

EARLY MORPHOLOGICAL DEVELOPMENT A DUO:
PRE- TO PROTOMORPHOLOGY IN
HEBREW-SPEAKING TWINS*

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1. Introduction

Recent interest in the study of modularity of mind and language, the nature of morphology and of morphological acquisition has converged in the form of studies on two specific stages in early linguistic development: pre- and protomorphology. During this period children move from a generalized, pragmatically-centered knowledge of separate lexical items (Bates, Bretherton and Snyder 1988; Dromi 1987; Gillis and De Schutter 1986), to the first outlines of lexical and functional categories and an initial formation of what will eventually be the network of items bound by major and minor rules and embedded in a language-specific typological context (Berman 1986). This paper will sketch what the earliest stages in morphological development look like, focusing on pre- and protomorphology of the verb system. The early morphological development of a pair of twins (boy and girl) provides a window on individual variation in morphological acquisition. These two aspects of the paper are highlighted in the next two sections. The route taken by the twins in acquiring the rich inflectional system of Hebrew verbs demonstrates the role of language-particular features of the early phases of morphological development.

1.1. Pre- and protomorphology

According to Dressler and Karpf (1995), the stage of premorphology crucially differs from that of protomorphology in relying on general cognitive rather than specifically grammatical knowledge since the morphological module is not formed

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yet. The child's operations at this stage are thus less subject to language-specific constraints, are mainly extragrammatical in nature (Dressler and Merlini 1994) such as the production of diminutives (Gillis 1997), and violate principles of morphology. At this stage, which has been described in a variety of languages (see, for example, Slobin 1985), the child has a small vocabulary of rote-learned forms with very few inflectional alternations. There is still no creative derivational morphology at work yet, and this is expressed in the lack of productive lexical affixation. The borders between lexical/syntactic categories are undefined yet, as these crucial distinctions characterize the morphological module (Ninio 1988; Radford 1990, 1992; Verrips and Weissenborn 1992). At the protomorphological stage, children already possess a larger vocabulary with first grammatically creative, though limited, inflectional forms, accompanied by the emergence of lexical/syntactic categories such as nouns, verbs, determiners and prepositions. At this time, the child's morphological system is initially formed in clusters of alternations, while his/her syntax is still characterized by isolated "verb-island" syntax so that arguments appear only in chunks (Tomasello 1992). Word order is, as a result, still unstable and dependent on pragmatic rather than on syntactic considerations, and as a result is in most cases ungrammatical (Dromi and Berman 1986; Givón 1979; Ingram 1989; Ravid 1997). A number of recent works have looked into extragrammatical morphology during the premorphology stage and compared case studies of children developing in Indo-European languages (e.g., Kilani-Schoch, de Marco, Christofidou, Vassilakou, Vollmann and Dressler 1997). The current work carries this endeavor into the Semitic language family.

1.2. Linguistic development of twins

This study focuses on acquisition of early verbal inflections by a pair of Israeli dizygotic twins. Twins are a fascinating natural phenomenon providing researchers with the opportunity to compare and contrast physical and cognitive developmental processes both within the pair and with singleton children (Akerman and Fischbein 1991; Segal 1993). These studies indicate that twins are more susceptible to lower birth weight, a shorter gestation period, and birth complications. These factors were also related to later physical and mental development. A number of studies examined language development within twin dyads with one handicapped member (e.g., Clements and Fee 1994; Edwards and Yuen 1990; Gaines and Hallpern-Felsher 1995), while others compared language acquisition in twins and singletons. These studies indicate that although twins use their language as appropriately as singletons, they speak less and their utterances are shorter and their articulation is poorer (Conway, Lytton and Pysh 1980). They have less verbal interaction with their mothers, and they use different interactive styles and strategies than singletons: while twin pairs tended to intervene in the interaction to support and complete the co-twin's performance, singletons seemed to care more about the quality of information and tended to engage in informative exchanges (Zani, Carelli, Benelli and Cicognani 1991). The "twin situation" was studied in normally developing as well as in impaired twin populations (Akerman and Thomassen 1991; Sandbank and Brown

1990) with careful attention to parents' and other caretakers' reduced contribution to twins' linguistic and communicative skills (Lytton, Conway and Sauvé 1977; McEvoy and Dodd 1992; Tomasello, Mannle and Barton 1989). More recently, the linguistic development of multiple-birth siblings was studied (Gillis and Verhoeven 1992). Several of the studies focused on individual differences within the twin dyad, mostly showing that twins differ as much as any two subjects (e.g., Leonard, Newnoff and Mesala 1980).

1.3 Hebrew morphological structure

As this study focuses on the early stages of the acquisition of the Hebrew verbal system, a short description of Hebrew morphology is provided below. Hebrew is a Semitic language with a characteristically synthetic morphology, based on the interdigitated constructs of ROOT and PATTERN. Semitic roots are abstract tiers of three to four consonants, which carry the substantial meaning core of the word; they require the addition of another tier of vocalic elements (patterns) with their own semantics to create words (Berman 1987; McCarthy 1981; Ravid 1990). Thus, for example, the root *g-d-l* 'grow' is combined with various patterns to yield different words: *migdal* 'tower' (pattern *miCCaC*), *gidel* 'raise' (pattern *CiCeC*), *gódel* 'size' (*CóCeC*), and *gadol* 'big' (*CaCoC*). Patterns (consisting of internal vowels and optional external affixes) fall into two main groups: noun patterns, and 7 verb patterns, called BINYANIM (literally: 'buildings'), expressing transitivity relations. Table 1 shows the combination of roots with BINYAN patterns:

Table 1. The 7 verb-pattern conjugations in Modern Hebrew, combined with roots *g-d-l* 'grow', *r-d-m* 'fall asleep', and *l-b-š* 'wear'.

