies relatively freely, often across the board, to a given lexical category, whereas derivational morphology is typically restricted to a subset of lexical items. For example, almost all English nouns have Plural forms (e.g., *boy ~ boys*, *flower ~ flowers*), but not all have a related adjective (e.g., *boy ~ boyish*, but not *flower ~ \*flowerish*) (Aronoff & Fudeman, 2005). In fact, inflectional morphology can be said to be obligatory, since it is required by the syntactic categories that it encodes, and hence typically applies productively to all or at least most of the relevant lexical items in a given category in a given language.

Items in the lexicon are traditionally subdivided in terms of membership in “word classes” that are grammatically determined (Lyons, 1968). The major lexical classes include Nouns, Verbs, and Adjectives, each characterized syntactically by the fact that the items in a given category are expected to exhibit similar inflectional behavior and to occur in similar syntactic contexts. For example, Hockett (1958) makes a distinction between Nouns and Adjectives such that Nouns have inherent gender whereas adjectives inflect for Gender, and hence, Gender is an inflectional category for Adjectives. All lexical items in a given language inflect for one or more

inflectional categories, depending on language typology and to which lexical category they belong. The present study examines S's inflections in the three lexical categories, with focus on his verb inflectional morphology.

## **1.2. Previous Research on the Acquisition of Inflectional Morphology**

The present study concerns the acquisition of inflectional morphology, focusing on verb inflections. This section delineates issues relevant to this investigation, against the background of previous research on the acquisition of inflections.

Children's developmental path in acquiring inflectional morphology can be considered to shed light on more general questions in language acquisition, such as whether children learn inflections item-by-item in rote fashion or by generalized rules, when they become aware of word-internal structure, and how and to what extent typological, formal, and/or conceptual factors play a role in shaping the acquisitional path (Clark & Berman, 2004; Dromi, 1999; Tomasello, 2003).

Existence of rule-based cognitive representations can be taken as evidence that linguistic systems consist of abstract, formal representations (Tomasello, 2003). As such, acquisition of inflectional systems requires children to approach language as an independent system, mastering its internal (and sometimes arbitrary) rules or conventions, and not only to use it as a tool for expressing meanings (Andersen, 1992). As functional items, inflectional morphemes have a critical role in determining relations between words, and so, as noted by Andersen (1992), children begin to produce verb inflections when they start combining words and expressing such syntactic relations.

As used here, the term "acquisition" refers to when the child exhibits **productive** use of a given inflectional category – where “productive” is assigned a specific

interpretation, as elaborated below (Section 1.5.2.1). Since inflection is obligatory, speakers of a given target language have no choice but to use inflectional morphology and to apply it appropriately to the forms that they produce (Berko, 1958). Previous studies show that children's initial usage of grammatical elements such as verb inflections is not necessarily productive, and in many cases, seems to be rote-learned (Bowerman, 1985; Clark & Berman, 2004; Gathercole, Sebastián, & Soto, 1999; Kilani-Schoch & Dressler, 2002; MacWhinney, 1975); that is, although inflections may surface early on in child language, they do not always manifest morphological knowledge. For example, Bassano (2000) notes that although French-speaking children produce verbs early on, these are used with productive inflections relatively late. Similar observations have been made for early verbs in Hebrew, as noted further below. One indication for initiated as against merely repetitive use of grammatical categories is errors in child speech. Clark (2003) divides children's initial errors with new forms into two types: "omission" – cases in which children omit inflections altogether, and "commission" – cases in which children apply over-generalization to irregular items – attributing forms derived by commission to the existence of morphological knowledge. The present study aims to show, that the omission of inflectional morphology may also be considered as indicative of knowledge.

Several different approaches have attempted to account for the pace and order of acquisition inflectional morphology in verbs. Previous studies on the acquisition of verb morphology show that, at the beginning, forms of one inflectional category tend to predominate in the child's speech, largely replacing other related inflectional forms (Berman, 1981a; Brown, 1973; Bybee, 1978; Dressler & Karpf, 1994; Laaha, Ravid, Korecky-Kroll, Laaha & Dressler, 2006; Ravid & Farah, 1999). A critical issue related to the various accounts for such phenomena is of the balance between innate

knowledge and the role of the input language (Bowerman, 1985). That is, to what extent innate constraints in the children's grammar determine the order of occurrence of grammatical categories in their speech, and what the absence or occurrence of categories can imply regarding the knowledge children possess.

Some nativist approaches take a continuous view of children's grammar, arguing for maturation of grammatical categories such as inflections, and attribute the absence of inflectional morphology in early speech to innate constraints that are an integral part of Universal Grammar. Inflectional categories can sometimes be omitted, and result in so-called "Root-Infinitives" constructs, since such categories in children's early grammar are subject to maturation (see, for example, Goodluck, 2007; Haegeman, 1995; Radford, 1990; Rizzi, 1994; and Wexler, 1995). A completely different approach accounts for the absence of morphological marking in early speech by arguing that in the initial stages of acquisition, children have no morphological grammar at all (Dressler et al, 1987; Dressler & Karpf, 1994). Instead, children move from a "premorphological" stage, where no system of grammatical morphology has dissociated from a general cognitive system, to a "protomorphological" stage, where the system of morphological grammar and its subsystems begin to develop.

The present study focuses on another approach that specifies innate "principles" that determine the way children's linguistic systems interact with their environment. Slobin (1985) specified "operating principles" as children's self instructions for perceiving and producing speech and for organizing and storing linguistic rules. He proposed that although children may not be credited to be equipped with "knowledge" at the outset of acquisition, they can be said to be equipped with a set of "procedures" for analyzing linguistic input.

Early on, Slobin (1973) specified as a cognitive prerequisite for the development of grammar the ability to relate to both the meanings and forms of utterances, on the assumption that a child cannot be credited with knowing a given linguistic form until he or she understands its meaning. This means that, in inflectional morphology, the child needs to perceive the meanings and contrasts involved in concepts such as singular versus plural (one or more than one) or present versus past (now or before now), in order to acquire grammatical categories such as Number or Tense. In addition, as pointed by Clark (2003), before children can use inflections productively, they have to master the formal constraints in their language, that is, they need to know where these can occur. Children also need to classify items into word-classes, in order to apply the appropriate inflectional operations to the relevant items. Clark further suggests that after adding grammatical morphemes to their repertoire, children can use them to identify word-class membership. In an earlier attempt to address the issue of compositionality in acquisition, Brown (1973) formulated a "law of cumulative complexity" to the effect that if children are able to construct two components into one, it follows that they are also able to construct each of them separately. In sum, in acquiring inflectional morphology, children need to master compositional systems, and in order to do so, they must gain control of the form and meaning of their components.

According to such approaches, both formal and conceptual complexity play a role in determining the order and pace of the acquisition of these categories (Andersen, 1992; Bybee, 1979; Clark & Berman, 2004; Slobin, 1973). Each inflectional modulation adds complexity to the word, and therefore, inflections combining several features are predicted to be acquired later than those that bear one-to-one form-meaning correspondence. For example, in English, children acquire the *-iz* suffix on

nouns that end in a sibilant later than other markers of plural or 3<sup>rd</sup> person present tense (Berko, 1958); and conceptually – verbs in future tense are acquired later than present and past (see, for example, Berman & Dromi, 1984, 1999; Brown, 1973, Tomasello, 1992). In many cases, there is an interplay between the two factors as, for example, in why Hebrew-acquiring children use two out of the three forms of resultative participles (*CaCúC* and *meCuCáC*) earlier and better than *muCCaC*, which is both structurally and conceptually more complex (Berman, 1994). Relatedly, Ravid & Farah (1999) noted that the degree of morphological productivity and language typology also play a role in determining which forms predominate the child's speech in the acquisition of plural forms in Palestinian Arabic.

Karmiloff-Smith (1991, 1992) proposes a model of Representational Redescription that will be presented in more detail later on, in section 1.5.1. This model depicts a continuous process of development in which children's base of knowledge constantly enlarges through interaction with the environment. Karmiloff-Smith claims that human cognition is equipped with some innately specified information that channels its attention to specific input. This model includes innately-specified processes which enable self-redescription and self-organization, such that the human mind represents recursively its own internal representations.

In sum, previous research have concerned key issues in language acquisition, and in particular in inflectional morphology, such as the relation between language output and linguistic knowledge (Gleitman, Gleitman, Landau & Wanner, 1988), identifying and characterizing children's existing state of knowledge (Karmiloff-Smith, 1992), stages in acquisition of knowledge (Berman, 1986; Brown, 1973).

The present study concerns with the issue of "productive" usage of inflectional categories. Inflectional categories are identified as "acquired" only when there is

evidence for morphological knowledge that enables the child to use these categories in a grammatically appropriate manner. For this purpose, I attempt to set criteria for measuring "productive" usage of inflectional categories (As will be defined later on, in Section 1.5.2.1). In addition, the notions of re-organization and constant expansion of the available knowledge basis (Karmiloff-Smith, 1991, 1992) will be adopted here, in accounting for the acquisition of inflectional morphology.

Against this background, the present study attempts to deal with these issues in the acquisition of inflectional affixes in Hebrew verbs.

### **1.3. Hebrew Inflectional Systems**

This section outlines the inflectional paradigms of Hebrew major lexical categories – nouns, verbs, and adjectives, with reference to the affixes, as background to the present study concerning the acquisition of inflectional morphology of Hebrew verbs. Special attention is accorded to the so-called *benoni* 'medial' forms of verbs, in order to demonstrate that their intermediate status in Hebrew is relevant for the acquisition of inflectional verb morphology. The following outline considers the two traditionally nominal categories of Nouns and Adjectives together (Section 1.3.1) with separate attention to Verbs as the focus of this study (Section 1.3.2).

#### **1.3.1. Noun and adjective inflections**

All Hebrew nouns are grammatically specified for Gender, either natural gender in animate nouns (for example, *tarnegól* 'rooster' is Masculine, while *tarnegól-et* 'hen' is Feminine), or grammatical gender (for example, *bakbúk* 'bottle' is Masculine, while *cincén-et* 'jar' is Feminine). Feminine nouns are often identified by their suffix (*-a*, *-it*, *-et*, and *-ut*), though there are quite a few feminine unaffixed nouns (e.g. *cipór* 'bird

FM.SG.'). Masculine nouns are not structurally marked (e.g., *kiyór* 'sink MS.SG.'). Nouns are inflected for Number by the addition of the Plural suffixes *-im* for Masculine nouns and *-ot* for Feminine, where Singular animate nouns are also inflected for Gender.<sup>5</sup> Feminine Singular counterparts of Masculine nouns are generally inflected by the addition of the suffixes *-a*, *-et* or *-it*, (e.g., *barváz* 'duck MS.' – *barvaz-á* 'duck FM.', *xayál* 'soldier MS.' – *xayél-et* 'soldier FM.', *sapár* 'barber MS.' – *sapar-ít* 'hairdresser FM.'). Thus, all Hebrew nouns are specified for Gender and inflect for Number, while some can be inflected for both Number and Gender.

**Table 1: Hebrew noun inflectional affixes**

Masculine Singular	Feminine singular	Masculine plural	Feminine plural
<i>barváz</i> 'duck'	<i>barvaz-á</i>	<i>barvaz-ím</i>	<i>barvaz-ót</i>
<i>xayál</i> 'soldier'	<i>xayél-et</i>	<i>xayal-ím</i>	<i>xayal-ót</i>
<i>sapár</i> 'barber'	<i>sapar-ít</i>	<i>sapar-ím</i>	<i>sapariy-ót</i>

As predicative elements, Adjectives do not have inherent Gender or Number, and all adjectives must be inflected for Gender and/or Number to agree with their head Noun (e.g., *yald-á yaf-á* 'girl pretty FM.SG = (a) pretty girl') (Aronoff & Fudeman, 2005; Ravid, 1995a). Their unmarked citation form is Masculine Singular. Adjectives are inflected by the addition of suffixes similar to those used with nouns: *a*, *-et* and *-it* for Feminine Singular (e.g., *adum-á* 'red FM.SG.', *axér-et* 'different FM.SG.' *gandran-ít* 'dandy FM.SG.'), *-im* for Masculine Plural (e.g., *adum-ím* 'red MS.PL') and *-ot* for Feminine Plural adjectives (e.g., *adum-ót* 'red FM.PL.').

**Table 2: Hebrew adjective inflectional affixes**

Masculine Singular	Feminine singular	Masculine plural	Feminine plural
<i>adóm</i> 'red'	<i>adum-á</i>	<i>adum-ím</i>	<i>adum-ót</i>
<i>axér</i> 'different'	<i>avér-et</i>	<i>axer-ím</i>	<i>axer-ót</i>
<i>gandrán</i> 'dandy'	<i>gandran-ít</i>	<i>gandran-ím</i>	<i>gandraniy-ót</i>

<sup>5</sup> There are some lexical exceptions where *-ot* is added to Masculine nouns (e.g., *xalonot* 'window MS.PL.'), or *-im* is added to feminine nouns (e.g., *ciporim* 'bird FM. PL.')

### 1.3.2. Verb inflections

Modern Hebrew has a three-way tense system, including Past, Present and Future as well as two moods, Imperative and Infinitive, which are not marked for tense (Coffin & Bolozky, 2005). This inflectional system mark Number, Gender, Person and Tense, usually by means of one conflated morpheme, since this is a fusional system (Levy, 1981). Finite verbs must agree with their subject in Gender, Number, and – in Past and Future – for Person. The inflectional categories are marked either by addition of stem-external affixes, typically for Gender, Number, and Person (e.g., *holéx-et* 'is.walking FM.SG.', *haláx-ti* 'walked 1<sup>st</sup> SG.')

and/or by stem-internal vowel changes marking Tense/Mood (e.g., *halax* 'walked' vs. *holex* 'is.walking') (Schwarzwald, 2002).

#### 1.3.2.1. Verb stems

A crucial question arises in defining a "stem" or a "bare stem" (Armon-Lotem & Berman, 2003), whether in linguistic analysis or in child language. The question arises as to what can be defined as "basic form" in an inflectionally rich language like Hebrew (Berman, 1978b). Unlike English *jump*, *walk*, *eat* etc., there is no unequivocally unmarked form that is neutral morpho-phonologically as well as semantically, or citation form – some use the infinitive form, other use Masculine Singular Present or Past tense forms.

In the present study, "bare stems" are defined as stems with no stem external affixes. These include Masculine Singular in past tense, Masculine Singular forms in Present tense in two of the verb conjugations (*binyanim*), Masculine Singular Imperatives, and Infinitives. This view of the "unmarked" nature of stems without affixes is also taken by Gathercole, Sebastián & Soto (2002), who treat Masculine

Singular forms in Spanish verb system as the "unmarked". These forms, according to the analysis of Gathercole et al, are unmarked since they involve only stem-internal vocalic change, with no stem external affixes.

Previous research on the acquisition of Hebrew inflections have shown that children identify bare stems at their initial stages of acquisition, and the present study aims to show that these forms play an essential role in the developmental path of acquisition.

#### 1.3.2.2. *Inflectional categories*

Below is a brief review of the structure and function of inflectional categories in the Tense/Mood system of Modern Hebrew:

The Infinitive is composed of the Future stem of the verb plus a prefixed *l* as its marker (Berman, 1978a). The prefixal vowel alternates depending on the verb stem (e.g., *lignor* 'to finish', *lasim* 'to put', *le'exol* 'to eat') or its associated *binyan* verb pattern (e.g., *lilbosh* 'to.wear', *lehalbish* 'to.dress').

