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The emergence of grammar: early verbs and beyond*

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ABSTRACT

The paper examines the first twenty verb-forms recorded for six Hebrew-speaking children aged between 1;2 and 2;1, and how they evolve into fully inflected verbs for three of these children. Discussion focuses first on what word-forms children initially select for the verbs they produce, what role these forms play in children's emergent grammar, and how emergent grammar is reflected in the acquisition of fully inflected forms of verbs. Children's early verb repertoire indicates that they possess a strong basis for moving into the expression of a variety of semantic roles and the syntax of a range of different verb–argument structures. On the other hand, children's initial use of verbs demonstrates that they still need to acquire considerable language-particular grammatical knowledge in order to encode such relations explicitly. This language-particular knowledge demonstrates a clear pattern of acquisition, in which aspect precedes inflectional marking for gender, followed by tense, and then by person.

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INTRODUCTION

This paper examines the early verbs of six Hebrew-speaking children and how they evolve into fully inflected verbs for three of these children. Discussion focuses on the following two questions. First, what word forms do children initially select for the verbs in their repertoire, and what role do these forms play in children's emergent grammar? The term 'verb' refers to lexical items that express activities, changes of state, and other kinds of predications. 'Early verbs' are verb forms that appear in children's speech during the one word stage and in their transition to word combinations. Second, how is emergent grammar reflected in the acquisition of fully inflected forms of verbs? In Hebrew, a language rich in grammatical inflection, 'fully inflected verbs' are verbal forms productively marked for tense/mood, and for gender, number, and person agreement. These questions are discussed from a functional perspective (Berman, 1996), integrating some typological observations in answering the second, in the conviction that the acquisition of verbs can throw light on the interface between the development of syntax, morphology, semantics, and the lexicon.

Following a brief overview of Hebrew verbal morphology, the article is organized as follows. The first part analyses the first 20 verbs of six children, quantitatively and qualitatively, in order to determine the role of these early verbal forms in their emergent grammar. The next part goes beyond the 'early verbs' phase to focus on further verbal development for three of the children, showing how the acquisition of verbal morphology stems from their initial verb repertoire. Finally, we suggest how the findings presented for Hebrew throw light on the more general issue of the way verbal morphology is acquired across languages.

Hebrew verb morphology

As background to examining these issues for early verbs in Hebrew, we present a brief overview of Hebrew verbal morphology. Hebrew verbs are constructed in one of five morphological patterns called *binyan* conjugations, which associate affixal stem elements with a set of root consonants or radicals. Table 1 shows the distribution of two verb roots, *g-d-l* meaning 'grow', and *k-t-v* meaning 'write', across five verb patterns.

Though the core semantics of each root is preserved across the patterns, we analyse each root–pattern combination as constituting a distinct lexeme. For example, the combinations of g–d–l + P1 *gadal* 'grow up, become bigger' and g–d–l + P3 *gidel* 'grow = raise corps/animals' represent clearly distinguishable syntactic and semantic functions, as shown by their English glosses.

The so called *qal* or *pa'al* pattern (here labelled **P1**) has the highest frequency of both type and token, and is equally accessible to transitive and intransitive (mainly unergative, activity) verbs; *pi'el* (**P3**) and *hif'il* (**P5**)

TABLE 1. *Distribution of two verb roots across five verb patterns*

Pattern	*g-d-l*	Gloss	*k-t-v*	Gloss
P1 *pa'al*	*gadal*	'grow, Intr'	*katav*	'write'
P2 *nif'al*	—	—	*nixtav*	'be/get written'
P3 *pi'el*	*gidel*	'grow, Trans'	*kitev*	'captionize'
P4 *hitpa'el*	*hitgadel*	'self-aggrandize'	*hitkatev*	'correspond'
P5 *hif'il*	*higdil*	'enlarge'	*hixtiv*	'dictate'