Binyan	Verb
<i>Qal</i> (P1)	<i>gadal</i> 'grow', <i>lavaš</i> 'wear'
<i>Nif'al</i> (P2 and passive of P1)	<i>nirdam</i> 'fall asleep', <i>nilbaš</i> 'be worn'
<i>Pi'el</i> (P3)	<i>gidel</i> 'raise'
<i>Pu'al</i> (P3 passive)	<i>gudal</i> 'be raised'
<i>Hitpa'el</i> (P4)	<i>hitlabeš</i> 'dress oneself'
<i>Hif'il</i> (P5)	<i>higdil</i> 'enlarge', <i>hirdim</i> 'put to sleep', <i>hilbiš</i> 'dress'
<i>Huf'al</i> (P5 passive)	<i>hugdál</i> 'be enlarged', <i>hurdám</i> 'be put to sleep', <i>hulbaš</i> 'be dressed'

1.3.1. Hebrew verbs

Unlike nouns, which may either be constructed of roots and patterns or of linear components, all Hebrew verbs must consist of the two tiers of root and one of the 7 BINYANIM (Ravid 1990; Schwarzwald 1981). The Hebrew verbal system thus con-

stitutes a closed system with unique and salient derivational characteristics which facilitate acquisition (Clark 1993); previous studies show that these manifest themselves to Hebrew-speaking children rather early on (Berman 1993, 1994).

1.3.2. Verb inflections

The Hebrew category of verb is also uniquely marked in inflection. All Hebrew verbs are inflected for TENSE, e.g., *hilbiš / malbiš / yalbiš* 'dress, Tr' (past, present, future, P5); or MODALITY (imperative), usually taking the form of 2nd person future tense, e.g., *talbiš* 'dress!'. Present tense verbs agree with their subject in NUMBER and GENDER, e.g., *malbiš / malbiša / malbišim / malbišot* 'dress, Tr: Masc / Fem / Pl Masc / Pl Fem'. Past and future tense verbs also mark PERSON agreement, e.g., *hilbášti / hilbášta* 'I / you dressed'. Imperative forms are inflected for NUMBER and GENDER in 2nd person, e.g., *talbiš / talbíši / talbíšu* 'dress / Fem / Pl'. The infinitive form is preceded by *le-* 'to', e.g., *le-halbiš* 'to-dress'. Verb inflections morphophonologically contrast with noun inflections in two ways. Firstly, while all obligatory nominal inflections are stressed linear suffixes, verb tense is expressed through non-linear patterns, e.g., past-tense *CaCaC* vs. future-tense *yiCCoC*, P1 (Ravid 1995a); and secondly, linear agreement affixes on verbs are subject to unique stress rules, contrasting with nominal inflectional stress assignment (Blau 1971). Thus, despite its complexity and rich allomorphy, the Hebrew verbal system constitutes a learnable system which expresses verbal features in consistent ways. Verbal inflections, especially tense, gender and number, are among the earliest learned by Hebrew-speaking children (Armon-Lotem 1996, Kaplan 1983).

2. The study

The current study is a longitudinal examination of the development of Hebrew inflectional morphology in M and D, dizygotic twins. To the best of our knowledge, such a study has not been conducted on Hebrew yet, and the comparison of the twins may contribute to highlighting the early stages in the acquisition of verbal inflections from both language-particular and general points of view. M (boy) and D (girl) are fraternal twins from a high SES family with one older sister (14), all native speakers of Hebrew, living in a rural neighborhood in central Israel. They were recorded in various situations within their family circle by their aunt, a kindergarten teacher, who also transcribed the recordings. There were 12 recording sessions of 20 minutes to half an hour each, conducted every two weeks over a period of 6 months, from age 1;11.05 to 2;04.27. Below we present an analysis of the twins' development of the verbal system. First, background information about the twins' general linguistic growth is provided, including number and types of utterances, amount of content words, and number of inflected content words. Then the development of verb tokens and types are analyzed grammatically for both twins in pre- and protomorphology.

Table 2. D's development in terms of utterances and content words.

recording #	age	# utterances	% initiated utterances	% utterances consisting only of repetitions	% utterances consisting only of yes/no	% unintelligible utterances	multi-word utterances	# inflected content word tokens	# content word tokens	ratio: inflected content words over total content words
1	1;11.05	56	54%	23%	21%	11%	12.5%	1	35	0.03
2	1;11.26	30	53%	10%	23%	3%	23%	3	22	0.14
3	2; 0.11	50	36%	8%	16%	-	10%	5	36	0.14
4	2; 0.23	48	69%	17%	15%	-	19%	10	49	0.20
5	2; 1.15	59	56%	14%	10%	3%	44%	12	63	0.19
6	2; 1.27	45	84%	11%	4%	-	53%	25	36	0.69
7	2; 2.11	57	48%	7%	24%	-	29%	23	49	0.47
8	2; 2.27	71	78%	9%	7%	-	68%	38	71	0.54
9	2; 3.08	77	68%	3%	8%	5%	61%	35	88	0.40
10	2; 4.00	68	71%	7%	12%	-	63%	41	72	0.57
11	2; 4.14	89	56%	7%	10%	-	60%	49	87	0.56
12	2; 4.27	90	61%	16%	8%	1%	57%	46	101	0.46