The Imperative mood typically conveys commands and instructions (Coffin & Bolozky, 2005). Imperatives inflect only for 2<sup>nd</sup> Person and, like Infinitives, they have the same base as the future stem. Number and Gender are marked by suffixes: *-i* for Feminine Singular (e.g. *kúmi!* 'get up FM.SG.!) and *-u* for Plural, both Feminine and Masculine (e.g., *kúmu!* 'get up PL!). Traditionally, Imperatives are formed either with no prefix or with a prefix composed of the consonant *h* plus a vowel (*hV*). These forms, however, are irrelevant for child language, since they are rare in everyday Hebrew (Berman, 1985; Bolozky, 1979). In colloquial usage, when Imperative forms occur with a prefix, they occur with the 2<sup>nd</sup> Person Future prefix *t(V)-* (e.g., both *kanés!*, *tikanés!* and *tkanés!* can be used for 'get in!') (Bolozky, 1979; Bat-El, 2002).

Present tense can refer to a repeated, continuous or ongoing action or a state (Coffin & Bolozky, 2005). The unmarked Masculine Singular form is composed of a stem with no suffixes (e.g., *boxe* 'is.crying MS.SG.', *oxel* 'is.eating MS.SG.'). All Present tense verbs are inflected only for Number and Gender, encoded by the suffixes: *-a* and *-et* for Feminine Singular (e.g., *box-á* 'is.crying FM.SG.', *oxél-et* 'is.eating FM.SG. '), *-im* for Masculine Plural (e.g., *box-ím* 'are.crying MS.PL.', *oxl-ím* 'are.eating MS.PL.') and *-ot* for Feminine Plural (e.g., *box-ót* 'are.crying FM.PL.', *oxl-ót* 'are.eating FM.PL.'). In three of the five verb patterns (binyanim), Present tense forms are also marked with a prefix *mV-* (e.g., *me-va šél-et* 'is.cooking FM.SG.', *ma-lbi š-ím* 'are.dressing MS.PL.', *mitlab š-ím* 'getting.dressed MS.PL.') (Schwarzwald, 2002).

Past tense verbs are inflected for Gender, Number, and Person, all encoded by inflectional suffixes (e.g., *hitraxác-ti* 'washed 1<sup>st</sup> SG.', *dibr-ú* 'talked 3<sup>rd</sup> PL.', *hikshá-ten* 'you FM.PL. listened') except for the Masculine Singular form, that is formed as a stem with no suffixes (e.g., *yashav* 'sat MS.SG.', *diber* 'talked', *hikshiv* 'listened'). As specified earlier, such Masculine Singular forms in Present and past tense, together with infinitive forms and Masculine Singular imperatives are considered in this study as "bare stems" (Armon-Lotem & Berman, 2003), since they are formed with no stem external affixes.

Future tense verbs are also inflected for Gender, Number and Person, by the addition of both prefixes and suffixes. The prefixes mark Person (e.g., *nelex* 'will.go 1<sup>st</sup> PL.' vs. *te-lxú* 'will.go 2<sup>nd</sup> PL. ') and, in 3<sup>rd</sup> Person Singular forms, Gender distinction (e.g., *te-léx* 'will.go 3<sup>rd</sup> FM.SG.' vs. *ye-lex* 'will.go 3<sup>rd</sup> MS.SG.'). The suffixes

mark Number (e.g., *ye-léx* 'will.go 3<sup>rd</sup> MS.SG.' vs. *ye-lx-ú* 'will.go3<sup>rd</sup> MS.PL. '), and in 2<sup>nd</sup> Person Singular forms also Gender (e.g., *telx-i* 'will.go2<sup>nd</sup> FM.SG.').<sup>6</sup>

Table 3 summarizes the full set of inflectional affixes in the verb system of spoken Hebrew, relevant to children's input and output.

**Table 3: Hebrew verbal inflectional affixes**

Person	Number	Gender	Past		Present		Future		Imperative	
			Prefix	Suffix	Prefix	Suffix	Prefix	Suffix	Prefix	Suffix
1	Sg.			ti	mV/Ø	et/a/Ø	ʔ/yV			
2	Sg.	Ms.		ta			tV		tV/Ø	
2	Sg.	Fm.		t		et/a	tV	i	tV/Ø	i
3	Sg.	Ms.					yV			
3	Sg.	Fm.		a		et/a	tV			
1	Pl.	Ms.		nu		im	nV			
1	Pl.	Fm.		nu		ot	nV			
2	Pl.	Ms.		tem		im	tV	u	tV/Ø	u
2	Pl.	Fm.		ten		ot	tV	u	tV/Ø	u
3	Pl.	Ms.		u		im	yV	u		
3	Pl.	Fm.		u		ot	yV	u		

As can be seen from Table 3, all paradigms include vowel initial suffixes, which are the only ones that can attract stress and, depending on the prosodic structure of the verb stem, they can trigger deletion of the final stem vowel (for example, the final stem vowel in the verb *kafác* 'jumped SG.MS.' is deleted when the Feminine Singular suffix *-a* is added to the stem in *kafc-á* 'jumped SG.FM.'). The only vowel-initial suffix that never attracts stress is *-et*, for example, in the form *koféc-et* 'is.jumping SG.FM' the stress stays on the final stem vowel and therefore no change occurs in the stem.

All verb forms in the language, whether inflected or not, occur in one of seven morphological patterns – the so called *binyaním* (singular: *binyan* 'construction'), traditionally termed conjugations (Gesenius, 1910). As described below, these patterns alternate across syntactic transitivity and valence-changing operations like

<sup>6</sup> Historical distinctions between feminine and masculine endings in Plural Future tense (and also Imperative) forms have been largely leveled in current Hebrew usage.

passivization, causativeness, and reflexivization. Table 4 lists these patterns by labeling them as Pn, with P3 and P5 noted as having passive alternatives that are largely irrelevant to early child language; followed by the traditional terms naming these patterns, the template of each in the uninflected Masculine Singular Past Tense form, and examples of a verb in each pattern.<sup>7</sup>

**Table 4: Hebrew verb patterns (*binyanim*)**

<i>Binyan</i>	Name	Template	Example
P1	Qal (Pa'al)	CaCáC	<i>rakád</i> 'dance'
P2	Nif'al	niCCál	<i>nixnás</i> 'enter'
P3	Pi'el	CiCéC	<i>sixék</i> 'play'
P3 <sub>ps</sub>	Pu'al	CuCál	<i>sudar</i> 'be-tidied'
P4	Hitpa'el	hitCaCéC	<i>hitxapes</i> 'get-dressed-up'
P5	Hif'il	hiCCíC	<i>hílbish</i> 'dress (someone)'
P5 <sub>ps</sub>	Huf'al	huCCáC	<i>hustár</i> 'be-hidden'

The phonological template of all verbs is defined by assignment to a given morphological *binyan* pattern. For example, the future stem of P1 is CCoC, as in Infinitive, Future, and Imperative forms of the verb 'to catch': *litfos* 'to-catch', *yi-tfos* '(he) will-catch' and *tfos!* 'catch!', or sometimes CCaC, as in the corresponding forms of the verb 'to lie down': *lishkav* 'to lie down', *yi-shkav* '(he) will lie down' and *shkav!* 'lie down MS.SG!'.<sup>8</sup>

Inflectional affixation interacts with the templates provided by these seven patterns, through three relevant processes in various combinations: (1) Stem-internal vowel

<sup>7</sup> The inflectionally least marked form of Past Tense Masculine Singular is used as the citation form for verbs throughout this study.

<sup>8</sup> P1 *qal* – which is the most frequent pattern in child and adult usage, in types and tokens, (Berman, 1993) – is also morphologically most variable, since it has three distinct stems: Past Tense CaCaC e.g.: *gamar* 'finished', Present CoCeC *gomer* 'is.finishing', and CCoC as in Future *yigmor* 'will-finish..

alternation (for example, in P1 Past and Present Masculine Singular forms are distinguished by their stem-internal vowels, e.g., *tafas* 'caught' vs. *tofes* 'is.catching'; (2) Stem-external prefixation (for example, the vowel in the future tense prefix *tV* is defined according to the *binyan* in which the verb occurs: e.g., compare *tī-lbeshu* 'will.wear 2<sup>nd</sup> PL ' in P1, with *te-dabru* 'will.talk 2<sup>nd</sup> PL ' in P3); and (3) Stem-external suffixation (for example, while vowel initial suffixes trigger the deletion of the final stem vowel in P4 – *hitlabésh* 'got dressed MS.SG.' vs. *hitlabsh-ú* 'got dressed 3<sup>rd</sup> PL ' – they do not trigger deletion in P5 – *hilibísh* '(he) dressed' vs. *hilibísh-u* 'they dressed').

In sum, Hebrew verbal affixation system is relatively morphologically rich and morphophonologically varied compared to the noun and adjective inflectional systems. The next section deals in further detail with Present Tense forms, in relation to the category of the so-called *benoni* 'medial' as critical to early child grammar.

### 1.3.3. The *Benoni*

As specified above, Hebrew tensed verbs inflect for Past, Present, and Future – along lines similar to what is known in many European languages. However, the forms that today function as Present tense were in fact the "quasi-nominal" Participial forms of Biblical Hebrew, traditionally termed *benoni* 'medial' (Berman, 1978a; Goldfajn, 1998; Gesenius, 1910; Gordon, 1982). As analyzed for Hebrew morpho-syntax (Berman & Neeman, 1994; Berman & Nir-Sagiv, 2004; Kupersmitt, 2006), *benoni* 'medial' forms today are categorially mixed, since they observe their classical role as non-tensed participles – as adjectival modifiers – e.g., *mayim zormím* 'water running = running water', and in subordinate clauses like *hu ra'a et ha-yeladim holxím* 'he saw the children walking', *hi yašvá sham boxá* 'she set there crying'). However, since late Biblical and Mishnaic times, these forms also alternate with Past and Future verbs

to express something equivalent to Present tense (e.g., *hu ro'él/ ra'ád/ yir'é* 'he is.seeing/ saw/ will.see'; *hi mitlocécet/ hitlocecá/ titlocéc* 'she is.joking/ joked/ will joke').

Children at S's stage of development do not as yet use participial adjectives, complements, or subordinate clauses, and so his usage of such forms can mainly be identified as expressing 'Present' tense – both extended (like simple present in English (e.g., *kol yom hem holxím la-gan* 'every day they **go** to the kindergarten'), immediate present (e.g., *hi lo yxola lesaxek axshav, hi ovedet* 'she cannot play right now, she **is working**'), and a protracted ongoing activity (e.g., *hi mexaká kan kvar shaot* 'she **has been waiting** here for hours') (Coffin & Bolozky, 2005). However, in order to avoid over-interpretation of the function of such forms in early child speech, reference throughout will be to the traditional, more neutral term *benoni* 'medial', since words in this category are intermediate in their lexical class membership. They can function as nouns (e.g., *shofét* 'judge', *mit'agréf* 'wrestler') or as adjectives (*mehané* 'enjoyable', *margíz* 'irritating') as well as verbs (Berman, 1978a).

Even when they function as verbs, *benoni* forms may have an intermediate status between tensed and non-tensed forms; for example, in its participial use in a sentence like *rainu oto yoshev baxuc* 'we saw him **sitting** outside', the verb *yoshev* 'sit' is assigned Past reference in relation to the main verb *rainu* 'we saw'. Moreover, as with English present tense verbs, for example, *benoni* forms may also be assigned Future reference, as in *maxar ani holex lesham* 'tomorrow **I am going** there' (Berman, 1978a).

Finally, in morphology, the *benoni* category differs inflectionally from Past and Future forms, since it is not inflected for Person, but – like nouns and adjectives –

marks only Number and Gender. In fact, *benoni* inflectional suffixes are identical, both in their form and in the features they encode, to those of nouns and adjectives.

These properties lend *benoni* forms a uniquely medial status categorially, semantically, and morphologically. The 'neutral' nature of *benoni* is shown below to play a role in the early acquisition of inflectional morphology.

#### **1.4. Previous Research on the Acquisition of Hebrew Verb Inflections**

As noted above, Hebrew inflectional systems are fusional, and in many cases encode more than one feature in a single morpheme (Levy, 1981). In addition, children acquiring Hebrew lack a "base" form for verbs (such as "walk" or "jump", in languages such as English), and must use inflected verb forms, right from the start, and thus need to gain control of a complex array of largely synthetic inflectional markers (Berman & Dromi, 1984; Berman, 1985).

Studies on the early acquisition of verb morphology in Hebrew note that children's early verb forms take the form of "bare stems", that is, stems with no stem external affixes (Armon-Lotem & Berman, 2003; Adam & Bat-El, 2000). These forms correspond to infinitives, and Masculine Singular forms in past, present, and imperative, that have been shown to be the first forms to be acquired by children (Uziel-Karl, 2002). Past-tense forms were shown to occur mainly with action type verbs of the meaning of 'did' or 'made', 'went', or 'happened', with favoring of more punctual verbs, such as 'fell', 'arrived' (Berman & Dromi, 1984). The Masculine Singular form is viewed as more "basic" in Hebrew, while the Feminine or Plural forms are considered to be derivable from their Masculine counterpart (Levy, 1981; Kaplan, 1983). Present-tense forms, together with infinitive and imperatives are the

most frequent in early speech (Berman & Dromi 1984; Armon-Lotem & Berman 2003; Ravid 1997).

It has also been noted, that the early occurrence of inflectional morphology is not in itself evidence for children's knowledge or ability to encode inflectional features, and that initial inflectional rules are acquired along with initial syntax (Armon-Lotem & Berman, 2003; Armon-Lotem 2006; Berman 1981a; Berman & Dromi, 1984; Berman, 1985; Berman & Dromi, 2004; Kaplan, 1983). Only at this later stage, children's usage of morphemes exhibits productive distinctions in number, gender and person (Berman, 1981a).

The morphological factors affecting the order of acquisition of features constitute a central issue in this study. Levy (1981) notes in her study, that the child-subject was implementing adjective agreement quite randomly, both for animate and inanimate nouns, even though gender marking is completely arbitrary in inanimate nouns. This may suggest that what affect the early path of acquisition of inflections are formal morphological rather than context-related semantic factors, as there was no apparent difference for the child between animate and inanimate Gender.

Moreover, it seems that formal features are acquired gradually and items that are less specified have a preferable status in early stages of acquisition. For example, Berman & Dromi (1984) suggest that the present-tense/benoni forms' "neutral" temporal status allows them not to be identifiable with a specific point in time, and this may contribute to their relatively high frequency in early verb usage.

The present study aims to examine what Hebrew-acquiring children "select" as their initial verb forms, and what does this indicate regarding their path of acquisition of inflectional morphology. As a consequence it has to account for the way formal

features of inflections affect the order of acquisition morphemes and provide certain verb forms "preferred status" over others.

The following subsections discuss more general issues concerning the developmental path of acquisition that are taken into account here, in order to characterize the way children acquiring Hebrew break into new grammatical systems, such as verb inflections, and their transition from one stage of knowledge to the next.

### **1.5. Development of Morphological Knowledge**

This section concentrates on the notion of morphological knowledge in language acquisition, with a focus on inflectional morphology. It starts by defining morphological knowledge according to previous studies (Section 1.5.1), and then considers two notions viewed as relevant to the acquisition of morphological knowledge: productivity (Section 1.5.2.1) and selectivity (Section 1.5.2.2), and discusses their role in specifying developmental stages (Section 1.5.3).

#### **1.5.1. A developmental view of morphological acquisition**

Acquisition of inflectional morphology, like other types of linguistic knowledge, involves achieving a level of command that follows a gradual developmental path (Berman, 2004). Children acquiring such knowledge need to both break into (often quite complex) new systems and to gain mastery of the constraints and principles that govern them, both semantically and formally.