TABLE 2. *Alternation of verbs across five categories of mood/tense*

Root	Pattern	Gloss	Infinite	Imperative	Present	Past	Future
g-m-r	P1 *pa'al*	'finish'	*ligmor*	*gmor*	*gomer*	*gamar*	*yigmor*
t-q-n	P3 *pi'el*	'fix'	*letaken*	*taken*	*metaken*	*tiken*	*yetaken*
g-d-l	P5 *hif'il*	'enlarge'	*lehagdil*	*hagdel*	*magdil*	*higdil*	*yagdil*

contain mainly transitive verbs (activity and causativity respectively); while *nif'al* (**P2**) and *hitpa'el* (**P4**) have mainly intransitive, unaccusative type verbs. As these characteristics suggest, the verb patterns are associated in a partially productive way with particular syntactic and semantic functions. For example, P5 verbs are often causative counterparts of intransitive P1 verbs, lexicalized reflexives are generally in the P4 pattern. However, there are many lexical gaps and semantic inconsistencies between *binyan* form and function in the lexicon of contemporary Hebrew, setting this system in the domain of derivational word formation, which is not relevant to this work, rather than of grammatical inflection (Berman, 1993).

Hebrew verbs are marked for tense, but not for grammatical aspect; they take agreement markers for number and gender; and in the past and future they are also marked for person. The inflectional categories of tense and of person, number, and gender agreement are marked by prefixes and suffixes as well as by vowels interdigited with root consonants, which alternate across a restricted set of vowel patterns. Table 2 illustrates the alternation of verbs across the five categories of mood/tense. The examples in Table 2 show verbs in the three *binyan* patterns with highest frequency of usage in the speech of adults and children alike. The three tensed forms, present, past, and future, are listed in the morphologically simplest form of masculine singular, 3rd person.

INFINITIVES are marked by a prefixal *l-*, which takes a different vowel (either *li*, *la*, or *le*), depending on the nature of the following syllable. IMPERATIVES are based on future tense stems, and children generally use the imperative in their colloquial forms as a future stem with or without the 2nd person *t-* prefix, depending on the vowel pattern of the conjugation (Berman, 1985).

PRESENT TENSE verbs are also participial, and are marked for number and gender (but not person), yielding four forms per verb: masculine singular (with a zero morpheme), to which are added unstressed *-et* for feminine singular, stressed *-im* for masculine plural and stressed *-ot* for feminine plural. PAST TENSE verbs have even more forms since they also take suffixes for person, added to the masculine singular stem as follows: *-ti* 1st singular, *-ta* 2nd masculine singular, *-t* 2nd feminine singular, *-a* 3rd feminine singular, *-nu* lst plural, *-tem* 2nd masculine plural, *-ten* 2nd feminine plural and *-u* 3rd person. FUTURE TENSE verbs are similarly inflected for number, gender and person but by means of prefixes, e.g. *ti-*, *ta-* or *te-* for 2nd person, *ni-*, *na-*, *ne-* for 1st person, plural, as well as by suffixes for number and gender.

The system is further complicated by many morphophonological alternations, depending on the nature of the consonantal root. For example, some verbs have a 'full' or canonic triconsonantal root (as shown in Tables 1 and 2), while others have defective roots, since they contain a 'weak' root element (typically a pharyngeal, glottal, or glide) which is not realized consistently across all forms of the verbs constructed from that root. For any verb form they produce, then, Hebrew speakers have a wide range of decisions to make, depending on three interrelated factors: (1) lexical and/or syntactic choice of *binyan* pattern; (2) grammatical choice of inflection for mood/tense, number, gender, and person; and (3) morphophonological choice of form depending on the nature of the root consonants from which the verb is constructed.

Children master the inflectional system first, and show command of the full inflectional paradigm by 3;0 at the latest (Berman & Dromi, 1984; Berman, 1985; Armon-Lotem, 1997). They learn most relevant alternations along the verb pattern dimension between 3;0 to 4;0 (Berman, 1993). It takes them much longer to master the third dimension, the numerous morphophonological distinctions required by so called 'defective' verb forms, some of which remain non-normative or substandard well into school age (Ravid, 1995).