Table 3. M's development in terms of utterances and content words.

recording #	age	# utterances	% initiated utterances	% utterances consisting only of repetitions	% utterances consisting only of yes/no	% unintelligible utterances	multi-word utterances	# inflected content word tokens	# content word tokens	ratio: inflected content words over total content words
1	1;11.05	83	40%	18%	13%	2%	22%	6	61	0.10
2	1;11.26	111	47%	10%	14%	2%	43%	11	96	0.11
3	2; 0.11	84	63%	7%	7%	2%	35%	11	64	0.17
4	2; 0.23	107	78%	16%	8%	2%	36%	16	92	0.17
5	2; 1.15	61	63%	-	16%	-	38%	10	47	0.21
6	2; 1.27	94	69%	2%	13%	2%	47%	33	68	0.49
7	2; 2.11	127	47%	4%	22%	2%	38%	55	79	0.70
8	2; 2.27	104	44%	3%	16%	1%	40%	23	79	0.29
9	2; 3.08	115	70%	4%	13%	-	53%	47	104	0.45
10	2; 4.00	92	71%	9%	9%	-	70%	34	102	0.33
11	2; 4.14	61	89%	8%	7%	-	42%	24	58	0.41
12	2; 4.27	91	74%	7%	9%	1%	65%	40	78	0.51

2.1. Results

This work examines the acquisition of verbal inflections by the twins. As background to this examination, the transcriptions of the 12 recording sessions were analyzed in two dimensions: the amount and types of utterances, counted by intonational units (Chafe 1994), and the amount and types of content words, of which verbs are a subcategory. Tables 2 and 3 present this information for M and D respectively.

2.2. Analysis of background information

A comparison of M and D's development in terms of utterances shows individual variation as well as some general patterns.

2.2.1. Comparison of utterances

D speaks less than M. She has about 50 utterances per session up to age 2;1.27, when she goes up to about 70, and up to 90 utterances at 2;4. M starts with more than 80 and usually has about 90 utterances or more per session. However, in both children, initiated utterances – those that are not replies to questions or prompted speech – constitute about 60-70% of all utterances. In both children, the amount of utterances consisting only of repetitions (e.g., *taim taim taim* 'tasty tasty tasty') decreases to about 7% of the utterances after age 2;3. A similar pattern is found in the number of yes/no utterances: these decrease in both subjects to about 8%, though D starts with more and ends up with more. The number of unintelligible utterances, consisting of syllabic productions or distorted incomprehensible speech starts high in D, but is soon down to 1% of all utterances, or is completely missing. In M, unintelligible utterances are constantly about 2% of the utterances in each transcript. The number of multi-word utterances increases dramatically in D and gradually in M, and reaches about 2/3 of the utterances in both subjects at 2;4.27. Thus, from a number of viewpoints, both twins speak more, and more independently and creatively, as they grow older.

2.2.2. Comparison of content words

An analysis of the amount of content words again shows an increase with individual variation across the transcripts. The number of content word tokens (nouns, verbs and adjectives) was counted for both subjects. D shows a dramatic increase from 20-30 content words at the end of her second year to 80-100 by age 2;4; M starts with about 60 content words per transcript which reach over 100 after 2;4, but decrease towards 2;5. Another measure used to evaluate the twins' language was the number of INFLECTED content words – nouns, verbs and adjectives. This meant plural nouns, feminine and plural adjectives; and non-infinitive verbs (the only non-inflected verb category in Hebrew). In D's transcripts the difference is huge: from under 12 inflected words up to 2;1.15, to about 45 towards age 2;5. Exactly the same pattern is revealed in M's transcripts, and for the same range: he has very few inflections up to 2;1.15 (the fifth session), which increase to 30-40 towards age 2;5. Finally, the ratio of inflected content words over the total number

of content words was calculated for each session. For both D and M, the sixth recording (age 2;1.27) demarcates a remarkable change in this ratio: though the general number of content words continues to increase, the ratio of inflected over content words increases dramatically from 0.1-0.2 to double and triple that.

Table 4. An analysis of the twins' verb types and tokens, premorphology.

	Age	Verb tokens per session		Verb types per session	
		D	M	D	M
1	1;11,05	12	16	4	8
2	1;11,26	5	10	2	10
3	2;0,11	2	17	2	8
4	2;0,23	12	27	6	7
5	2;1,15	18	15	9	8
Total in premorphology		49	85	23	41
Mean number of inflected verb tokens per session		4.6	5.2		
Total grammatical types				18	34
Total lemmas				13	26

3. Verb inflections

We now reach the main purpose of this study – comparing and analyzing the development of verb inflections in the twins from 1;11 to 2;5. As indicated in the general background information section remarkable changes occurred in the 25th month. The speech of both children's became more initiated and contained fewer repetitions and yes/no utterances; multi-word utterances soared from under 20%-30% to close to 2/3; and the number of inflected words as well as their ratio over the general number of content words rose dramatically. Thus, the first 5 transcripts (ages 1;11.5 – 2;1.15 – the PREMORPHOLOGICAL stage) were demarcated from the last 7 (ages 2;1.27 – 2;4.27 – the PROTOMORPHOLOGICAL stage). Moreover, the 6th transcript is significant for both twins, who make their first typically Hebrew creative mistakes in it: D backforms plural *xipušiyot* 'beetles' into singular *xipušiya* (Ravid 1995b), and M produces a first overregularized morphophonological verbal form *aláti* for *alíti* 'I-went-up' (Ravid 1995a).