Karmiloff-Smith (1991, 1992) has argued that the process of acquiring linguistic knowledge is based on both innately specified predispositions and subsequent learning that is constrained by these predispositions. According to her developmental model of Representational Redescription, the human mind is equipped with a number

of innately-specified processes that enable self-redescription and self-organization by means of which the human mind can potentially, at any given period, recursively re-represent its own internal representations. This model thus takes into account both a constructivist view of the interaction of children's grammar with the external environment as well as more domain-specific internal organization of knowledge within this grammar.

The process of acquiring knowledge, then, is both complex and protracted. It involves interaction with the environment – in the case of linguistic knowledge, drawing information from the ambient language. The input from the environment then needs to be processed in order to translate and organize it into relevant categories. And these systems, once established, must be fully mastered in a productive fashion (in the sense discussed in the next section) in both production and comprehension. In acquisition of inflectional morphology, specifically, children need to abstract out and grasp concepts such as number, gender, person, and tense. And they need to distinguish between them and to encode these distinctions correctly through the inflectional systems of the target language (Berman, 1981a; Bybee, 1985; Dressler & Karpf, 1994; Ravid, 1995b). Ultimately, this knowledge will then need to be re-integrated within an overall umbrella of form-meaning relations involving both inflectional and derivational morphology, both lexicon and syntax.

### **1.5.2. Productivity and selectivity in acquisition**

The following subsections discuss two notions that are presented here as critical for acquisition of linguistic knowledge in general and of inflectional morphology in particular: productivity and selectivity. The former relates to properties of children's speech that are required in order to identify what can be considered as knowledge of

grammatical categories. The latter is related to how children's interaction with the linguistic environment is reflected in their use of such categories. Although these notions reflect different facets of knowledge, they are interrelated in defining the developmental path of acquiring morphological knowledge.

### **1.5.2.1. Productivity**

In linguistics, a "productive operation" is one that applies with relatively few constraints to a relatively large number of items (Berman, 1988; Baayen, 1992).

When used in this sense, linguistic productivity is a structural property of both forms (e.g., affixes) or of operations (e.g., affixation). This notion of productivity serves, for example, in distinguishing between inflectional and derivational morphology, where inflectional morphology is generally considered to be more productive, since it typically applies more freely, with fewer constraints, to a larger number of items (Anderson, 1985; Schwarzwald, 1982 – on feminine gender in Hebrew). And it also applies to different types of structures and operations within both derivational and inflectional morphology. For example, English inflections may be divided into productive affixes (such as the past-tense *-ed*) versus non-productive affixes (such as the plural marker *-en*) (Clark, 1993). Derivational morphology is typically more scalar, with varying degrees of productivity, involving factors like: morphological structure – affixes that can be attached to a larger number of bases are considered more productive (Anderson, 1985; Aronoff, 1976; Baayen, 1992); word meaning – the more productive a complex word form, the more compositional and predictable the meaning of its morphemes (Aronoff, 1976; Clark, 1993); frequency – the more productive an operation, the larger the distribution of its affixes in colloquial speech (Baayen, 1992).

The term, and in fact the very notion of “productivity” is used rather differently in the field of language acquisition. In acquisition of derivational morphology, productivity has been considered as a factor that leads children to prefer certain forms over others, hence combining with other acquisitional principles such as formal simplicity and semantic transparency (Clark, 1993; Clark & Berman, 1984, 1992) to determine which forms are acquired earlier than others.

In the present context, a rather different notion of "productivity" in child language research is adopted as relevant to characterizing children's linguistic knowledge. "Productivity" here refers to a child's ability to apply certain operations to a given set of items, in a meaningful and consistent fashion (Berman, 1978b; Ingram, 1989, pp. 76-77). That is, here productivity in this sense does not characterize forms or operations, but rather children's **usage** of linguistic forms taken as reflecting their linguistic competence, and hence as defining the state of their linguistic abilities. Ingram (1989) defines assumptions regarding "competence" and "productivity" in relation to language acquisition in the following terms:

"Competence Assumption:

Assume that the child's linguistic performance is relatively close to the child's linguistic competence. That is, do not propose a linguistic construct until there is evidence for it in the child's performance" (p. 76).

"Productivity Assumption:

Assume that the child's utterance was produced by a rule only when there is evidence that the rule is productive. i.e. that it creates new instances of the structure under discussion" (p. 77).

*Productivity as a measure of knowledge.* When aiming to characterize the child's competence at a given period of time, there is a risk of over-generalization in two directions. One is to assume that a child's competence is only what appears on the surface, that is, grammatical elements that occur overtly in his or her speech. This assumption is mistaken, since the speech that is observed is always partial, even in cases where it is a large sample of the child's actual output. More importantly, children's comprehension of linguistic forms typically precedes and outstrips their overt production (Ben-David, 2001; Clark & Berman, 1987; Clark, 2003). Another problematic assumption to which Ingram alludes in discussing what is involved in competence is to attribute genuine linguistic knowledge to the child before there is evidence for it in his or her speech, simply because he or she makes use of a certain form. That is, the occurrence of a form in a child's speech output does not necessarily mean that the relevant grammatical knowledge has been "acquired".

In order to determine whether a linguistic category constitutes part of the child's linguistic knowledge, productive use of this category must be identified. That is, in a study such as the present – on the acquisition of inflectional morphology in Hebrew verbs – in order to examine productive knowledge of inflectional affixes, explicit criteria for productivity in affixation need to be established. Failing this, there is no way of specifying whether a given inflectional affix can be defined as "acquired".

*Quantitative measures of productivity in previous studies.* Previous studies have specified different criteria for what they consider productive use of linguistic categories in several domains. Perhaps the most extensive discussion on the issue in the literature on early child language is given by Bloom (1991). She considers at length the difficulty of setting criteria for productivity that are neither too restrictive nor too lenient. Her measures are quantitative, and involve a conservative criterion for

productivity, in terms of what she defines as a "large number" of tokens of a target form. This requirement of a "large number", according to Bloom, will eliminate many forms that occur only sporadically in the child's speech, giving priority to forms that are most frequent and most likely ones the child knows well by this time. Bloom acknowledges that this procedure may as a result disregard forms that are in fact part of the child's knowledge even though they are less frequent in his or her speech, or in the process of being acquired. Bloom also notes other disadvantages of using criteria that are too lax, as a result of which items that have been rote-memorized or learned as part of a formulaic routine are treated as part of the child's knowledge. Bloom stipulates several criteria in order to address these problems, varying according to the linguistic domain in question, but all constructed by the same principle: No fewer than three or more than five instances of a target form, depending on the researcher's intuitions regarding the relative frequency of the target form in question.

Despite Bloom's cautionary measures, and her clear acknowledgement of the problems entailed by such procedures, she considers them the best alternative for researchers. Even researchers as Pizzuto & Caselli (1994) working on inflectionally rich language like Italian, prefer to use quantitative criteria of productivity. They identify productive use of affixation when: (1) the same root occurs in at least two inflected forms, and (2) the same inflection is used with at least two different verbs. In their research on the acquisition of Spanish verb morphology, Gathercole et al (1999) rely on these criteria deliberately adopting "such liberal criteria [as helping] to ensure that we are not underestimating the child's productive command".

Quantitative measures are, however, avoided in the present context, precisely in order not to **over-estimate** children's productive command of Hebrew inflectional morphology.

Besides, such measures depend critically on the nature of the data-collection and sample size and they tend to vary not only from one category to another, but even from one child to the next. Moreover, quantitative measures fail to take into account the fact that non-productive phrases may occur several times in a child's speech, since they are associated with a particular situation (having a bath or drinking juice, say).<sup>9</sup> For present purposes, however, the variable application of quantitative criteria like those proposed by Bloom (and following Bloom, by Uziel-Karl, 2002, for early Hebrew grammar) means that they are insufficiently generalizable across children and situations. More seriously, such "counts" fail to take into account what kind of knowledge is represented by a given form used by the child, irrespective of whether it occurs once, or three, or ten times in his or her output.

*Contextual/qualitative measures for productivity.* As opposed to quantitative measures, qualitative measures relate to the **nature** of the child's productions and hence are more generally applicable, since they relate to different types of utterances and across different children irrespective of the particular circumstances.

The view taken here is that "productivity", by definition a qualitative term, describes a self-initiated use of a form, driven by the ability to apply a rule or use a grammatical category that has been "acquired" and so distinguish it from other grammatical categories (Berman, 1981a, 1986). Criteria for qualitative productive use need to specify not merely whether certain forms occur in a child's speech output, but whether these forms represent a grammatical category that has been acquired.

In fact, this is what is entailed by Brown's (1973) characterization of the notion of productivity. He, too, defines criteria for productivity in dealing with spontaneous

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<sup>9</sup> Bloom, in fact, classifies such usages as non-productive, although in terms of number of occurrences, they in fact might be considered "productive".

speech, when frequency and variety are the most available aspects of performance. Taking these two factors as determining productivity is problematic, according to Brown, since even when frequency in the input is taken into consideration, the number of occurrences depends on circumstances such as the topic of conversation or the character of the interaction. To overcome these difficulties, with respect to grammatical morphemes, Brown suggests criteria that are context-related, that is, that do not relate only to output but, rather, to what he terms "output-where-required". He treats the grammatical context as a kind of test case that a child can either "pass" (by supplying the required grammatical morpheme) or "fail" (by supplying an incorrect morpheme or not supplying any morpheme).

Brown points out that such a performance measure is not dependent on variable elements like the topic of conversation or the nature of the interaction but rather relates to "obligatory contexts" as an overriding factor in deciding on the "productivity" of children's grammatical knowledge: Linguistic, Nonlinguistic, Prior Linguistic context, and Subsequent Linguistic context.

The present study adopts and adapts the idea of relating to grammatical context as a key criterion for productive use of inflectional morphemes, but departs from Brown's analysis in several respects. For one thing, the grammatical context is not taken as a "test-case", but rather as an indicator of the productivity of affixed forms that occur in the child's speech, in the following sense: When a child consistently uses a given inflectional affix only when it is grammatically required, it can be said that he or she uses it productively. A period in which the child uses inflectional affixes only when and where they are required reflects productive use of inflectional affixes, while during this "productive" period, the child may still use bare stems (Armon-Lotem & Berman, 2003; Berman & Armon-Lotem, 1997) where affixed forms are required. In

the present study, "productive" use is demonstrated not merely by consistent use of inflectional affixes whenever they are required, but by consistently accurate use of the relevant forms.

An example of an attempt to define "productive knowledge" is provided by Berman's (1978b) examination of the first verbs of her Hebrew-acquiring daughter. She defines "productive vocabulary" as a string compared to an adult word that has a clear and consistent semantic content. She restricts this term only to words her daughter used several times in her presence with the same semantic intention, that is, items that the child appeared to have internalized and could be predicted to use again, on her own initiation. This analysis is qualitative in that it relates to the semantic content of a productive use and so refers not only to the number of occurrences, but also to the nature of the child's productions.

A consistent use of a certain form with the same meaning could indicate that the relevant meaning is encoded in the form and hence that the form has been acquired productively. In order to identify such form-meaning relations, however, particularly in the case of verbs, one needs to also consider the context in which the verb occurred (for example, if the child says "jump" while jumping). Moreover, as suggested by Brown (1973), in order to identify such form-meaning relations in use of inflectional morphology, it is not enough to take into account the extra-linguistic situational context, one needs to also examine the grammatical context of the child's production, since inflectional affixes are functional elements that encode relations between linguistic elements in a given grammatical environment. For example, when the child uses an affix incorrectly, e.g., *sus dahar-á* 'horse SG.MS galloped FM.SG.', the meaning of the verb may be appropriate to the context, that is, in this example, that horse was really galloping; but the feminine suffix *-a* is inappropriate in this grammatical

context. The principle of form-meaning consistency requires that the child exhibit consistency in both aspects of his or her use of a given form – meaning alone is not enough. Moreover, in this sense, consistency cannot be identified only through the number of occurrences of a given affix, but must be reflected in the way a child makes use of affixes. Consistency in use of inflectional affixes can be attributed only when they are always correct in a given grammatical context. That is, for example, if a child says both correct *íma yeshen-á* 'mommy is.sleeping FM.SG.' and incorrect *kélev rats-a* 'dog MS.SG. is.running FM.SG.', he or she cannot be said to be using the feminine affix *-a* consistently. Only when use is "consistent" across a given grammatical category, can the child be said to have internalized the relevant meaning encoded by particular affixes and to be likely to use them for the same function in the future.

#### **1.5.2.2. Selectivity**

This section discusses the notion of selectivity in language acquisition, in particular in the acquisition of inflections. "Selectivity" here refers to the phenomenon of children displaying a clear preference for certain items when they start using grammatical categories. It does not refer to a conscious selection made intentionally by the child, but rather to a process or mechanism that operates over a certain period of time, inclining the child to use only a subset of the available items in a given grammatical category.

When acquiring a language, children need to "break into" different grammatical systems, in order to begin using linguistic elements grammatically (or "productively") and eventually master these systems. To do so, they need first of all to extract relevant linguistic data from the stream of speech in the ambient language. This involves

several different, though interrelated problems for the researcher, no doubt for the child as well. On the one hand, children need to recognize the kinds of objects and events that are encoded in the language they hear; they need to segment the stream of speech into meaningful linguistic units; and to cope with mapping between the objects and events and the linguistic units (that is, between meaning and form), organizing them at both the lexical and syntactic level (Gleitman et al, 1988; Gleitman & Wanner, 1982; Karmiloff-Smith, 1992; Clark, 2003; Slobin, 1973)..

In attempting to address these problems, researches have approached the issue of selectivity from several related perspectives. Thus, Karmiloff-Smith (1992) concludes that there must be some innate component for the acquisition of language. Gleitman and Wanner (1982) also claim that innate knowledge of language principles is required for language learning, since linguistic forms and categories are distinct from forms and categories of cognition in general. The greater the distance between preexisting knowledge and what the child needs to know to acquire a given language, the harder the task for the child. In his earlier cognitively based model, Slobin (1973) suggests that children are able to do so, since they come to the task equipped with certain operating principles that assist them in identifying linguistic units in the ambient language. In addition to language-specific skills, children also need what Slobin termed “cognitive prerequisites” to understand the basic notions that are encoded by linguistic items. That is, the process of language acquisition can be viewed, at the most general level, as a process of "drawing" data from the available input and assigning features to and classifying the data with the aid of preexisting acquisitional principles together with generalizations derived from the input.

Clark (2003) notes that from the very beginning, during the early stages of acquisition, children seem to be selective in which words or word types they try to

pronounce, a selectivity which she views as correlating with earlier preferences for particular segments and syllable types in babbling. Karmiloff-Smith (1992) claims that in their interpretation of sound waves, infants distinguish between linguistically relevant and nonlinguistic auditory input due to attention biases and some innate predispositions that incline them to focus on linguistically relevant input, in order to build up linguistic representations that are domain specific. That is, researchers working from different perspectives suggest that right from the start, children are equipped with a selective mechanism that enables them to construct linguistic representations of sounds, items, categories, and structures.

Gleitman et al (1988) investigation of the phonetic cues that enable the child to detect language-relevant units in the sound stream showed that children tend to omit elements that occur in weak prosodic positions at the initial stages of acquisition. This led them to conclude that, in the early phases of language learning, children are disposed to select items based on their acoustic-prosodic properties. Karmiloff-Smith (1992) further observes that children are sensitive not only to overall phonological or prosodic patterns, but that they also attend to features that will ultimately have syntactic value such as clause boundaries. It seems that right from the start, children are responsive to certain perceptual cues in their target language that enable them to extract linguistic units selectively out of the stream of speech.