THE EARLY VERBS

Against this background on the task faced by Hebrew-speaking children, we consider the role of early verbs in the acquisition of Hebrew verbal morphology. Researchers differ in what they include under the heading of 'early verbs'. Tomasello (1992) defines 'first verbs' as those which occurred in the child's speech in the early stages of her language acquisition, until around 2;0. Other analyses consider the verbs as used by children at different phases of development: the one word stage (Clark, 1993), in early word combinations (Bloom, 1991), and with command of simple clause structure and an array of verb argument relations (Verrips & Weissenborn, 1992; Guasti, 1994).

In light of these different definitions, early verbs are analysed differently in explanations for general processes of language acquisition. For example, Tomasello (1992) provides a contextually-based account of his daughter's early learning of English verbs from the perspective of cognitive linguistics and a social interactionist view of language acquisition. Various reviews of his work each propose distinct interpretations for both the data and the theoretical framework presented in his study (Deuchar, 1995; Pine, 1995).

Another dimension of variability concerns crosslinguistic comparisons. In English, children can use an uninflected basic or stem form as the default for verbs, defined as reflecting the 'underspecification of functional heads' in a generative account (Hyams, 1994). In a language like French, it is difficult to derive clear evidence for children's early verb forms, because of the surface identity of a wide range of suffixal verb inflections. For example, *jouer*, *jouez*, *jouais*, *jouait*, as well as the past participle masculine *joué* or feminine *jouée* are all pronounced the same. In Italian child language, in contrast, it is argued that inflections and some inflectional paradigms are present from very early on since in the target language, 'verbs never appear as unmarked forms, but always bear inflectional affixes' (Pizzuto & Caselli, 1993). A similar conclusion is reached for Polish children by Weist (1986) and by research on acquisition of other languages with rich systems of verb inflection, including Greek (Stephany, 1981), and Turkish (Aksu-Koç, 1988). That is, where a language requires this, children appear to use inflected forms of verbs from the very start of their speech production.

However, and this is the crux of the present study, the STATUS of these forms is not entirely clear. The question is whether (inflected) early verbs and their use provide evidence of early grammatical knowledge. Is it the case, as Pizzuto & Caselli have argued for Italian, that very few of these inflections manifest productive, adultlike use at the early phases of acquisition? Or should children be credited with some level of productive knowledge from very early on, as claimed by syntacticians who take not only verb morphology but also the syntactic criterion of word order as evidence that two-year-olds are able to distinguish finite from nonfinite verbs in their early word combinations (see Guasti (1994) for Italian or Verrips & Weissenborn (1992) for French and German). A third possibility is that children invariably adopt an initial default option of some stemlike base to which inflections are then added, regardless of the typological characteristics of the target language.

Each of these options derives from a different definition of early verbs, coinciding with a different phase in the acquisition of the verbal system. In order to examine the validity of these options for Hebrew, our discussion of 'early verbs' focuses on verbal forms used prior to the multi-word stage, which is dealt with separately later in the paper. This enables us to eliminate word order as a criterion for grammatical knowledge and to focus on the

TABLE 3. *Breakdown of 3 longitudinal samples analysed for early verbs use*

Child	Age range	No. of transcripts	Total no. of utterances	Mean MLU
Leor, boy	1;9.0–1;10.23	10	1039	2·65
Lior, girl	1;5.19–1;6.27	21	1917	1·23
Smadar, girl	1;4.14–1;6.20	11	1970	1·67

morphological form and the extralinguistic context of these verbs as evidence for emergent grammar.

Methodology

This section examines the first 20 verb forms recorded for six Hebrew-speaking children, Keren, Leor, Lior, Shelli, Smadar, and Yuval aged between 1;2 and 2;1. All six children come from middle class families who live in Tel-Aviv or its suburbs, in which at least one parent has obtained higher education. Keren, Leor, and Lior are first children in their families, with no younger siblings, Smadar and Yuval are the younger ones in their families, each having two older (preschool and school age) siblings, and Shelli is the youngest in her family with adolescent siblings.