It now remains to be seen whether this point of demarcation is valid for the specific development of the twins' verb inflections. Tables 4-7 present an analysis of both verb tokens and verb types for both D and M for both periods. The notion of "type" deserves both a numerical and ideational explanation. Types were counted in three different ways: First, the number of verb types in each transcript was counted and added together to "total in premorphology" (23 in D's case). However, not all types in every session were new, so a second counting took into account

only single types without those that recurred in other sessions (a total of 18 in D's case). Though "types" are usually lexical entries (lemmas), our first and second countings of verb types included GRAMMATICAL words. There were two reasons for that. One was developmental in nature: at this stage, children's words are isolated amalgams that cannot yet be said to constitute part of a grammatical – not to mention lexical – network, so that each grammatical form should be counted separately as a vocabulary item (Berman 1986). Another reason had to do with the nature of the verbal system in Hebrew. Hebrew verbs have no single uniform stem, and an inflected choice (at least number and gender) must obligatorily be made for each verb production. For every lexical verb stem there are 25 inflections in colloquial Hebrew (Blau 1971), of which few occur sporadically at this age: paradigms are partial, few and very unsystematic. This is borne out by the mean number of inflected verb tokens per session, which is around 5. Finally, a lexical count of verb types was conducted to yield the total amount of verb stems (lemmas) for each twin (13 for D). The actual verbs that served as a basis for this analysis are arranged by semantic classes (following loosely Berman and Slobin's semantic classification of verbs) in Appendix I. The few verbs are distributed evenly in D's transcripts among 6 semantic classes: motion and change of location; (e.g., *la-rédet* 'to go-down'); transfer (*kax* 'take Imp'); transitive activity (e.g., *ftoáx* 'open'); accomplishment (*hitparek* 'fell apart'); cognitive functions (*roca* 'wants Fem'); and auxiliary (*haya* 'was'). M has more verbs and more versatility: there are many more motion (e.g., *bo* 'come, Imp') and transitive activity verbs (*le-taken* 'to-fix').

Table 5. Grammatical analysis of premorphology verbs.

Verb type	Tokens		Inflection	
	D	M	D	M
to-infinitives	7	19		
bare infinitives	18	21		
imperatives	11	13	8 – m 3 – f	8 – f 5 – m
past tense	10	5	1 – 1Sg 9 – 3Sg	1 – 2m 2 – 3m 1 – 3f
present tense	3	12	f, Sg	m, Sg
future tense		1		3Sg
same root alternations	2	1		
binyan	4	5	75% – <i>Qal</i>	54% – <i>Qal</i>

3.1. Analysis of inflections in premorphology

Table 5 presents the analysis of grammatical verb categories in the twins' pre-morphological inventory – infinitives, imperatives, past, present and future forms with or without person, number and gender inflections, as well as same-root clusters and BINYAN analysis. It is clear that the verbs in both twins' speech are isolated items, and that they cannot be said to be sited in any grammatical module. The majority of verbs in both children are infinitives (either with *le-* 'to' or without it, as a bare stem) and imperatives, which are in many cases hard to distinguish from infinitives, since both (together with the future form) are constructed on the basis of the modal stem (Gesenius 1910). For example, compare P2 past and present masculine stem *nixnas* 'entered / is entering' vs. the modal stem in future, imperative¹ and infinitive: *yikanes / tikanes / hikanes / le-hikanes* 'will-enter / enter, (colloquial) Imp / enter, Imp / to-enter. Thus, when a child says *sim* 'put' it is difficult to know whether this truncated form is a bare infinitive for *la-sim* 'to-put' or a colloquial imperative *tasim*. In D's inventory, these constitute 36 verbs out of 49; in M's, they are 53 out of 85. Both categories are impoverished in inflections and thus make the child's selection process easier: infinitives have no grammatical inflections (though they do have internal structure: a root, a *binyan* form and a prefixed *le-* 'to', e.g. *le-hikanes* 'to enter': root *k-n-s* in P2); while in imperatives only one of 3 forms (2nd person marked for gender and number) must obligatorily be selected (*tikanes / tikansi / tikansu* 'enter Masc / Fem / P1'). D and M have mostly opposite-gender inflections on their imperatives (both genders for D, e.g., *kax / kxi* 'take', only feminine for M, e.g., *tasimi* 'put Fem'). The few present-tense verbs take the gender of the child, while only in the small number of past-tense verbs do sporadic person inflections appear. The overwhelming part of the obligatory verbs marked for gender are singular (e.g., D – *lo yodáat* 'don't know Fem'; Masc – *lo roce* 'don't want, M'). No verbs are marked for plural, and almost none – for person. The most fundamental feature of Hebrew verbs – the root – does not play a role at this stage, tantamount to saying that verbs have no internal structure. There are very few grammatical clusters – verbs sharing the same root to express same-*binyan* grammatical shades of tense, modality and agreement features (e.g., *kax / kxi* 'take Masc / Fem'). Of each lexical verb-stem, there is usually only one – sometimes two – grammatical representatives out of the possible 25. And there is almost no indication of the major role of the Semitic root as a derivational marker of shared semantics in different-*binyan* verbs with contrasting transitivity value, as in adult *zaz / heziz* 'moved, Intr, P1, Tr, P5' (Berman 1994).