Karpf's (1990) more general model of self-organization also suggests that initial stages of acquisition involve selective processes. It describes a dialogue between the brain and the environment such that: (1) different living systems interact selectively with the environment; (2) the basis for selection is the available criteria offered by the stage reached by the system at any given point, with the system able to enlarge the basis for further selection and organization of information; (3) such changes involve

self-organizing and irreversible processes; and (4) these irreversible processes lead both to increasing complexity and to successive bifurcation (Dressler & Karpf, 1994).<sup>10</sup> Their proposal thus depicts a system that develops gradually and selectively, constantly enlarging its basis for further development. This developmental path is "one-way" or irreversible, since once a certain type of knowledge is acquired or re-organized, there is no returning to a previous state of knowledge.

Although as far as I know, the topic has not been addressed in these terms in the literature, acquisition of morphological knowledge can also be viewed as a process of selection between the individual child and the ambient language, one that is irreversible and characterized by increasing complexity. In analyzing the early acquisition of Hebrew inflectional morphology below, the process of selectivity is taken to account for the subset of items that are used **productively** at each successive stage of the child's knowledge of the system. In what follows, the earliest occurrences of verb inflections by a Hebrew-acquiring boy are examined as a means of identifying development and re-organization of morphological knowledge.

A preference for certain verb forms in early stages of acquisition has been documented in different languages (for example, Brown, 1973 – for English; Berman & Dromi, 1984 – for Hebrew; Bassano, Laaha, Maillochon & Dressler, 2004 – for French and German). Adam and Bat-El (2000) describe Hebrew-acquiring children as undergoing a stage in their morphological development where they have only a single form for each verb paradigm. These verb forms typically take the form of "bare" stems with no stem-external affixes (Armon-Lotem & Berman, 2003; Berman & Armon-Lotem, 1997). Such preference for "bare" forms is surprising, according to Adam and Bat-El, since type-frequency of affixed forms in Hebrew verbs is much

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<sup>10</sup> Bifurcation is relevant to the notion of modularity, and it is mentioned here as a part of Karp's (1990) model, although it is less relevant to the notion of selectivity.

higher than that of bare stems, and since most suffixes are in prosodically prominent stressed positions, they can be expected to be acquired early (Gleitman et al, 1988). Adam and Bat-El claim that the absence of inflectional affixes in this stage of acquisition is indicative of the presence of morphological knowledge rather than its absence, since children need to be responsive to the internal structure of words and to distinguish between stems and affixes or between stems and affixed forms in order to produce only stems with no affixes.

I suggest that this tendency of Hebrew-acquiring children to favor stem forms when they first start producing verbs is “selective” in the sense that they use, almost exclusively, only a narrow subset of the verb forms available in their input language. This selectivity can be taken as indicative of a stage in morphological knowledge, and not merely a matter of chance, since the same pattern is found across different children and lasts for a period of several months.

Different approaches have been taken to account for this selectivity in children’s speech. Adam and Bat-El, for example, explain the absence of affixed forms in the framework of Optimality Theory (Prince & Smolensky, 1993), to the effect that phonological constraints that require the output to be identical to the stem form outrank morphological constraints that require the addition of affixes. Dressler and Karpf (1994), on the other hand, claim that children's preferences in the selection of items out of the input data observe the principles of natural morphology (Dressler et al, 1987), and hence are affected by such usage-based factors as saliency and frequency. From their perspective, inflectional paradigms are acquired “top-down” and piece-meal in the sense that the most unmarked and stable categories are acquired first, whereas “holes” in the paradigms are filled in gradually, form by form. Clark (1993) specify three general developmental principles that affect children’s preference

for linguistic complex forms (i.e., forms that are composed of more than one morpheme): (1) formal simplicity – when the elements combined in the word do not cause change or cause minimal change in the word form; (2) semantic transparency – when the meaning of the elements composing the word is accessible to the child; and (3) usage productivity – when the devices for word formation are the ones favored by adult speakers of the language. These principles, defined by Clark as principles of processing, are taken as predictors of the acquisition of word formation in several languages, and they accord with Brown's (1973) and Slobin's (1973) observation that in addition to cognitive or semantic complexity, formal complexity also plays a role in the order of acquisition.

The present study aims to show that in addition to the stage examined by Adam and Bat-El (2000), the period following this stage, in which inflectional affixes begin to occur productively, likewise exhibits a special kind of selectivity that is manifested by the child's preference for a certain subset of **affixes**. In general, I suggest that the principle<sup>11</sup> of selectivity enables children to break into a new grammatical system, and that different types of selectivity will characterize different periods along the path of acquisition.

Against this background, the present study considers the selectivity exhibited by Hebrew-acquiring children when they start producing affixed forms of verbs. Detailed analysis is undertaken of the morphological, lexical, and categorial properties of the selected items, in an attempt to account for the special status of a given set of forms in this particular period of acquisition.

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<sup>11</sup> I adopt the notion of "Operating Principles" (Slobin, 1973, 1985), to refer to principles that enable the child to deal with linguistic material and to acquire new linguistic knowledge at each point of development. This is rather different than the way Clark (1993, 2005) uses the notion of "principles" as characterizing linguistic forms that are selected by the child.

### 1.5.3. Characterizing developmental stages

In the preceding sections, productivity and selectivity were argued to characterize morphological knowledge in distinct, though interrelated ways. Previous studies argued that although linguistic categories are acquired gradually, they are established through a continuous process of generalization and re-construal of schemes according to the knowledge-base available at a given point in time (Karmiloff-Smith, 1992; Ninio, 1999). I suggest that the scope of items used productively is determined by the principle of selectivity. As a result, identifying productive usage of a subset of items may reveal the (re-) organization of knowledge en route to acquisition of grammatical categories. Taken together, the principles of Productivity and Selectivity characterize a system that is acquired both selectively and gradually across time and productively by abstract generalization.

*Defining a stages and phases in morphological knowledge.* In discussing the one-word period, Dromi (1986) sets criteria for defining a developmental stage as needing to exhibit the features of: novelty, qualitative change, and distinct boundaries. These criteria accord with Karmiloff-Smith's (1986) definition of a stage as a stretch of time that is characterized by a qualitative change. By “qualitative change”, Karmiloff-Smith refers to new internal organization of the system, and not merely to the addition of new information. Thus, the transition from one stage to the other is irreversible in the sense that once a child reached a certain stage, under normal circumstances, he or she cannot return to previous, less advanced stages.

Karmiloff-Smith (1986) also distinguishes the notion of a developmental “stage” (in the canonic, domain-general, across-the-board Piagetian sense) from “phases” in development. She defines the latter as recurrent processes applied by both children and adults when confronting new problems within and across parts of different

domains. That is, certain phases can occur at more than one general developmental stage, and in fact, may recursively characterize the transition from one stage to the next. Berman (1986, 2004) describes a developmental pattern that progresses from pre-grammatical non-analysis to productivity in terms of five recurrent phases: (1) rote-learned unanalyzed forms, (2) initial alternation of several familiar forms, (3) application of nonnormative rules, (4) application of normative rules with some deviations, and (5) appropriate rule application, including mastery of lexical exceptions. These phases may occur in several domains in the language, in different stages of their development.

The interaction between selectivity and productivity is manifested in the fact that the selected items are the ones chosen for productive usage. Both selectivity and productivity can characterize different phases and stages of development. Selectivity may be considered a process characterizing a phase, in the sense that it is recurrent and can apply in different stages of acquisition. Productive use may also be viewed as characterizing a phase in which children reach mastery of a given grammatical category – the fifth phase described by Berman (1986) above.

However, other aspects of productivity and selectivity can also characterize a stage. The criteria for selection of items change according to the knowledge-base available at a given stage combined with the constraints of language typology. In addition, once certain items have been selected, they characterize a stage in the sense that they are unique to this specific stage, and cannot occur selectively in any other stage. In this sense, selection of items may be viewed as irreversible and hence as characterizing a developmental stage. Productive usage, even of a subset of items, can also provide evidence for a developmental stage, since developmental stages are characterized by newly acquired knowledge, re-organization of previous knowledge,

and clear temporal boundaries. Productive use of a given form or class of forms may be indicative of such novel re-organization, since it provides evidence for existing knowledge that had no earlier manifestation, and this change can be viewed across a given period of time.

Thus, different aspects of productivity and selectivity and the interaction between them can be taken as indicative of developmental phases and stages, since they can help identifying and characterizing both the process of breaking into new grammatical systems and the newly established systems or structures themselves.

## **2. DESCRIPTION OF THE STUDY**

This section describes the nature of the study, in terms of data collection, transcription, and selection of data for analysis. The data for this study were collected, transcribed and encoded in the framework of the Child Language Project, headed by Prof. Outi Bat-El (PI) and Dr. Galit Adam (PI).

### **2.1. The Child-Subject**

This is a longitudinal case-study of a typically-developing Hebrew-acquiring boy – S. His speech was documented over a period of more than two years, and the present study is confined to a set of data over the 8 months between ages 16 and 24 months.

### **2.2. Recording Procedures**

Recordings took place when S was in his natural environment, mostly in his home, while some included a walk outside or a visit to his grandparents or his aunt. The bulk of all recordings were conducted with S alone with the investigator (S's aunt), with

other participants, most often S's sister, mother, father and/or occasionally another family member or friend also present.

Most sessions took the form of naturalistic, non-elicited speech output, such as playing a game, eating or taking a bath. Elicitation tasks, used in a few sessions, included picture naming and telling stories from picture-books constructed to encourage S to produce verbs. Most pictures illustrated events that S was asked to describe, and the same pictures and stories were used in different sessions in order to examine S's production of the same lexical items across time. The success of this tasks, quite naturally, depended on S's patience and cooperation, and in some cases, there was more need for guiding questions, such as "What is this?" (for labeling) or "What happened here?" or "What did X do?" (for verb elicitation).

### **2.3. Significant Developmental Points**

S's first recorded word was documented at age 1;01.23. It was *dah*, for *todá* 'thanks', followed by *púax*, for *tapúax* 'apple', at age 1;02.00. These were chosen as S's first words according to the following criteria (Adam & Bat-El, 2007): They bore phonetic resemblance with their target words, as opposed to previous utterances in S's speech, such as *dída* for *kadúr* 'ball' or onomatopoeic utterances such as *tíktak* that referred to a clock or a watch (*šáón*). Another related factor in identifying S's utterances as 'words' was his consistency in producing these words, while constantly expanding his vocabulary. S used these words in the following sessions, while his use of onomatopoeic utterances gradually decreased.

S's first recorded verb form, the verb *pux* for *liftóax* 'to open', was documented at age 1;04.17, followed by seven verb forms (tokens), including *af* 'flew MS.SG.' and *tíni* for *tíni* 'give FM.SG.' in the following session at age 1;04.24. These were identified

as verbs due to their phonetic resemblance to their target verb forms and the context in which they were uttered. He used the verb *pux* when he wanted me to open my bag, the verb *af* 'flew/flies MS.SG.' while describing what an airplane was doing, and the verb *tíni* for *tni* 'give FM.SG.' while asking me to give him an apple.

#### **2.4. Transcription and Coding**

Recordings were transcribed by the investigator. Transcription includes all of S's utterances, and utterances of other participants only when they were directed to S or when they preceded his speech output.

The data were transcribed following the CHILDES conventions (MacWhinney, 2000). All utterances, S's and other participants, were transcribed phonemically, that is, according to Hebrew orthography conventions, in Latin characters. All utterances were assigned a gloss tier that included free translation into English. S's utterances were assigned three additional tiers: a phonetic tier, for narrow phonetic (IPA) transcription with word stress indicated, and two target tiers, one in phonemic and one in narrow phonetic transcription. Target forms were determined according to adult speech, represented as pronounced in standard adult usage, without regard for the correct usage in a given grammatical context. That is, if S used a certain verb inflection in an ungrammatical context, the "target form" would not be the verb form that is grammatical in that context, but rather the adult form corresponding to that same inflected form (For example, the target for *kélev áca* is *kélev ráca* 'dog MS.SG. runs FM.SG.', and not the grammatical form *kélev rac* 'dog MS.SG. runs MS.SG.').

## 2.5. Data Selection

The data for this study are taken from a sample of S's recorded speech outputs, as described in section 2.3 above. This section specifies the criteria for selection of the data analyzed in the present study.

### 2.5.1. Subset of the data

This study focuses on morphological knowledge as manifested through the development of affixation in S's speech.

S's affixed forms were taken as indicating the acquisition of affixes only from session 1;08.17 on, since S's earliest verb forms, from age 1;04.17 until age 1;08.10 consisted almost exclusively (91%) of bare stems with no stem-external affixes (Armon-Lotem & Berman, 2003). As such, they did not reflect a stable productive use of inflectional affixes, that is, as elaborated further below, when inflectional affixes did appear in S's verbs in this period, they did not seem in any way to be modifying the syntactic features of the verb form, but rather to constitute part of an unanalyzed or frozen form of the lexeme (MacWhinney, 1975).

For example, in one recording session, from age 1;06.02, S and I went outside and were followed by a cat, to which we both referred in our speech. I referred to the cat in the Feminine (saying, for example: *raitá eyx hi kafc-á?* 'did you see how she jumped FM.SG.?'), and when S repeated what I said, he also used feminine verb forms (*bó-i* 'come! SG.FM.', *kafc-á* 'jumped SG.FM.'). However, when S described on his own initiation what the same cat was doing in other cases, he did not use the Feminine affixes with the verbs (*baráx* 'ran away MS.SG.', *kam* 'got up MS.SG.'). This suggests that S's use of a Feminine affixes when referring to some of the cat's actions did not

derive from any understanding of the category of Feminine inflections or the concept of Feminine Gender in general.

A different example that seems to indicate that S did not distinguish between feminine and masculine inflections at that stage (the sessions between 1;04.17–1;08.10), occurred in another session, from age 1;07.02. There, S described a running dog as *kélev rác-a* 'dog MS.SG. is.running FM.SG.' in place of grammatical *kélev rác* 'dog MS.SG. is.running MS.SG.'. This example likewise suggests that S was using the Feminine suffix 'a' randomly, with a masculine noun, and not because he had acquired the category of Feminine inflection.

Interestingly, in the 1;06.02 session, S used the lexeme JUMP in three different verb forms – *koféc* 'jumping MS.SG.', *kofc-ím* 'jumping MS.PL.' (when describing what he was doing) and *kafc-á* 'jumped FM.SG.' (in repetition). Two of these forms contained stem-external affixes, though neither of them exhibited a productive use of affixation, in the sense of clearly indicating of acquisition of knowledge. Taken together, these observations indicate that the occurrence of more than one inflectional form of a single word (in this case, a verb) is not necessarily indicative of productive use of inflections in general and of productive affixation in particular.

Against this background of such "pre-productive" use of affixes, S's earliest productive verb occurrences were chosen for analysis, over a period of nearly five months from age 1;08.17. This was the first session in which S exhibits a productive use of inflectional affixes, that is, none of them seemed to be mere repetition or rote-learned (MacWhinney, 1975) and hence unanalyzed.

### **2.5.2. Productivity in (S's) verb affixation**

The definition of productivity in language acquisition, as discussed in section 1.5.2.1 above, restricts productive use of a certain grammatical category to cases in which it creates a new instance of the structure to which it is applied (Ingram, 1989). This means that the data considered here are confined to what Ingram (1989:77) terms "new instances". Identifying productive use in the acquisition of inflectional categories is crucial, since only such use of inflectional morphology may indicate of the acquisition of these categories.