Data for three of the six children, two girls and one boy (Lior, Smadar, and Leor), were taken from a year and a half of weekly longitudinal recordings of the children's spontaneous speech output in interaction with their parents (Leor, with his aunt), starting with their first word combinations. Leor's aunt and Smadar's mother were linguistics students at the time of recording. Twenty different verb forms were produced by all three children within the first two months of recording. Data for the sex, age, number of transcripts and of child utterances, and the mean MLU for the first two months of these three children analysed for early verbs are summarized in Table 3 below. MLU has been calculated following Berman & Dromi (1984).

The other three samples, for the girls Keren (Dromi, 1987) and Shelly (Berman, 1978*b*), and a boy, Yuval (Armon-Lotem, 1997), are based on parental diary studies of their children at the one-word phase, before the emergence of word combinations. All three parents were professional psycholinguists at time of recording. Data for the sex, age, and source for these three children are summarized in Table 4 below.

The difference in method of data collection for the two groups of children might result in a different picture since the children in the diary study were at an earlier stage of development than those from whom weekly recordings were made. The data for the first three children were recorded from a slightly LATER phase of language development, and their earliest verb forms are analysed over a period of one month, in a transitional stage from single-word

TABLE 4. *Age and source of children recorded in diary data*

Child	Age range	Source
Keren	1;2–1;4	Dromi, 1987
Shelly	1;11–2;1	Berman, 1978*b*
Yuval	1;4–1;9	Armon-Lotem, 1996

to multi-word utterances. In contrast, data for the three diary-based samples are taken from the earlier, one-word stage of development, and they were recorded over periods of more than a single month.

These differences, as well as the MLU and age differences between the different children, could have called for individual analysis. This was done initially, but our findings from an individual analysis of the first 20 verbs of all six children indicate that all six children in the two groups can in fact be treated together. We were careful to note individual differences whenever we found them. Crucially, our initial analysis implies that MLU is not indicative of early verb use, as far as lexical, semantic and verb pattern distribution are concerned, making is plausible to compare and analyse diary data from the single word phase together with data from early word combinations, despite the different MLU. A similar proposal was made by Rollins, Snow & Willett (1996) for the relations between semantic and morphological skills. They argue that different children use different strategies to lengthen their utterances reflecting different skills, making MLU partially indicative of syntactic development, but misleading for semantic development.

Inflectional markings, on the other hand, seem to be MLU related, showing changes over time. Therefore, the diary data of the single word phase is not comparable, and discussion is limited to the longitudinal corpus. In the longitudinal corpus, no correlation was found between MLU and the onset of use of verbal inflection. All three children in the longitudinal study follow the same course of development, no matter when they started using inflections, making it possible to discuss the development of the inflectional system for all three together.

Supplementary diary data is also noted for the verbs produced in one week by a seventh child, the boy Raz, aged between 1;5.28 and 1;6.5, when he was already combining words. Since his data is clearly from a later stage of development, they are not included in the main corpus, but used as an extra source of information when appropriate.

The database includes all forms that could be unequivocally defined as 'verbs,' uniquely identifiable as such in terms of Hebrew lexico-morphology (Berman, 1988). We excluded any forms that were clearly imitative, that is, that were produced contiguously to a caretaker version of the same form

with the five utterances that preceded the child's production. For each of the children, the 20 verb forms were analysed phonologically, morphologically and syntactically. This enabled us to ascertain the lexical and semantic distribution of the verbs, use of morphological verb pattern and valence alternations, as well as inflectional forms. Due to the findings of the individual analysis, which suggested a very strong similarity across children, the same criteria were applied to the full set of 120 verbs. Using two analyses made it possible to derive a general breakdown without obscuring individual differences.