3.2. Analysis of types and tokens in protomorphology

Table 6 (see next page) lists the verb types and tokens for the protomorphology period, as explained above. The verb list by semantic classes is given in Appendix

¹ Imperatives have three forms in Hebrew: a literary Biblical form, e.g. *hikanes* 'enter, Imp'; a colloquial adult form, identical to future tense, e.g. *tikanes*; and a childish truncated form e.g. *kanses* (Berman 1992).

Table 6. An analysis of the twins' verb types and tokens protomorphology.

	Age	Verb tokens per session		Verb types per session	
		D	M	D	M
6	2;1,27	19	20	8	10
7	2;2,11	19	43	9	19
8	2;2,27	40	21	17	13
9	2;3,08	33	34	16	21
10	2;4	45	41	19	23
11	2;4,14	43	25	28	11
12	2;4,27	46	35	23	22
total in protomorphology		245	219	120	119
mean number of inflected verb tokens per session		27	26.3		
total grammatical words				90	90
total lemmas				55	48

II. The total number of verb tokens is now over 200 – five and three times the number of premorphology tokens, and the combined number of types – 120 for both children, five and six times the number for premorphology. It must be noted, however, that 7 sessions are recorded here vs. 5 in the previous period. A clearer picture is brought forth by counting single true types: both children have 90 grammatical types, and about 50 lexical types. In M, this is three times and twice the number of types in premorphology, respectively; for D the leap is even higher: 5 and 4 times the number of types in premorphology, respectively. This increase is also very obvious in the mean number of inflected verb tokens during this period: 27 for D, 26 for M, more than 5 times as many as in premorphology. The increase in number is accompanied by a great lexical variety beyond the initial basic set in premorphology: D's inventory now contains verbs for collecting, agreeing and kicking, while M's has verbs for holding, raking and swinging. Most semantic classes, now with the addition of experiential and modal verbs, now contain a large variety of verbs, though all of them still converge around basic activities and a few states. We will now see how this variety in lemmas provides the basis for a variety in grammatical inflections.

3.3. Inflections in protomorphology

Table 7 (next page) presents an analysis of the twins' verbal inflections during the protomorphology period. It is clear that the morphological module is still consolidating and that morphological knowledge is very far from systematizing yet. In D's transcripts, half of the verb tokens are still in infinitival or imperative form, though bare infinitives, with no preceding *le-* 'to' have dropped to a mere 5. In M, a third of the verb tokens are in the juvenile infinitive or imperative. There are

Table 7. Grammatical analysis of protomorphology verbs.

Verb type	Tokens		Inflection	
	D	M	D	M
to-infinitives	49	19	–	–
bare infinitives	5	7	–	–
imperatives	79	61	1 – Pl, 49 f 29 – m	18 – m, 43 f
past tense	38	71	20 – 1Sg 5 – 2f 12 – 3Sg m 1 – Pl	14 – 3Sg m 11 – 3f Sg 3 – 3Pl 2 – 1Pl 1 – 2Sg m 1 – 2Sg f 37 1st Sg
present tense	58	50	48 – f, 7 – m 3 – Pl	6 – m Pl 33 – m Sg 11 f Sg
future tense	6	6	1 – 1Sg 1 – 3Sg m 3 – 1Pl	2 – 3m Sg 1 – 3f Sg, 1 – 1Pl
same root alternations	17	20		
binyan	5	5	78% – <i>Qal</i>	86% – <i>Qal</i>

now verbs in all three tense forms in both children's transcripts (e.g., M's past-tense *nafla* 'fell Fem', present-tense *oved* 'working, Masc', future tense *yiten* 'will-give, M') with 6 verb tokens for each in future tense. The predominant agreement marker is still gender, with a few verbs marked for plural (e.g., D's *tiru* 'look, Pl', *afu* 'flew, Pl'). Person suffixes are emerging, especially on past tense verbs, most of them 1st person singular to mark the child's actions (e.g., M's *zarákti* 'I threw'), and initial occurrences of 1st person plural in future tense to mark shared future experiences (e.g., M's *naase* 'we-will-do'). However, the number of clusters is still low. In D's transcripts, there are 17 same-root clusters; in M's, there are 20. Moreover, here, too, most of the verbs in the cluster are grammatical forms of the same *binyan*. For example, root *y-š-v* 'sit' occurs in the following forms in D's transcripts: *la-šévet* / *tešev* / *šev* / *yošvim* / *nešev* 'sit, Inf / Imp, Fut / sit, Imp / sitting, Pl / they will-sit', while root *?-x-l* 'eat' takes the following forms: *le-exol* / *oxélet* / *toxli* 'to-eat / eating Fem / you Fem, Sg will-eat' – all forms in both roots in the same BINYAN P1 (*Qal*). In M's transcripts root *n-f-l* 'fall' appears in the following forms: *nofel* / *nafal* / *nafálti* / *nafla* / *naflu* 'falling / fell / fell 1.Sg / fell, 3.Fem / fell, 3.Pl', again all in P1.

4. Discussion

At first glance, the twins seem to differ as to number of utterances and number of content words. D seems to lag behind her brother to begin with in amount of speech and in grammatical development: he talks much more on the tapes. However the analysis of verb types and tokens as well as their grammatical inflections reveals a similar pattern of the initial steps in the development of the Hebrew verbal system. The type of knowledge about Hebrew verbs that should be within the child's grasp is both universal and language-particular. It is, first of all, categorial knowledge – a perception of the notion "verb" as distinct from "noun", with its syntactic function as the source of the argument structure of the sentence. Hebrew speakers are powerfully bootstrapped in their construal of this lexical / functional category by unique morphophonological information about the verb. Its lexical components (roots and BINYANIM) form a relatively closed system and its grammatical components (tense, modality, number, gender, and person) take unique phonological shapes. A systematic grasp of these components and their function in the verbal form and semantics characterize the full-fledged existence of the morphological module. The twins in the present study have not reached this stage yet.