As elaborated in more detail in section 1.5.2.1, previous studies (mainly Bloom, 1991, and for Hebrew, Uziel-Karl, 2002) define productive use of inflectional morphology in one of the following ways: either when more than one inflectional form occurs with three different lexemes, or when one inflectional form occurs in five different lexemes. Such criteria examine verb forms in isolation, and do not relate to the grammatical context in which they occur. As argued in the previous sub-section, the occurrence of an inflectional affix in the child's speech (even several times, with several lexemes) does not necessarily indicate that the category assigned by this affix has been acquired. Such forms can be simply repetitions or unanalyzed rote-learned forms, especially in their initial occurrence. Previous studies on the acquisition of Hebrew verb morphology have shown that the initial occurrence of inflectional morphology is typically in the context of "frozen" unanalyzed forms (Berman 1981a; Armon-Lotem & Berman, 2003; Armon-Lotem, 2006).

The present study suggests a more restrictive criterion of productivity for defining a given inflectional category as "acquired", taking into account the syntactic environment in which verbs are used. In Hebrew, all verbs agree in both Number and Gender, as well as in Person (in past and future), with the subject of the clause

(Berman, 1978a, 1985). The realization of this grammatical relation is obligatory and has been shown to be acquired relatively early (Armon-Lotem, 1996, 2006).

Following Brown's (1973) "obligatory contexts" (see section 1.5.2.1), the present study suggests that Subject-Verb agreement be considered in order to identify productive use of inflectional morphology. Since verbs must agree with their grammatical subject, such agreement can be achieved only if the child recognizes as such the features encoded by the subject (for example – Singular Number, Feminine Gender, 2<sup>nd</sup> Person) and is able to encode these features on the verb, using the appropriate inflectional morphology. As defined in section 1.5, morphological knowledge includes a grasp of the relevant grammatical categories and the ability to encode the distinctions between them by means of the inflectional system of the language (Berman, 1981a). The claim here is that the relation between verb and its grammatical subject is a kind of categorial distinction that, when realized through inflectional marking of agreement between the two, can be taken as evident of "morphological knowledge".

This, then, is used as the criterion by which the data for this study were selected. Session 1;08.17 was the first in which S's affixation was always grammatical in a given Subject-Verb context, whether both elements were produced by the child himself (e.g. '*roni yeshen-á* 'Roni is.sleeping') or one was given by the investigator (e.g., Investigator: *ma ima osa im ha-tutim?* 'What is mommy doing with the strawberries?' S: *mexin-á* 'is.preparing FM.SG.'). That is, whenever S used a stem-external affix, it agreed with the subject. From this session on, S's use of inflectional affixes was grammatical, as far as Subject-Verb agreement was concerned. True, there were still cases in which he used bare stems where stem-external affix was required (e.g., *ima shon* 'mommy to.sleep'). However, whenever a stem-external affix did

occur, it was always grammatical (e.g. *ima yeshen-á* 'Mommy is.sleeping FM.SG.'). This grammatically consistent use of inflectional affixes suggests that S's use of inflectional affixes is no longer random, and that whenever they occur in his speech, they can be taken as productively acquired, in the sense they modify the meaning of the verb forms they occur with by means of features they overtly encode.

### 3. FINDINGS

This section describes the findings for verb usage over an eight months period in S's speech, supplemented by data from other Hebrew-acquiring children. It provides a description of the gradual development of S's affixation in the verbal paradigm (Section 3.1), followed by consideration of his affixation of nouns and adjectives (Section 3.2).

#### 3.1. Verb Affixation

Following the criteria for productivity in affixation specified in section 1.5.2.1 earlier, I divided S's earliest verb usage into two major periods, when the first one can be further divided into two sub-periods:

**Table 5: Periods of verb affixation**

Period	characteristic	Age
No affixation	Stem-like forms and rote learned suffixed forms	1;04.17–1;05.29
Variation in affixation	Suffixed forms used in free variation	1;06.02 – 1;08.10
Productive affixation	Productive use of inflectional morphology with verbs	1;08.17 – 2;00.00

### 3.1.1. No affixation

The earliest documented verb form for S occurred at age 1;04.17. From there on, all recorded sessions included at least one verb, with the number of verb tokens increasing gradually from one session to the next.<sup>12</sup>

This period of initial verb forms lasted approximately two months (1;04.17–1;05.29) and included seven recorded sessions, in which 41 verb forms (tokens) were documented. Out of these, only four (i.e. less than 10%) were affixed, while all the rest took the form of "bare" stems. Below are a few examples:

**Table 6: S's earliest verb forms (1;04.17–1;05.29)**

Age	S	Target	Gloss
1;04.24	<i>ʒaf</i>	<i>ʒaf</i>	'flies/flew MS.SG.'
	<i>tíni</i>	<i>tn-i</i>	'give FM.SG.'
1;05.04	<i>taðiði</i>	<i>tazíz-i</i>	'move!/you will move FM.SG.'
	<i>lo otθée</i>	<i>lo rotsé</i>	'don't want to MS.SG.'
1;05.21	<i>peθ</i>	?	truncated form that has no clear morphological target (lexeme: CLIMB)
1;05.29	<i>áti</i>	<i>matsá-ti</i>	'found 1 <sup>st</sup> SG.'
	<i>haláx</i>	<i>haláx</i>	'went MS.SG.'

Here, the term "bare stems" refers to all forms without an inflectional stem-external affix, including: Singular Masculine forms in Present and Past tense (e.g., *koféts* 'is.jumping MS.SG., *axál* 'ate MS.SG. '); Singular Masculine imperative forms (e.g., *zuz!* 'move! MS.SG., *bo!* 'come! SG.MS '); Infinitives (e.g., *liftóax* 'to open', *lishón* 'to sleep'); and truncated forms that do not have clear targets, since they are morphologically ambiguous (e.g., *\*tapés* that could correspond to each of the following targets: *letapés* 'to.climb', *metapés* 'climbs MS.SG.', *yetapés* 'will climb MS.SG.').

<sup>12</sup> In "tokens" I refer here to all occurrences of verb forms in S's speech, excluding repetitive usage of verbs (e.g., *mi li, mi li, mi li* 'give me, give me, give me') that clearly do not indicate an initiation of a new utterance.

Hebrew infinitives, while strictly speaking neither “bare” nor “stems”, are treated here as unanalyzed elements, in principle differing from verbs with affixes, since their prefix *IV-* elements fails to alternate paradigmatically with other affixes, and they are morphologically unvarying since they are not marked for person, number, or gender in a given paradigm.<sup>13</sup>

This period in S’s verb usage cannot be considered to manifest “productive” use of inflectional morphology: His verbs were predominantly in the form of “bare stems”, while those that did include an affix showed no evidence of being more than unanalyzed amalgams, so that the affix in question could not be defined as having been “acquired”.

### 3.1.2. Variation in affixation

From age 1;06.00 on, S started using suffixed forms in free variation, by producing more than one affixed form for some of his verb lexemes.<sup>14</sup> During this period of two months (ten sessions, ages 1;06.02 – 1;08.10), the number of verb form tokens increased (144 tokens), but still less than 10% were affixed (14 tokens).

**Table 7: S's initial variation in affixation**

Lexeme	Age (earliest documented occurrence)	Affixed forms	Gloss
JUMP	1;06.02	<i>koféc</i>	jumps MS.SG.
		<i>koféc-et</i>	jumps FM.SG.
		<i>kofc-im</i>	jump MS.PL.
EAT	1;07.02	<i>oxél-et</i>	eats FM.SG.
	1;07.23	<i>oxél</i>	eats MS.SG.
FLY	1;04.24	<i>ʔaf</i>	flies MS.SG.
	1;06.02	<i>ʔafa</i>	flies FM.SG.

<sup>13</sup> A related set of forms, the so-called “gerundive” infinitives may take different preposition prefixes, e.g., *be-*, *ke-*, and even the non-prefixed *im*, but these are syntactically quite different constructions (with an obligatory post-posed bound subject noun or pronoun), and they are typical of formal, high-register usage and hence irrelevant to child language input or output.

<sup>14</sup> I use the term “variation” for this pre-productive usage as against “alternation” which implies paradigmatic knowledge.

I claim that this variation does not necessarily indicate of "productive" usage of these affixed forms, but rather reflect a transitional pre-productive phase, at which S used different inflectional affixes for one lexeme, without fully assigning them their morphological features (i.e., number and gender). Although this period does not exhibit productive affixation, it reflects the acquisition of the phonological structure of some of the suffixes. This suggests that the acquisition of the inflectional paradigm starts with the phonological structure, and later on, as shown in the following section, the morphological properties of the morphemes are acquired.

### **3.1.3. Early productive affixation**

The first session at which "productive" use of affixes was identified was at age 1;08.17. According to the productivity criterion proposed in section 1.5.2.1, from this session on, all of S's affixes were grammatical in the context in which they occurred. This period, of course, also included bare stems without any affixes. Some such forms still occurred where affixes were grammatically required (e.g., *ima šon* for *ima lišón* 'mommy to sleep'), that is, not all of S's productions in this period were grammatical in context. However, his use of affixes no longer seemed rote-learned, but rather indicative of "acquisition" of inflectional morphology, when grammatical context is as a criterion of this notion, as specified in Section 1.5.2.1.

S produced a total of 614 verb forms (tokens) during his "productive" period (16 sessions, ages 1;08.17 – 2;00.00), 115 (19%) of them were affixed forms, including 126 affixes (prefixes and suffixes). Below is a sample of S's verb forms during this period:

**Table 8: Sample of S's Early productive verb forms**

Age	S	Target	Gloss
1;08.17	<i>kofím</i>	<i>kojc-ím</i>	'jump MS.PL.'
1;09.00	<i>ʔafál</i>	<i>nafál</i>	'fell MS.SG.'
	<i>báti bájta</i>	<i>bá-ti habájta</i>	'came 1 <sup>st</sup> SG. home'
	<i>ʔába jʔen</i>	<i>ʔába ja Šén</i>	'daddy sleeps MS.SG.'
	<i>ʔená</i>	<i>je Šen-á</i>	'sleeps FM.SG.'
	<i>ʔením</i>	<i>je Šen-ím</i>	'sleep MS.PL.'
1;09.27	<i>boxá</i>	<i>box-á</i>	'cries FM.SG.'
	<i>hoxót</i>	<i>holx-ót</i>	'go FM.PL.'
1;10.12	<i>miʔajér</i>	<i>me-csajér</i>	'draws MS.SG.'
	<i>ʔaldá tapéʔet</i> <i>ʔasulám</i>	<i>jaldá metapés-et al</i> <i>hasulám</i>	'girl climbs FM.SG. the ladder'
	<i>taréket</i>	<i>mistarék-et</i>	'combs FM.SG.'
1;10.17	<i>ʔitʔáxti</i>	<i>hicláx-ti</i>	'succeeded 1 <sup>st</sup> SG.'
	<i>igmár</i>	<i>nigmár</i>	'finished MS.SG.'
	<i>naflá</i>	<i>nafl-á</i>	'fell FM.SG.'
	<i>miʔaxkím</i>	<i>me-saxk-ím</i>	'plays MS.PL.'
1;11.02	<i>metapés-et</i>	<i>me-tapés-et</i>	'climbs FM.SG.'
	<i>mitgalgél hapíl</i> <i>mitgalgél</i>	<i>hapíl mi-tgalgél</i>	'the elephant rolls MS.SG.'
	<i>jeʔajrú</i>	<i>je-tsajr-ú</i>	'will draw MS.PL.'
1;11.07	<i>ʔód ʔexad ʔafál</i>	<i>ʔód ʔexad nafál</i>	'another one fell MS.SG.'
	<i>ʔoléx ʔima</i>	<i>holéx ʔima</i>	'goes MS.SG. mommy'
	<i>xaðərá</i>	<i>xazr-á</i>	'returned FM.SG.'
1;11.22	<i>ʔaní ʔoté</i>	<i>ʔaní Šoté</i>	'I drink MS.SG.'
	<i>ʔaní litót</i>	<i>ʔaní li Štót</i>	'I to drink'
	<i>títi hakól</i>	<i>Šatí-ti hakól</i>	'drank 1 <sup>st</sup> SG. everything'
2;00.00	<i>koféʔet</i>	<i>koféc-et</i>	'jumps FM.SG.'
	<i>metʔajrím</i>	<i>me-cajr-ím</i>	'draw MS.PL.'
	<i>niberá</i>	<i>ni Šber-á</i>	'broke FM.SG.'

The following different types of inflectional affixes occurred in his speech at this period: all of the present-tense/*benoni* affixes – the suffixes *-a*, *-et*, *-im* and *-ot*, and the prefixes *me-*, *ma-* and *mi-*; out of the Past tense suffixes, he used *-a* (3<sup>rd</sup> Person Feminine Singular), *-u* (3<sup>rd</sup> Person Plural) and *-ti* (1<sup>st</sup> Person Singular); out of the future prefixes, he used *je-*, *ji-* (3<sup>rd</sup> Person) and *te-*, *ti-* (3<sup>rd</sup> Person Feminine Singular / 2<sup>nd</sup> person), and the suffix *-u* (3<sup>rd</sup> person Plural), as summarized in Table 9.

**Table 9: S's verb-affixes in the productive period (1;08.10 – 2;00.00)**

Category	Prefixes					Suffixes				
	Number, Gender & Person	prefix	N	% per prefix out of total	% per category out of total	Number, Gender & Person	suffix	N	% per suffix out of total	% per category out of total
<i>Benoni</i>		<i>mV-</i>	33/38	87%	87%	Fm. Sg.	<i>-a</i>	19/87	22%	67%
						<i>-et</i>	13/87	15%		
	Ms. Pl.					<i>-im</i>	25/87	29%		
	Fm. Pl.					<i>-ot</i>	1/87	1%		
Past						1 <sup>st</sup> Sg.	<i>-ti</i>	10/87	11%	32%
						3 <sup>rd</sup> Fm. Sg.	<i>-a</i>	13/87	15%	
						3 <sup>rd</sup> Pl.	<i>-u</i>	5/87	6%	
Future	3 <sup>rd</sup> Ms.	<i>jV-</i>	2/38	5%	13%	3 <sup>rd</sup> Pl.	<i>-u</i>	1/87	1%	1%
	2 <sup>nd</sup> Ms. Sg.	<i>tV-</i>	1/38	2.7%						
	3 <sup>rd</sup> Fm. Sg.	<i>tV-</i>	1/38	2.7%						
	1 <sup>st</sup> Pl.	<i>nV-</i>	1/38	2.7%						

The total number of affixes (prefixes and suffixes) in S's speech was 125 (some forms included both a prefix and a suffix), out of which, 91 (73%) affixes were in the *benoni*. Table 9 specifies the total number of occurrences for every affix, and the total numbers of prefixes and suffixes for each category. The total number of suffixes was 87, out of which 58 (67%) were in the *benoni*. The total number of prefixes was 38, out of which 33 (87%) were in the *benoni*. That is, *benoni* affixes – both suffixes and prefixes – were by far the most frequent out of his productive prefixes and his suffixes.

Three Past-tense suffixes (*-ti*, *-a*, *-u*) composed 82% (28/34) out of the non-*benoni* affixes in S's speech. Close examination of the lexemes of the Past-tense verbs show that these affixes were used in S's initial productive period with a relatively small set of lexemes, compared with the *benoni* affixes. The most diverse usage was of the 1<sup>st</sup> Person Singular suffix *-ti* that occurred in verbs such as *macáti* 'found 1<sup>st</sup> SG.',

*hišta`áti* 'coughed 1<sup>st</sup> SG.', or *nivháti* 'was alarmed 1<sup>st</sup> SG.'. The 3<sup>rd</sup> Person Plural suffix *-u* occurred only five times, and the most frequent out of these three was *-a*, but its occurrences were limited to a small set of lexemes, mainly *FALL* and *BREAK*. All Past-tense suffixes in S's speech in this period were used with lexemes that represent resultative punctual events, such as 'falling', 'breaking', or 'waking-up', as opposed to ongoing events, such as 'eating', 'sleeping' or 'watching' for which he used the *benoni* forms. This finding accord with previous findings on the acquisition of Hebrew verb inflections that show that initial occurrence of Past-tense forms is with action type verbs with a slight preference for more punctual verbs (Berman & Dromi, 1984); and perhaps with the more general claim that the acquisition of tense-aspect morphology is influenced by the inherent aspect of the verbs and the distribution of inflections in the input language (see, for example, Shirai & Andersen, 1995).