4.1. Premorphology in the Hebrew verbal system

For both twins, the verb category is not established yet. They both have a very small vocabulary, characterized by phonological flux in word form and with a low ratio of inflected content words over general number of content words. Most of their verb forms are those that do not take inflections or are barely inflected: infinitives and imperatives (Armon-Lotem 1996). This enables children to acquire the basic verbal meanings without having first learned the semantics of verb grammar. The twins show no knowledge of verbal components (root, BINYAN, grammatical morphemes) by treating each verb as a separate entity with no alternations. The transcripts show these pre-verbs to be embedded in "chunky" rote-learned or pragmatically-oriented word order.

4.2. Proto-morphology in the Hebrew verbal system

Taken together, the evidence compiled from both twins' transcripts points towards the emergence of the category of verb. This evidence consists of several elements. One is the dramatic growth of vocabulary, and specifically in the number and diversification of lexical and grammatical verbs: 90 separate grammatical verb types that emerge in each child over a period of 3 months, and about 50 different lexical verbs for the same period. This constitutes a solid base from which to construe the notion of "verb". Another significant point is the dramatic reduction in number of bare infinitives to 5 and 7 respectively in D and M, a clear move towards the category of "verb". Bare infinitives are verb forms that are totally uncharacteristic of Hebrew, where the very nature of a verb is that it is obligatorily inflected (Armon-Lotem 1996). Bare infinitives, while constituting a bridge from premodular to modular morphology by presenting the child with a unique, non-complex verbal

form, cannot survive the consolidation of the category of verb. The decline of bare infinitives and other inflectionally impoverished verb forms (to-infinitives and imperatives) is accompanied by the emergence of "grammatical-word" clusters, a single lexical verb stem in diverse, though still not rule-bound, inflected forms (incomplete paradigms): different tenses, including future tense, and forms marked for person and number in addition to gender. The mean number of inflected verbs increases dramatically from about 5 to over 26 per session. The full, decontextualized paradigm beyond specific BINYAN form is yet to emerge, however. Another piece of evidence of protomorphology is first occurrences of creative morpho-phonological deviations (e.g., *aláti* for *alíti* 'I went up' in M's 6th transcript at age 2;1,27), indicating the initialization of morpho-phonological generalizations in verbal patterns (Ravid 1995a). This is happening in the same transcript that D makes her first morphological backformation, another sign of morphological productivity (Ravid 1995b). The fifth sign of the emergence of the morphological module is the first alternations of same-root verbs in different BINYANIM (e.g., *šafáxti* / *nišpax* ('I spilled, P1 / spilled, Int, P2', root *š-p-*: here, the child is making his first steps in tracing the major function of the Hebrew verbal patterns as transitivity markers (Berman 1994). Moreover, we see D producing her first transitivity mistake, *tešev* (=tošívi) 'sit (=seat, Fem)', a semantic precursor of morpho-syntactic transitivity. Finally, we see "verb-island" argument structure accompanying single verbs (Tomasello 1992) and not extended elsewhere. For example, M says *koev li* 'hurts to-me' in the proper structure, but also **nafla madegot* '*fell, Fem, Sg (down the stairs' without any prepositional marker of case.

The analysis of the speech of D and M in the first half of their third year provided us with the opportunity to follow closely the shift from premorphology to protomorphology in the domain of verbal inflections. While the twins differ in the amount of speech that they produce, they are amazingly similar in the pace at which they move from premodularized morphology to incipient modularization in the verbal system of Hebrew. Unfortunately, we have at our disposal a recorded period of only 6 months of the twins' development. Further analysis of Hebrew-speaking twins and singletons at the same stages of acquisition is called for to determine whether this route is also taken by other children.

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Appendix I

Verb list for premorphology

D		
Semantic Class	Verb	Gloss
Motion and change of location verbs		
	<i>tédet (rédet)</i>	go down bare Inf
	<i>atédet / laédet (la-rédet)</i>	go down Inf
	<i>halax</i>	he went (recited)
Transfer verbs		
	<i>(a)vi (li)</i>	bring me Imp
	<i>tavi li</i>	bring me Imp (Fut)
	<i>kxi</i>	take f Imp
	<i>kax</i>	take m Imp
	<i>lakax</i>	he took
Transitive activity verbs		
	<i>(a)tati (li-ftóax)</i>	
	<i>ftóax</i>	open bare Inf
	<i>agalgel (le-galgel)</i>	roll Inf
	<i>bona</i>	building f
	<i>banti (baniti)</i>	I built
Accomplishment (change of state) verbs		
	<i>etpakek (hitparek)</i>	it fell apart
	<i>pol</i>	fall down bare Inf
Cognitive functions verbs		
	<i>oca (roca)</i>	
	<i>lo (yo)dáat</i>	
Auxiliary verbs		
	<i>haya</i>	was (recited)
M		
Semantic Class	Verb	Gloss
Motion and change of location verbs		
	<i>tédet (larédet)</i>	go down bare Inf
	<i>laédet (larédet)</i>	go down Inf
	<i>bo</i>	come Imp
	<i>lalot (laalot)</i>	go up Inf
	<i>ba</i>	he came
	<i>halax</i>	he went
	<i>tata (alta)</i>	went up f

Transfer verbs

<i>avi li</i>	bring me bare Inf
<i>tavi li</i>	bring me Imp Future
<i>tavii / avii</i>	bring f Imp Future
<i>kxi</i>	take f Imp

Transitive activity verbs

<i>por (lispor)</i>	count bare Inf
<i>taer (lecayer)</i>	draw bare Inf
<i>ftoax (liftoax)</i>	open bare Inf
<i>liftóax</i>	open Inf.
<i>ligor (lisgor)</i>	close Inf
<i>exol</i>	eat bare Inf
<i>agalgel (legalgel)</i>	roll Inf
<i>asim (la-sim)</i>	put Inf
<i>tasimi</i>	put f Imp Future
<i>oci (le-hoci)</i>	take out bare Inf
<i>akaken (le-taken)</i>	fix Inf
<i>axapes (le-xapes)</i>	look for Inf
<i>tatox / tox (laxtox)</i>	cut bare Inf
<i>texabi li (texabri)</i>	join for me f Imp Fut
<i>ta (asita)</i>	did / made 2.Sg
<i>yekane / yakef (yekalef)</i>	will peel

Intransitive activity verbs

<i>aki (xaki)</i>	wait f Imp
<i>kakel / akakel (mistakel)</i>	looking Pres
<i>lo taliax (lo hiciáx)</i>	didnt succeed

Accomplishment (change of state) verbs

<i>lašévet</i>	sit down Inf
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Cognitive functions verbs

<i>xeš (tenaxeš)</i>	guess Imp (imitated)
<i>lo oce (roce)</i>	dont want
<i>ce / oce</i>	want (imitated)
<i>lo yodéa</i>	dont know

Appendix II

Verb list for protomorphology

D		
Semantic Class	Verb	Gloss
Motion and change of location verbs		
	<i>lalot</i>	go up Inf
	<i>laédet / larédet</i>	go down Inf
	<i>lehikane(s)</i>	get in Inf
	<i>holéxet</i>	walking f
	<i>loxa (holxa)</i>	
	<i>yorédet</i>	going down f
	<i>ba(a)</i>	coming f
	<i>bo</i>	come Imp
	<i>boi</i>	come f Imp
	<i>nosim</i>	driving in the car Pl
	<i>fu (áfu)</i>	they flew
	<i>nelex</i>	we will go
Transfer verbs		
	<i>lokaxat</i>	taking f
	<i>havi / vi</i>	bring bare Inf
	<i>azuz (=lehaziz)</i>	move Tr base Inf (mistaken)
	<i>la-káxat</i>	take Inf
	<i>kax</i>	take Imp
	<i>kxi</i>	take f Imp
	<i>kaxt / lakaxt</i>	you took f
	<i>tavi</i>	bring Imp Future
	<i>tavii</i>	bring f, Imp Future
Transitive activity verbs		
	<i>lehoci</i>	take out Inf,
	<i>hoci</i>	take out bare Inf
	<i>kapel (=lekapel)</i>	fold bare Inf
	<i>lasim</i>	put Inf
	<i>sim</i>	put Imp
	<i>simi / tasimi</i>	put f Imp
	<i>ktof (liktof)</i>	pick bare Inf
	<i>lizrok</i>	throw away Inf
	<i>axlif</i>	exchange Inf
	<i>latatax (=laxatox)</i>	cut Inf

<i>leoid (lehorid)</i>	take down Inf
<i>lohid</i>	
<i>akalef / likalef / lekalef</i>	peel Inf
<i>leexol</i>	eat Inf
<i>akakax / akakot (lekasot)</i>	cover Inf
<i>kasi / tekasi / akasi / akaki</i>	cover f Imp
<i>oséfet</i>	collecting f
<i>loéset</i>	chewing f
<i>oxélet</i>	eating f
<i>hoféxet</i>	turning upside down f
<i>potaxat</i>	opening f
<i>doex (dorex)</i>	stepping m
<i>boet</i>	kicking m
<i>nexapes</i>	we will look
<i>eftax</i>	I will open
<i>asi</i>	do f Imp
<i>macat</i>	you found f
<i>macáti</i>	I found
<i>šavárti</i>	I broke
<i>samt</i>	you put f
<i>asíti</i>	I did, made
<i>hocáti (=hocéti)</i>	I took out
<i>afáxti (šafáxti)</i>	I spilled
<i>badakti</i>	I checked
<i>garamti (= gamarti)</i>	I have finished
<i>kana</i>	bought m
<i>azov</i>	leave Imp
<i>tere (tir'e)</i>	see Imp Future
<i>tiri</i>	see f Imp Future
<i>kalef / tekalef</i>	peel Imp
<i>kalfi</i>	peel f Imp
<i>tiftexi</i>	open f Imp Future
<i>tasim</i>	put Future
<i>texapsi</i>	look for f Imp Future
<i>tekapli</i>	fold f Imp Future
<i>toci</i>	take out Imp Future
<i>toxli</i>	eat f Imp Future