The following table specifies percentages of the four *benoni* suffixes in S's speech (out of the total of *benoni* suffixes).

**Table 10: Percentages within *benoni* suffixes**

Total number of <i>benoni</i> suffixes: <b>58</b>							
<i>-a</i>		<i>-et</i>		<i>-im</i>		<i>-ot</i>	
N	%	N	%	N	%	N	%
19	<b>33%</b>	13	22%	25	<b>43%</b>	1	2%

Out of the *benoni* suffixes (58 suffixes), the most frequent was *-im* (43%; 25/58) followed by *-a* (33%; 19/58), *-et* (22%; 13/58), and *-ot* (2%; 1/58). The preference of *-a* (33%) over *-et* (22%) is unexpected in terms of type frequency, since most of the stem types take *-et* as their Feminine suffix. This preference may be due to token frequency or due to the general phonological preference of the vowel *a*, appearing in the early acquisition of Hebrew (Adam & Bat-El, 2007).

Combined together, *-a* and *-et* compose 54% of the *benoni* affixes. That is, Feminine Singular suffixes have priority over other suffixes, including the Masculine Singular *-im* (which composed 43% of the total number of suffixes). This may be due to the typology of Hebrew, in which all nouns are inherently specified for Gender, and therefore oblige the child to master this distinction early on. In the case of Plural versus Singular, however, the speaker has more semantic and pragmatic choice, that is, he or she are less restricted in their use of plural forms and can manage by using Singular forms in more contexts. There is no way to avoid using a Feminine noun, and maybe this is why early on, children master feminine verb and adjective inflections and use them more frequently than other inflectional forms.

As noted, *-ot* had only a single occurrence in S's speech throughout his productive period of affixation. This distribution can be explained in terms of morphological complexity, enhanced by phonological markedness. Morphologically, Feminine (*-a* and *-et*) and Plural (*-im*) are preferred over Feminine Plural. I assume that the bare stem is fully specified for the features masculine and singular, where the addition of a suffix imposes a change in the feature value(s). The addition of a feminine singular suffix requires changing the value of one feature and so does the addition of the masculine plural suffix. However, the addition of the feminine plural suffix requires a change in two features:

**Table 11: Morphological features of *benoni* suffixes**

Bare stem		Suffixed forms		
Gender	Number	Suffixes	Gender	Number
MS	SG	<i>-a, -et</i>	<b>FM</b>	SG
		<i>-im</i>	MS	<b>PL</b>
		<i>-ot</i>	<b>FM</b>	<b>PL</b>

This may also explain, in part at least, why S prefers Present-tense/*benoni* forms – since these require addition of an external affix for number or gender or both

together – but not for person, as required in past and future. Dromi et al (1999) found that children with SLI have more difficulties with inflections that encoded more features and required more processing effort. It could be the case here that S prefers affixes that marks the smallest number of features.

However, as elaborated in section 1.3.2.1, in Hebrew, there is no unequivocal "base form" for Hebrew verbs. Many Hebrew grammarians and linguists treat the Past-tense Masculine Singular form as "unmarked"/"basic" and hence "stem-like". Here it could be the case of form being the platform for meaning (Ravid, 2007). These "stripped" forms are what he attends to since they meet the criteria for formal simplicity (Clark, 1993; Slobin, 1973). That is, I assume that the child first attends to this form and only subsequently attaches to it a meaning that contrasts with that of other forms, much like the case of the initial variation in S's suffixes that reflects degree of acquisition of phonological structure, without full distinctions in morphological features. Further research is needed to test the assumption that forms quite generally serve a bootstrapping for some, if not all form-meaning pairing.

To summarize: the majority of S's affixed verbs were in the present-tense/*benoni* form. This preference for a certain type of affix may be due to several factors, such as the features encoded in these affixes and the categorial status of the present-tense/*benoni* forms, as discussed further in section 4.7.

### **3.2. Noun Affixation**

Noun inflections in Hebrew include the following suffixes: *-a*, *-et* (Feminine Singular), *-im* (Masculine Plural) and *-ot* (Feminine Plural) (see section 1.3.1). That is, noun inflectional suffixes and their functions are identical to those of the *benoni*.

The first noun inflection in S's speech was documented at age 1;05.04. S used two inflected forms in this session, *biim* and *babím*, and both of them to refer to *garb-áim*<sup>15</sup> 'socks'. In the following twenty-four sessions (ages 1;05.08-1;11.16) he used the full range of noun inflectional suffixes, for example, the suffix *-et* in *gólet* for *tarnegól-et* 'hen', *-a* in *da* for *yald-á* 'a girl', *-im* in *paxím* for *prax-ím* 'flowers' and *-ot* in *xajót* for *xaj-ót* 'animals'. S's usage of noun suffixes seemed to be "productive" only from session 1;07.02 on, since only then he did not use plural forms to refer to Singular nouns, and so his usage seemed to be more contextually grammatical.

**Table 12: Sample of S's noun suffixes**

Age	S	Target	Gloss
1;05.08	<i>gílelet</i>	<i>tarnegól-et</i>	'hen'
1;06.12	<i>kubeót</i>	<i>kubiy-ót</i>	'blocks (FM.)'
1;07.17	<i>táktorim</i>	<i>tráktor-ím</i>	'tractors'
	<i>tapaxím</i>	<i>tapux-ím</i>	'apples'
1;08.03	<i>ʒalím</i>	<i>ʒal-ím</i>	'leaves'
	<i>dubim</i>	<i>dub-ím</i>	'bears'
1;08.17	<i>θa</i>	<i>ʒš-á</i>	'woman'
1;09.09	<i>páðelím</i>	<i>pázel-ím</i>	'puzzles'
1;09.19	<i>idá</i>	<i>jald-á</i>	'girl'
1;10.12	<i>xajót</i>	<i>xaj-ót</i>	'animals'
1;11.02	<i>tinóket</i>	<i>tinók-et</i>	'baby girl'

The total number of suffixed nouns (tokens) during this period was 217. By far, the most frequent was *-im* (67%; 145/217) out of the total number of suffixes, followed by *-ot* (17%; 37/217), *-et* (10%; 21/217) and *-a* (6%; 14/217).

The low percentage of the Singular Feminine suffixes, *-a* and *-et*, is not surprising since nouns are more restricted in inflectional alternation than verbs and adjectives. All verbs and adjectives can be potentially marked either as Feminine or Masculine (as well as Singular and Plural) through agreement with their subject noun (in verbs)

<sup>15</sup> This plural form is formed as dual, though it can refer to more than 'two socks'. Further research is required in order to examine whether children distinguish between plural and such dual plural forms at this stage.

or their head noun (in adjectives), as specified in sections 1.3.1 and 1.3.2. In contrast, only a subset of nouns inflect for both Masculine and Feminine Gender, in the case of animate nouns, that have natural Gender (compare *yéled* 'boy' ~ *yaldá* 'girl' and *tarnegól* 'rooster' ~ *tarnególet* 'hen' with *mita* 'bed FM.' that does not have a Masculine counterpart and *kadúr* 'ball MS' that does not have a Feminine counterpart). However, all Hebrew nouns take plural marking and therefore, compared with the Plural inflectional suffixes in nouns (*-im* and *-ot*), the feminine suffixes (*-a* and *-et*) are rarer in the language, and are predicted to be less frequent in the child's speech.

The suffix *-im* was, as noted, clearly predominant in S's noun inflections. It was the first to occur in his speech, and in some sessions it was the only inflectional suffix he used with his nouns. This high frequency of *-im* in S's nouns may partially explain its high frequency in S's verb inflection, since it marks Masculine Plural for verbs as well as nouns, and so may have been familiar to him from his noun inflections when he started using verb affixes, at a later point in time.

### 3.3. Adjective Affixation

Hebrew adjectives inflect for number and gender, and with suffixes that are the same as those of present-tense verbs as well as of nouns: *-et* and *-a* for Feminine Singular, *-im* for Masculine Plural, and *-ot* for Feminine Plural.

Adjective inflections were less common than noun and verb inflections in S's speech, and did not occur in all recorded sessions, even though he used relatively many adjectives at this time (a total of 37 types, 174 tokens). The first adjectival suffix documented was in the session of 1;07.02 – the suffix *-a* in *demá* (for *adum-á* 'red SG.FM'). Compared to his noun and verb inflections, S's adjective inflections

occurred later in his speech, and appeared to be grammatical in their linguistic context from the beginning.

**Table 13: Sample of Shchar's adjective suffixes**

Age	S	Target	Gloss
1;07.09	<i>taná</i>	<i>ktan-á</i>	'little FM.'
1;07.17	<i>haftaa meyxédet</i>	<i>haftaa meyuxéd-et</i>	'special surprise FM.'
	<i>xolá</i>	<i>xol-á</i>	'sick FM.SG.'
1;10.12	<i>tiním vaím</i>	<i>ktan-ím tsvaím</i>	'little colors'
1;11.02	<i>mithatháim xadathót</i>	<i>mixnásaim xadash-ót</i>	'new pants FM.PL.'
1;11.16	<i>xadaθá</i>	<i>xadaš-á</i>	'new FM.SG.'

From age 1;07.02 until age 1;11.16, only 20 adjective inflections were documented, with *-a* the most frequent with 14 (70%) occurrences, and the others having much lower occurrence percentage. *-et*, *-im* and *-ot* each occurred twice, together making up 30% of the inflectional suffixes.

The most frequent suffixes in S's noun and adjective usage (*-im* and *-a*) are ones that correspond in percentage of total occurrences to the most frequent suffixes in his verbs. This may provide some explanation for why *-im* and *-a* were the most frequent suffixes in his verbs, since he tended to use suffixes that were more familiar to him from other lexical categories with his verbs as well.

### 3.4. Data from Other Hebrew-Acquiring Children

This section examines early verb-morphology of three girls, between ages 1;06 and 3;00, from Berman Longitudinal Corpus, once they start using verb morphology productively. Data from children at the same age range as S are examined to see whether children acquiring Hebrew, in general, show an initial tendency to use certain inflectional affixes with verbs.

In the case of Lior, a Hebrew-acquiring girl, from age 1;05.19 to age 2;4.21, like with S's, her earliest documented verbs included many bare stems and some affixed

forms that seemed unanalyzed in nature. For example, some of them exhibited no agreement where required, such as when she addressed her mother with the Masculine Imperative form *tiftáx* 'open SG.MS.'. Other affixed forms seemed to be likewise unanalyzed, referring to general situations, for example, *gamanu* for *gamár-nu* 'finished 1<sup>st</sup> Person PL.=we finished' is used as semantically a non-specific term, when a certain routine was finished, and not necessarily to describe an action in 1<sup>st</sup> Person Plural (Dromi, 1999). Lior exhibited a more consistent use of inflectional affixes, with no agreement errors only from age 2;00.00. In this session and the following nine sessions, Lior used 387 verb forms (tokens), with a total of 274 verbs with affixes (prefixes and suffixes), out of which, nearly two thirds (61%; 166/274), were *benoni* forms.

In the case of the second child examined here, Smadar, it was harder to determine when exactly her affixation became "productive", since she did not make many agreements errors, and her recording sessions were less dense than Lior's. Smadar exhibited a more intensive and consistent use of inflectional affixes from age 1;08.13, and so I examined her affixes from this session up until the session of 2;00.00. During this period, 373 verb forms were documented, out of which affixed forms included 300 affixes (prefixes and suffixes), with over half of them, (54%; 161/373) in the *benoni*.

Recordings of the third child, Naama, were less frequent than the previous two, and therefore included a smaller number of verb tokens (184). Productive usage of verb affixation was identified at age 1;10.00, and for a period of three months, until age 2;01.12, 114 affixes were documented in her speech, out of which 66 (58%) were in the *benoni* category. Table 13 below summarizes the findings from the speech of the three children:

**Table 14: findings from other longitudinal studies in Hebrew**

Child	Beginning of productive affixation	Number of affixes	Number of <i>Benoni</i> affixes out of affixed forms
Lior	2;00.00	274	166 (61%)
Smadar	1;08.13	300	161 (54%)
Naama	1;10.00	114	66 (58%)

A sample of Berman Hebrew cross-sectional corpus on CHILDES, so-called "Phase One" data is also examined here. This database includes 157 samples by 102 Hebrew-speaking children between the ages 1;0 – 5;06. For present purposes, ten samples from ten different children, between ages 1;09 – 2;11, were taken in order to see whether they also show similar tendency to rely on *benoni* forms. These children showed slightly different trends in their use of the *benoni* affixes, in that *benoni* suffixes were more frequent than the *benoni* prefixes compared with the other suffixes and prefixes accordingly. Nevertheless, *benoni* affixes still dominated these children's early usage of inflectional affixes (55%; 160/293). Table 14 summarizes the findings from the cross-sectional data:

**Table 15: Sample of a cross-sectional data**

Prefixes		Suffixes	
Total	<i>benoni</i>	Total	<i>benoni</i>
87	33 (38%)	206	127 (62%)
Total number of affixes		Total number of <i>benoni</i> affixes	
293		160 (55%)	

Further data from more children need to be examined, but the data examined here suggest that Hebrew-acquiring children do have a tendency to favor *benoni* forms once they start using verb inflections productively. Moreover, *benoni* forms appear to have preferred status in early acquisition of inflectional morphology, since they predominate from the very start of productive inflection, and they do so across a relatively lengthy period of several months.

## 4. DISCUSSION

This section discusses the findings reported in the present study from the point of view of their relevance to more general issue concerning the developmental path in acquisition of inflectional morphology.

### 4.1. Summary of Findings

As background to the discussion that follows, I summarize the main findings of the study, derived from longitudinal data focusing on S's verb forms over a period of more than eight months (from age 1;04.14 to 2;00.00). The **first stage** (in the four months from 1;0.14 to 1;08.10) provided no clear evidence of “productive” (see Section 2.5.2) and fell into two periods. Initially, his earliest verbs, from age 1;04.24 until 1;06.02, were almost exclusively (91%), forms with no stem-external affixes (See section 1.3.2.1 for the notion of “stem”). These were either in the shape of (1) masculine singular forms in present or past (e.g., *koféc* 'jumps SG.MS', *axál* 'ate SG.MS' respectively), or (2) truncated “bare stem” forms (Berman & Armon-Lotem, 1997), also termed “stem-like” forms (Armon-Lotem & Berman, 2003), that can be interpreted either as having an infinitive target form (e.g., *tóax* for *liftóax* 'to open') or as lacking an unambiguous morphological target but as still clearly relating to a verb lexeme (e.g., *\*tapés* could be assigned to any of the following targets: *letapés* 'to.climb', *metapés* 'climbs SG.MS', *yetapés* 'will.climb SG.MS'). Subsequently, for a little over another two months, from age 1:06:00 until age 1;08.10, S's verb forms were still mainly composed of bare stems, but there were few cases of variation within lexemes. That is, some of his verb lexemes occurred in more than one form for (e.g., *koféts* 'jumps MS.SG' ~ *koféts-et* 'jumps FM.SG' ~ *kofts-ím* 'jump MS.PL'). However, these affixes, like the ones that appeared occasionally even earlier, did not

exhibit a consistent or stable pattern of affixation, and hence failed to meet the criterion of productivity specified in this study (Section 1.5.2.1), as further discussed below. However, this period indicates that S has acquired the phonological structure of at least some suffixes.

In **the second stage**, from session 1;08.17 for a period of more than four months, affixed forms increased to more than a fifth (21%) of the verbs used by S. More importantly, this increase in quantity was accompanied by a qualitative change in the nature of the affixed forms he used: They no longer appeared to be rote-learned or unanalyzed (MacWhinney, 1975), and were consistently grammatical in the syntactic contexts in which they occurred. Moreover, in this same period, S exhibited a clear preference for one particular subset of affixes out of the wide range of available affixes in the input language (Hebrew verbs having no fewer than 24 different inflectional forms). 73% of his affixed forms at this stage were in the category of *benoni* functioning as present tense verb (e.g., *oxél-et* 'eats FM.SG.', *rac-ím* 'run MS.PL.'). During this period, S's speech still included many bare stems, but their number gradually decreased as the number of affixed forms increased.

These findings for the verb-usage of the subject of this study are supported by both longitudinal and cross-sectional data from other children (Section 3.4), and so can be taken to reflect a general tendency for favoring of the *benoni* category by Hebrew-acquiring children at the stage when they begin to use verb inflectional affixes productively.

The following discussion considers the implications of these findings for the development and reorganization of S's system of verb morphology and for the transition between his stages of acquisition.

#### **4.2. The gradual nature of the acquisition of inflectional morphology**

Previous studies on early acquisition of grammatical categories in developmental psycholinguistics from a usage-based perspective have shown that grammatical categories are acquired gradually both in Hebrew (Berman 1978b, 1981a, b, 1985, 1986, 1988, 1994, 2003, 2004; Levy, 1981; Ravid, 1997; Uziel-Karl, 2002) as well as in other languages (e.g., Dressler & Karpf, 1994; Gathercole, 2006; Karmiloff-Smith, 1992; MacWhinney 1975, 1978; Slobin, 1973, 1985). Such systems are viewed by such researchers as being acquired through interaction with the environment, in the course of which children **select** particular items from the total set of elements they are exposed to in the ambient language, and it is to these items that they will apply generalizations. These generalizations depend on the knowledge-base available to the child at a given period of time, a knowledge-base that is in a constant process of expansion and enrichment through reorganization of existing and new data (Karmiloff-Smith 1991, 1992).

#### **4.3. Productivity as a criterion**

In the present study, “productivity” was used in the sense of characterizing S’s usage of verb affixation. The criterion applied here for productive knowledge study (see Section 1.5.2.1) was deliberately defined in qualitative rather than quantitative terms, based on the grammatical context in which verb forms occur. It makes sense to evaluate use of inflectional morphology by its grammaticality in the context in which it occurs, given that inflectional morphology modulates the syntactic features of the verb to express its relations to other components of the utterance (Lyons, 1968). When a child is consistent in making contextually correct use of an inflectional morpheme, this can be identified as productive usage, and the child can be credited

with the knowledge required for using the morpheme in question grammatically. This construal of “productivity” is compatible with Brown’s (1973) “obligatory contexts”, which he took as test cases that enable the researcher to identify grammatical usage of inflectional items. In Brown’s criteria for productivity, 90% of the occurrences must be grammatically correct in context in order to identify productive usage. The present study defines **consistently grammatical** usage as criterial for acquisition of a grammatical category. That is, when “testing” a given grammatical category, the crucial criterion for defining its productive usage is whether its **occurrences** are always grammatical, without considering whether or not it is omitted in other instances – even though such omissions may result in ungrammatical utterances. In this study, then, productivity was defined only in terms of occurrence rather than omission of affixal morphemes. That is, consistent grammatical use of inflectional affixes was taken as indicative of productive knowledge, even if the child might still sometimes (mainly in the case of remaining “bare stems”) omit these “productive” affixes.

Critical to the analysis of the data in this study is the idea of “degrees of productivity”. Reference here is to the gradual path noted above, in the sense that children move from total non-use (“absence”) of forms, via unstable variation of forms, and on to stable use of a subset of these forms. This proposal is demonstrated here by findings from S's speech that show how his use of verbs manifested gradual control of inflectional affixes. His initial verb forms were almost exclusively in the shape of stems with no stem-external affixes (as defined in Section 1.3.2.1); this was followed by alternating, but not stable – hence not fully productive – use of a few affixes belonging to the same paradigm; and, subsequently, by a clear preference for

one particular subset of inflectional affixes (in the *benoni* category), that exhibited productive usage of morphology.

S's acquisition of verb inflections can thus be taken to illustrate a quite general developmental route in the transition between different levels of knowledge. The transition from a stage in which there was no productive affixation to one of productive affixation took place via partial variation in the forms of a given verb lexeme that did not yet warrant the status of fully "productive" acquisition. Vogel Sosa & Stoel-Gammon (2006) suggest that variability may reflect instability of the system as it undergoes the kind of reorganization characterization of transitions between stages. Relevant variation in S's early verb forms seems to suggest that there has been a change in his morphological knowledge, since he produced more than one form for a few of the verbs in his repertoire. Yet these failed to reflect full morphological acquisition of form-meaning mappings let alone constitute a coherent linguistic category. That is, although these alternating forms belong to a given inflectional paradigm, the fact that they are used does not yet mean that the child has command of the paradigm as a whole or even recognizes that these items are members of the same inflectional paradigm. This may also suggest that in acquiring new linguistic categories, children are sensitive to distinctions in form and only later on make full distinction between clusters of form-meaning mappings that are evidence of productive knowledge of linguistic items functioning in a given category.

#### **4.4. The Role of Selectivity in Developing Productivity**

Below I attempt to specify the relationship between the principle of selectivity and productive usage of linguistic forms. Researchers working on different domains and from different perspectives have argued that "acquisition" be defined as productive

knowledge of a given category (Andersen, 1992; Bowerman, 1985; Clark & Berman, 2004; Tomasello, 2003). Others have noted that children acquire linguistic categories selectively (Bassano, 2000; Bat-El & Adam, 2000; Dressler & Karpf, 1994). It follows that if acquisition is selective, then the principle of selectivity can be understood as “selectivity in productivity”, as the set of items that children select for productive usage. Recall that in the present context, “selection” does not refer to conscious decisions made by the child, but rather to a process that he or she undergoes as part of the developmental path of acquisition.

#### **4.4.1. Selectivity as defining the scope of productive usage**

When S started to use verbs, he began by producing forms with no stem-external affixes, even though affixed forms are very frequent (in both type and token) in his ambient language, and many of the affixes occur in prosodically prominent positions (Adam & Bat-El, 2000). His productive use of affixed forms exhibited further selectivity in that in the period under consideration here, he used only a subset out of all the affixes available in the input. Both the early, largely exclusive use of bare stems and the subsequent preference for a subset of affixes reflect a certain degree of selectivity. S’s acquisition appears to be “selectively productive”: That is, at each stage of knowledge, his usage productivity applies to a subset of items in a given grammatical category.

The principle of selectivity enables children to gradually enlarge the scope of the generalizations they make and to apply them to a subset of the items available in their ambient language. In the case of inflectional morphology, selectivity defines the range of affixes to which children come to eventually use in a more stable and productive fashion.

#### **4.4.2. Selectivity as a principle in breaking into new grammatical systems**

Several studies have identified children's tendency to be selective in their initial use of forms belonging to particular linguistic systems as a means of breaking into new grammatical categories, whether phonological, morphological, or syntactic (Clark, 2005; Dressler & Karpf, 1994; Gleitman et al, 1988; Karmiloff-Smith, 1991; Ninio, 1999; Slobin, 1973). This suggests that selectivity is a quite general mechanism characterizing children's attentiveness to linguistic input and how they approach acquisition of new grammatical knowledge.

In addition to explaining why certain forms are selected to occur at certain stages, the absence of other forms also needs to be accounted for. As Gleitman et al (1988) note, it is unlikely that material in non-salient positions is completely ignored even by the youngest children. These non-salient elements – in their case, low stressed material – are roughly detected from the beginning, but with no detailed analysis or distinctions. As they observe in the case of the omission of inflectional suffixes by Russian-acquiring children, it cannot be assumed that elements are omitted on the ground that they encode semantically unimportant features, since stressed elements, are acquired earlier across the board, irrespective of whether they are in semantically more loaded open-class items or in relationally dependent closed-class items. Shipley, Smith and Gleitman (1969) showed that even children whose usage was "telegraphic" since they failed to produce closed class functional elements in their own speech output, refused to respond to input speech that lacked such items.

Brown (1973) distinguishes between three types of linguistic behaviors as representing levels of knowledge in acquisition: total absence of the grammatical element from the child speech; occasional presence in fixed situations; and full control. This has direct relevance to the notion of selectivity noted earlier, but it also

implies that acquisitional processes are gradual and do not take place all at once. That is, there is more than a single degree of “knowing” a category.

The items that are not selected by children may nonetheless be familiar to them in some sense or to a certain degree. That is, they must necessarily recognize a set of items as such in order to avoid producing them consistently. Thus, for Gleitman et al (1988), children’s omission of unstressed items does not mean they have no knowledge of them at all, but rather that the relevant phonetic distinctions are not as yet fully acquired.

The notion of selectivity may help shed light on the disparity between language acquisition and speech production since, at some points in development, only the subset of items that are actually produced provide evidence that they have been acquired productively. Items that are not selected by the child at these stages cannot be considered as "acquired" in the sense of productive usage, but they may still be "familiar" to the child, and hence in some sense constitute part of his or her linguistic knowledge. That is, acquisition is not necessarily a matter of a binary distinction between "acquired"/"not acquired", but rather a more gradual process in which items may be identified, perhaps in some undefined sense even “understood” by children, and yet not yet be fully acquired.

In the framework of a developmental model such as that of Karmiloff-Smith (1992), children are said to be equipped with a mechanism that enables them to expand and reorganize their existing knowledge in order to reach a new level of command of any given linguistic system. This mechanism is essentially selective in nature, since children seem to apply the linguistic conventions they acquire at each stage to a limited range of items. This means that, as noted earlier, they do not move directly from total absence to full mastery of a grammatical category, but follow a

gradual process in which generalizations are applied to a subset of items at each step of development.

#### **4.5. Productivity and Selectivity in the Developmental Path of Acquisition**

I construe the notions of productivity and selectivity as underlying and guiding the developmental path of inflectional morphology as a whole, possibly of grammatical knowledge in general. As such, they constitute **overriding** “operating principles” (Bowerman 1985; Slobin, 1973, 1985) in language acquisition, at least in the early years. And they can thus be taken as applying to and hence determining the structure of recurrent phases in the acquisition of different types of linguistic knowledge at different stages of development in general and of inflectional morphology in particular (Berman, 1986, 2004; Karmiloff-Smith, 1986).

Compared to adult speech, children’s language at different stages in acquisition typically exhibit partial knowledge that represents the generalizations they have already internalized. In the transition to a more advanced stage of knowledge, children need to make further selections and to apply either an existing generalization to a larger set of items, or a new generalization to the existing subset of items. This suggests that selectivity and productivity operate continuously and in tandem in the transition from one developmental stage to the next.

In sum, the principles of Productivity and Selectivity characterize a system that is acquired both selectively (and hence gradually across time) and at the same time productively (by means of abstract generalization and category formation). From this point of view, language acquisition, while viewed as developmentally motivated and hence non-nativist in essence, is governed by general principles that go well beyond item-by-item learning or simple extraction of instances from input.

#### **4.6. The notion of "bridge" into grammatical systems**

Researchers have noted the first items to be acquired out of different grammatical categories can usually be defined as “prototypical”, “unmarked” or “generic” (Dressler, 1987; Ninio, 1999). In the present framework, this means that the prototypicality of such items causes them to be selected first by the child, and hence to function as a platform to new grammatical knowledge. Here it is suggested, further, that the neutral nature of certain **classes** of items makes them good candidates for children to select in crossing over into a new grammatical system. By “neutral” in the present context, reference is to classes of items that are structurally less complex in form and that are semantically relatively less restricted, and hence more open-ended in terms of their form-meaning mappings.

A key claim of the present study is that, as part of the gradual process of acquisition, some grammatical elements will be acquired before others. I suggest, further, that existence of a relatively neutral class of items in a given grammatical category promotes the selection of this subset of items as a “bridge” (in the sense used, say, by Berman, 1983; Ravid, 1997) to the rest of the members in the category. Thus, classes of items that can be defined as “neutral” within a given grammatical category play an important role in directing selectivity and in the acquisitional path in general. Once selected as a starting point from which to break into a given grammatical system, they can provide a bridge for children to cross over into acquisition of a new, more general linguistic category.

#### **4.7. *Benoni* Forms a "Bridge" to Verb Inflection in Hebrew**

As noted, S’s early productive verb affixes were composed mainly of what could be identified as “present-tense” forms, in the shape of items from the so-called *benoni*

(Section 3.1.2). I suggest that the predominance of *benoni* forms in S's early verb-use is due to what can be defined as their neutral nature.

Several related factors conspire to account for the uniquely neutral status of the *benoni* affixes in S's speech. As noted earlier (Section 1.3.3), *benoni* in Hebrew means 'medial', a traditional label that points to its mixed or intermediate nature as a lexical category, since it can function as noun, adjective or as "Present-tense" verb (Berman, 1978a). *Benoni* affixes, as opposed to other verb inflections, are shared by all lexical categories (e.g. *yelad-ot nexmad-ot coxak-ot* 'grils nice FM.SG. laugh FM.SG. = nice girls laugh'). This suggests that *benoni* affixes may well be more familiar to children than other verbal affixes, since they are heard in more contexts and with more lexical items.<sup>16</sup> Another consequence of their non verb-like nature is that the *benoni* inflections are the only verb affixes that do not carry marking for Person. As claimed in previous studies on the acquisition of inflectional morphology (Andersen, 1992; Dromi et al., 1999), and as hypothesized regarding the single occurrence of the suffix *-ot* earlier in this study (Section 3.1.2), the simpler a morpheme in terms of the features it encodes, the earlier it is predicted to be acquired. *Benoni* affixes encode fewer features than the other tense affixes, due to their lack of Person marking, and so may be preferred in early stages of acquisition. Besides, unlike Number and Gender, Person marking is entirely context-dependent, not only in terms of linguistic environment, but also governed by pragmatic communicative factors that require speakers to assign different Person reference to different participants in a given situation. Thus, children may be freer in using the *benoni* forms, since these do not require them to select Person marking as well. Moreover, since *benoni* inflections can be used for all Persons, they make up a relatively small set of affixes, compared to

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<sup>16</sup> This important, frequency-related issue was not separately examined in this study but remains subject to future research.

past and future subsets. All these factors assign relative morphological simplicity to *benoni* forms, compared to other tense paradigms.

In addition to being intermediate between the lexical categories of verb, noun, and adjective, *benoni* forms have an intermediate temporal status, both between past and future, and between finite forms (past and future) and non-finite forms (infinitive and gerund) (Berman, 1978a). These features do not necessarily mean that *benoni* is a less complex category; on the contrary, in terms of one-to-one form-meaning mapping, *benoni* forms are multiply ambiguous, without clearly defined boundaries. Nonetheless, the uniquely ‘medial’ status of the *benoni* enables children to use forms from this class of items without obliging them to make specific reference to either person or time. Formal simplicity combined with their relatively flexible semantics evidently conspire in giving them a preferred status for selection in the early phases of productive verb affixation in Hebrew.

#### **4.8. Directions for Further Study**

In conclusion, I note several issues that are relevant and important for the topic analyzed here, but that lie outside the scope of this study.