Intransitive activity verbs

<i>lašévet / ašévet</i>	sit down Inf
<i>yošévet</i>	sitting f
<i>tešev</i>	sit Imp Future
<i>šev</i>	sit Imp
<i>tešev (=tošivi)</i>	sit = seat, f Imp (mistaken)
<i>lišon</i>	sleep Inf
<i>tiru</i>	look Pl Imp
<i>ovédet</i>	working f
<i>midgaléšet</i>	sliding f
<i>péset (metapéset)</i>	climbing f
<i>ašena, šena (yešena);</i>	sleeping f
<i>yošvim</i>	sitting Pl
<i>nešev</i>	we will sit down
<i>xaki</i>	wait f Imp (mistaken)

Accomplishment (change of state) verbs

<i>liškava (liškav)</i>	lie down Inf
<i>asa / yaca</i>	came out m
<i>nafal</i>	fell m
<i>barax / baax</i>	ran away
<i>nišpax</i>	spilled
<i>kum</i>	get up Imp
<i>kúmi</i>	get up f Imp

Experiential verbs

<i>koev lo</i>	it hurts to-him
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Cognitive functions verbs

<i>(yo)dáat</i>	knows f
<i>rosa / roca / oca</i>	wants f
<i>maskima</i>	agrees f

Modal verbs

<i>axola / yexola / xola</i>	can f
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Auxiliary verbs

<i>haya</i>	was
<i>yihye</i>	will be m

D

Semantic Class	Verb	Gloss
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Motion and change of location verbs

<i>laléxet</i>	go Inf
<i>lalot</i>	go up Inf

	<i>linsóa</i>	drive in the car Inf
	<i>boi</i>	come Imp f
	<i>bo</i>	come Imp
	<i>ba</i>	came m
	<i>alati (aliti)</i>	I went up
	<i>higánu</i>	we have arrived
	<i>avar</i>	passed m
	<i>halax</i>	went m
	<i>rad (yarad)</i>	went down
	<i>holéxet</i>	walking f
	<i>holex</i>	walking m
	<i>mared (yored)</i>	going down
	<i>metapes</i>	climbing
Transfer verbs		
	<i>avi</i>	bring=give bare Inf
	<i>tavi</i>	bring=give Imp
	<i>tvi</i>	give Imp f
	<i>kax</i>	take Imp
	<i>kxi</i>	take Imp f
	<i>hevéti</i>	I brought
	<i>natáti</i>	I gave
	<i>yiten</i>	will give
	<i>titen</i>	she will give
Transitive activity verbs		
	<i>lekasot</i>	cover Inf
	<i>liftóax / ftóax</i>	open Inf
	<i>laxbor (lexaber)</i>	join Tr Inf
	<i>hoci</i>	take out bare Inf
	<i>lasim</i>	put Inf
	<i>leexol</i>	eat Inf
	<i>akalef</i>	peel Inf
	<i>tekalef</i>	peel Imp Future
	<i>axzik</i>	hold bare Inf
	<i>toxal</i>	eat Imp Future
	<i>texabi (texabri)</i>	join Imp, f Future
	<i>sim</i>	put Imp
	<i>sími</i>	put Imp f
	<i>tiri / tari</i>	see Imp, f Future
	<i>si (taasi)</i>	do Imp f
	<i>zaáti (zarákti)</i>	I threw

	<i>aíti (raíti)</i>	I saw
	<i>macáti / makáki</i>	I found
	<i>xapásti / xapáti</i> <i>(xipásti)</i>	I looked for
	<i>asáfti</i>	I collected
	<i>hixánti (hixnásti)</i>	I brought in
	<i>sagárti</i>	I shut
	<i>hocáti (hocéti)</i>	I took out
	<i>asit</i>	you did f
	<i>macáta</i>	you found
	<i>axal</i>	ate
	<i>oxélet</i>	eating f
	<i>mefaréket</i>	taking apart f
	<i>osa</i>	doing f
	<i>kodex (kodéax)</i>	drilling
	<i>megaref</i>	raking
	<i>yoxal</i>	will eat
	<i>nase (naase)</i>	we will do
Intransitive activity verbs		
	<i>lehikanes</i>	go in Inf
	<i>exabe (lehixabe)</i>	hide bare Inf
	<i>lašévet</i>	sit Inf
	<i>zuz</i>	move Imp
	<i>šev</i>	sit Imp
	<i>švi</i>	sit Imp f
	<i>am / ánu</i>	we stood
Accomplishment (change of state) verbs		
	<i>liškav</i>	lie down Inf
	<i>epol / pol</i>	fall bare Inf
	<i>kúmi</i>	get up Imp f
	<i>gamárti</i>	I have finished
	<i>aváti (avádeti)</i>	I worked
	<i>oved</i>	working m
	<i>nafálti</i>	I fell
	<i>nafal</i>	fell m
	<i>nafla</i>	fell f
	<i>naflu</i>	fell Pl
	<i>nofel</i>	falling m
	<i>yošen (yašen)</i>	sleeping (creat. mistake)
	<i>yošev</i>	sitting

	<i>kore</i>	reading
	<i>racim</i>	running Pl
	<i>nedim (mitnadnedim)</i>	swinging Pl
	<i>yošvim</i>	sitting Pl
	<i>nosim</i>	going in the car Pl
<i>Experiential verbs</i>		
	<i>koes</i>	is angry
	<i>koyev/koev</i>	hurts
<i>Cognitive functions verbs</i>		
	<i>roca</i>	wants f
	<i>roce</i>	wants m
	<i>yodéa</i>	knows m
<i>Modal verbs</i>		
	<i>yaxol</i>	can
	<i>yexola</i>	can f
<i>Auxiliary verbs</i>		
	<i>haya</i>	was