##### **4.8.1. Pros and cons of a case-study analysis**

This research is a qualitative developmental study focused on a single child, from the onset of his verb usage, for a period of over eight months. S's documented productions provided rich material for analysis due to the relative frequency of recordings (once a week), and the length of each session (one hour long). Moreover, the investigator had the advantage of close familiarity with the child, her nephew, with whom she met on numerous occasions other than official recording sessions, and

whose home and school environment are well known to her. In this sense, the present analysis combines features of longitudinal sampling with those of a diary study (Ingram, 1989). Besides, findings for S were supplemented by both longitudinal and cross-sectional data from other Hebrew-acquiring children that showed similar tendencies to those that he exhibited.

Parents or other caretakers tend to pay attention to special or idiosyncratic features rather than providing an overall documentation of the child's production, whether in a given domain or in general. See, for example, in Hebrew, Sagi's documentation of the words used by his grandson Ran (Berman & Sagi, 1981) and of Borochofsky's (1984) observations of her child's acquisition of noun plurals. Moreover, when the diarist is an expert on child language, there may be a tendency to focus on one particular domain of acquisition. For example, Clark's (1993) study of her son, Damon, highlighted his strategies for new-word formation, while Bowerman's (1974, 1977) study of her daughters' productions focused on "productive errors" and semantic development. In the diary study she conducted of her daughter, Dromi (1986) defends the use of case-study methodology, since it ensures close and constant adult-child interaction over an extended period of time and intimate knowledge of the child's linguistic repertoire at any point in time. Such a methodology also allows the investigator to rely heavily on relevant context, both linguistic and extra-linguistic, making it possible, for example, for Dromi's study of early lexical development to define a "meaningful word" as any sequence of sounds consistently produced by the child in similar contexts. Dromi also emphasizes the importance of longitudinal studies in general, since examining items across time makes it possible to evaluate their developmental history with reference to their "age" – the time that elapsed since they first occurred or were first documented. Moreover, unlike cross-sectional studies

of groups of children at given points in time, longitudinal examination of children's utterances -- including longitudinal sampling of the kind undertaken in the present context -- makes it possible to identify **processes** of change and growth in the same child's productions at different points in time.

The present study encountered difficulties in identifying "productive use" of verb affixes when examining data from other children -- both those recorded longitudinally as well as others documented by cross-sectional research with only one or two transcripts for several children at a given age-range. In both types of recordings, I had difficulty interpreting the exact nature of any given affix, since I myself had not been personally involved in the recording or even transcription of their speech output. In a study such as the present, where focus is on the process of "selectivity in attaining productivity", the information provided by data from other children was insufficient for unambiguous identification of what constituted productive knowledge. In sum, a case-study like the present one has the advantage not only of being, by definition, longitudinal and hence ensuring detailed documentation of the history of the child's speech, it also reflects the close relationship manifested in the interaction between the child and the investigator. Taken together, such a methodology gives the database density of amount, and hence reliability, and it gives the investigator greater confidence in interpreting the data, hence lending them more validity.

Further and more detailed research is clearly needed, however, in order to generalize more fully concerning the acquisitional path of Hebrew-acquiring children. The findings documented here, then, need to be supported by additional research of other children, both boys and girls, at the same developmental stages. It is recommended that such studies, likewise, adopt a "case-study" approach, for the reasons noted here: to ensure density of richly contextualized data across time.

#### **4.8.2. Comparisons with other languages**

The assumption underlying this study, that “neutral” forms tend to be acquired earlier than other members of a given grammatical category, needs to be further supported by findings from other languages – including Arabic, as typologically closely related to Hebrew. Some evidence for this claim is provided by studies in European languages showing that children do in fact demonstrate preferences for a particular subset of affixes when they begin producing verbs (see, for example, Bassano et al, 2004 for French and German; Brown, 1973, and Tomasello, 1992, for English). However, these “favored” forms need to be carefully re-evaluated in terms of the psycholinguistic notion of neutrality formulated here, as well as in terms of the particular typological features of each target language (for example, that English simple present tense forms are largely unmarked for affixes, or that verbal affixes in French, Italian, and Spanish are affected by which of three verb conjugations they occur in).

#### **4.8.3. Implications of child grammar for analysis of the Hebrew verb system**

As noted in section 1.3.2.1, the Hebrew verb system has no obvious neutral or “basic” form (Berman, 1978a). As a result, children acquiring Hebrew must deal with inflections from the very beginning, as soon as they start producing their first verb forms (Berman & Dromi, 1984). Nevertheless, as shown in earlier research on the acquisition of Hebrew, and in the findings from the present study, children do prefer certain verb forms over others when they start producing verbs. Although the Hebrew verbal paradigm may lack a basic, uninflected form, different forms still differ in their inflectional status. Specifically, the tendency of Hebrew-acquiring children to start out with “bare stems” indicates that these constructions play an important role in

acquisition, possibly reflecting their special status in Hebrew in general, as argued below.

For present purposes, bare stems were defined as stems with no stem-external affixes, either prefixes or suffixes. For Hebrew verbs, this definition covers the following: Masculine Singular Past tense (e.g., *tipes* 'climbed 3<sup>rd</sup> MS.SG. '); Masculine Singular Present tense in the *pa'ál* and *nif'ál binyan* patterns (e.g., *holex* 'goes MS.SG. '); Masculine Singular Imperatives, Infinitives, and also "truncated" forms of either one of these four forms or forms lacking a clear inflectional target. The fact that these forms made up almost all of S's earliest verb forms for a period of four months suggests that they compose a subset of the available verb forms in Hebrew. That is, Hebrew can be considered to have a subset of "bare stems", which are characterized by the absence of inflectional affixes.

Further, in S's verb affixation, prefixes appear to have a different status than suffixes. In Hebrew, Past tense inflections do not include any prefixes, Present-tense/*benoni* forms have a prefix in three of the five *binyanim* (other than *pa'al* and *nif'al*), while all Future verb forms have prefixes. Nonetheless, productive prefixation occurred later than productive suffixation. This could be due to phonological factors, since the word-initial position and invariably unstressed nature of prefixes make them less salient than suffixes. A second factor concerns the grammatical categories encoded by prefixes compared with suffixes. The latter typically mark Number and Gender, which are pervasive across the ambient language, being marked on nouns and adjectives as well as on verbs, whereas prefixes occur only in some, not all, Present-tense forms, and in Future tense, known to be acquired latest.

The *benoni* prefixes that dominated S's early productive prefixation mark verbs uniquely for "present-tense"<sup>17</sup>; moreover, unlike Future tense prefixes, they do not encode Person. These prefixes have been analyzed as playing a role in constituting a "bridge" to full acquisition of the distinctions between non-finite and tensed verbs in Hebrew, as part of an "interim strategy" by which children use *mV* prefixes as prototypical present-tense markers (Berman, 1983). Children are said to use a "schema" that reflects (partial) productivity, that will later be replaced by a more adult-like rule indicative of fuller specification of the category in question (For a similar argument based on English past tense acquisition, see Bybee & Slobin, 1982). That is, Hebrew *mV* prefixes play a role in the transition from partial to complete acquisition of inflectional categories in general and in the acquisition of prefixes in particular, and these factors may explain their high frequency in early speech.

*MV* prefixes are also familiar to the child from other lexical categories, since many nouns and adjectives in Hebrew begin with *mV* (e.g., *matós* 'airplane' *mitriyá* 'umbrella', *meluxlax* 'dirty', *macxík* 'funny'), words whose internal structure is not always transparent (Berman, 2003). Thus, there are numerous lexical items that resemble the *benoni* prefixed forms in structure. Such high frequency across lexical categories may contribute to their preferred status in early verb productions

It might be argued that prefixes are more intimately related to the verb stem, together with which they constitute a particular pattern or template, hence being part of the stem; this would mean that, unlike suffixes, Hebrew verb prefixes are not in fact independent morphemes (Ravid, 2007). This claim has implications for how such elements are perceived by children, and so would require a different analysis than the

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<sup>17</sup> The *benoni* in Hebrew, as discussed earlier, also has various participial functions (Berman, 1978), but these are largely irrelevant to early child language.

one adopted here, where prefixes are considered as separate affixes and not as part of the stem.

Ravid's analysis may be particularly relevant in relation to the category of Infinitives in Hebrew, specifically to the infinitival prefix *IV-* (Section 1.3.2). All and only Infinitives are composed of the Future stem of the verb preceded by a prefixed *l-* plus an alternating vowel as its marker (Berman, 1978a). I accept the analysis of traditional Hebrew grammar, stipulating that the prefixed *IV* is an integral part of the stem (e.g., Blau, 1975). The prefix is conventionally considered an inseparable part of the stem owing to its phonological behavior compared to other prepositional clitics that occur with the so-called "construct infinitive" or what Berman (1978a) defines as the gerund. Compare, for example, infinitival *lišbór* 'to.break' with a root-medial stop consonant versus gerundive *bišvór*, *kišvór* 'in-breaking, while-breaking' with the root-medial consonant spirantized. The stop consonant in the infinitive indicates that there is no vowel between the root-initial *š* and the medial *b* (so-called *quiescent shwa*) compared with intervening vowel between these two consonants (the *shwa mobile*) in the gerund, which requires that the medial consonant be spirantized following a vowel (Gesenius, 1910: 51).

More importantly, Infinitives have a different status from all other forms in the Hebrew verb paradigm since they carry no inflections. This assigns a non-alternating status to the prefixed *IV*, differentiating it from the affixal inflectional paradigms. Since infinitive forms are not marked for any of the inflectional categories, they do not reflect relations between other items in their grammatical context. This means that they cannot be measured for productive use by children in terms of the grammatical context in which they occur (by looking, for example, at tense or agreement). During S's productive affixation period, he continued to occasionally use infinitive forms as

"bare stems"; that is, they still sometimes occurred where an inflected form was required. For example, in session 1;09.27, S said *gam aní laamód* 'also I to-stand', using the contextually ungrammatical infinitive form with a Masculine Singular 1<sup>st</sup> Person pronoun.<sup>18</sup> In his productive period, from which this utterance of S is taken, S never used affixes where they were not grammatically required. That is, he still used bare stems where affixed forms were required, but all the occurrences of his affixed forms were grammatical in context. This suggests that S did not perceive the prefixed *IV* as a prefix, but rather as an integral part of a "bare" stem, and that is why he used infinitive forms where inflected affixed forms were grammatically required. Further support for the stem-like status of infinitives is provided by a case where S used an infinitive form together with an inflectional suffix, to yield the ungrammatical, totally non-Hebrew like form *\*lecayér-im* 'to.draw + MS.PL.', although the plural suffix was used in the correct grammatical context. Here, it seems that S perceived the infinitive form to be a bare stem to which he could apply suffixation. All these observations suggest that infinitive forms have a status distinct from that of prefixed forms.

This suggests that Hebrew has a three-way system of affixation: (1) non-affixed forms (such as Masculine Singular Past forms), (2) zero-affixed forms, that include Infinitives, and (3) affixed forms. If that is the case, then the data presented in this study indicate that both non-affixed and zero-affixed forms are perceived by children as stems, as opposed to affixed forms.

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<sup>18</sup> These occurrences seem to provide evidence for the so-called 'root infinitive' analysis (for example, Wexler, 1995). But such forms were so rare in fully ungrammatical contexts in the speech of S, as of all other Hebrew-speaking children observed to date, that they do not seem to be evidence for any kind of systematic knowledge or lack of knowledge. Bear in mind, moreover, that infinitives can be used grammatically as the only verb in an utterance in certain pragmatic contexts, such as "teacherese", where teachers or mothers use such forms for making requests or giving orders, both in the affirmative and even more in the negative (e.g., *lo laruc* 'not to-run' in the sense of 'you mustn't run, don't run').

#### 4.8.4. Lexically specific factors and semantic contexts

This study considers consistent grammatical usage of inflectional morphemes as indicative of "productive" acquisition of the relevant inflectional categories. To this end, criteria for productive usage were specified, in order to exclude rote-learned forms from consideration. However, children may also use certain forms in "rote-learned" contexts, analogously to rote-learned affixation. That is, use of an affix may be consistently accurate in a given grammatical context and yet not in fact signify productive acquisition in cases where the entire context of usage is rote-learned (e.g., as where Hebrew-acquiring girl-children say *lo roca* and boys say *lo roce* 'not want = I don't want to' with appropriate gender marking and the intended meaning, well before they have acquired productive command of gender marking). This suggests the need for a more detailed analysis of the diversity of contexts in which each affix occurred, in order to ensure that consistent grammatical usages of affixes all in fact denote grammatical knowledge.

A related issue that is not considered in this study is the semantics of S's verb forms, including such features as their temporal extension (e.g., are present tense verbs used only to refer to ongoing events and activities, or do they include habitual or generic reference) and what kind of person reference is involved in the child's use of verbs in the *benoni*.

Another topic in acquisition of a verb lexicon that is not examined in this study is the issue of types versus tokens, as well as of the semantic classes of verbs that make up S's lexical repertoire at each stage. The definition of "type" varies across different studies, and can refer either to a lexeme or to a word-form. Both notions of "type" are critical for early grammatical development and require further investigation of the data.

#### 4.8.5. The input-output relationship

The issue of input-output correspondences, specifically in terms of frequency, lies beyond the scope of the present study. Yet such issues questions appear critical to the analysis of early child language. Frequency of elements in Child Directed Speech (CDS) may play an important role, especially in examining the order of acquisition inflectional categories and dominance of certain forms over others in children's speech. Specifically, it may be the case that more neutral or less marked forms of a given category are favored in CDS. For example, a quite general tendency has been observed that caretakers /parents in different languages including Hebrew to use the neutral or unmarked forms of nouns in talking to young children, by showing a strong preference for morphologically simpler Singular nouns and morphologically regular Plural nouns rather than irregular plural forms (Ravid , Dressler, Nir-Sagiv, Korecky-Kröll, Souman, Rehfeldt, Laaha, Bertl, Basbøll & Gillis, 2006).

Comparable data for verb usage in Hebrew CDS are not available at this point, yet detailed findings for a limited sample of the speech directed by a mother to her 18-month-old daughter are suggestive. Preliminary counts of verbs in Hebrew CDS (Ravid, 2007) indicate that one-third (240/719) of the verb tokens used by the mother were in the *benoni* category. The vast bulk of these forms (204/240 = 85%) were suffixed while 15% (37/240) were prefixed. Other categories in this corpus included Past-tense forms (11%; 81/719), Imperatives (14%; 99/719), Future-tense forms that mostly functioned as imperatives (26%; 187/719), and Infinitives (16%; 112/719). These initial findings for parental verb usage with a child in the same age as S thus reveal that *benoni* forms were the category with the highest frequency out of total verb input to this child in this session. I take this to support the explanation given earlier (Section 4.7) for why Hebrew-acquiring children favor *benoni* forms so

markedly, since they can be used in a wide range of different contexts, due to their function as "present-tense verbs" and their semantic flexibility.

It is interesting that *benoni* forms, are not predominant in do not dominate all verb forms in this (admittedly very limited) sample of CDS, since most of the mother's verbs (67%) take some other form. If this turns out to be the case in CDS in general in Hebrew, it would indicate that Hebrew-acquiring children's preference for *benoni* inflections is not only due to their high frequency in the input. Rather, this would highlight the role of selectivity in early grammar, since the child in question here, like all Hebrew-acquiring children from the very beginning are exposed to a variety of verb inflections, not predominantly to *benoni* forms.

Two important issues need to be pursued with respect to the role of input in verb acquisition of verb inflections in Hebrew as of early child grammar in general. One is the question of the degree of correspondence between frequency of forms in children's speech and in CDS as a means of identifying the factors determining the developmental course of acquisition. A second is the question of whether CDS has a specially "simplifying" status in this respect – as suggested by the notion of "core morphology" in the largescale cross-linguistic study of noun plurals referred to earlier (Dressler et al, 2006). On the other hand, patterns of CDS might merely reflect quite general patterns of usage in the ambient language, another interesting question that requires separate study.

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