A major problem in analysing the data was the possible ambiguity of children's output forms at this early phase of language development. In general, it is not easy to interpret what children mean when they first use verbs, because of the very nature of such items as functional, relational terms which refer to typically transient situations in contrast to substantives which generally refer to concrete physical objects in early child language (Tomasello & Merriman, 1995). In a study like ours, this problem is confounded by the surface opacity of many of the forms which children produce at the young ages considered here.

Forms were interpreted on the basis of linguistic context, including parental expansions or explanations as well as the extralinguistic situation, such as the kind of activity being engaged in or the pictures or objects being talked about. Nonetheless, around one half of the items in our sample turned out to be 'unclear', with no less than one quarter of the items for each of the six children. These 'unclear' items were typically 'stemlike': they contained some or all the root consonants of the verb and also some or all of the interdigited vowels associated with the particular verb form, but no inflectional affixes. Thus, the tense/mood category of such forms could be unclear.

Other ambiguous forms were more accessible to resolution by context, for example, when the child (apparently) uses the same surface form for more than one target form (e.g. Keren used *pes* for both *le-xapes* 'to-seek' and *le-tapes* 'to-climb,' which are phonetically and semantically quite distinct in the adult language). Besides, children's early articulation of verbs, like other words in their repertoire, is often far from the target. This leads to two difficulties in analysis. First, it is not always clear whether the child's deficit is morphological (i.e. grammatical) or articulatory (i.e. phonological). Second, even with the rich contextual information which we used to interpret the children's utterances, it was often hard to decide which target form a child was aiming at. This problem proved particularly acute in the case of what we called 'stemlike' forms. Therefore, a decision was made to add to the five tense/mood categories of analysis a sixth category of unclear stripped forms, in order to be able to incorporate these verbs in our discussion (and see Table 6 below for more details).

RESULTS AND DISCUSSION

This section starts with the results of the individual analysis of the first 20 verbs of one child, focusing on the use of different morphemes. It is followed by a discussion of the general breakdown of all 120 verbs used together by the six children, which goes beyond morphology to discuss other aspects of the verbal system, i.e. lexical, semantic and verb pattern distribution.

Individual analysis

To start, consider the first 20 verbs that Dromi (1987) lists in her detailed case study of her daughter, Keren, aged between 1;2 and 1;4, as shown in Table 5. Each item on the list contains a phonetic transcription of the form used by the child (stress is word-final, unless marked as penultimate by an acute accent); the corresponding most likely target form in adult Hebrew (as decided by Dromi based on contextual knowledge: her knowledge of the immediate context and of the child's linguistic repertoire and world of experience); a gloss and analysis for tense/mood. Agreement is marked only when different from the default masculine singular (2nd person in imperative, 3rd person elsewhere).

This list of verbs raises several observations regarding Keren's knowledge of the verbal system at this early period (and compare Berman, 1978*b*). Phonetically, most forms are not adultlike: Keren omits most prefixes, reducing the verbs to monosyllabic and bisyllabic forms. Syntactically, these forms fall into three tense/mood classes: infinitives without the infinitival morpheme *le-* 'to' (13/20), imperatives (3/20) and past tense forms, used only with change of state verbs carrying a perfective sense (4/20). This child has no present or future tense forms. Morphologically, all forms (except the infinitivals, which do not take agreement marking) are singular with some variation between masculine and feminine forms. Yet Dromi (1987) notes that these forms were used both with masculine and feminine addressees, regardless of the morphology. Though the imperative forms are second person and the past forms are always in third person, these are the default forms and there is no other overt person morphology.

These findings show that Keren starts with a verbal stem, with some use of tense morphology to mark either mood or aspect but not tense. Though the child uses past tense morphology, this is nonproductive and limited to telic or perfective-type verbs. This suggests that, at this phase of the development of verbal morphology, tense morphology is used to mark aspect rather than tense, though, again, the two are morphologically indistinguishable in Hebrew. Keren gives no evidence of knowing the agreement morphological paradigm of Hebrew since she does not apparently distinguish masculine and feminine forms.

These findings for Keren at the one word stage are supported by Berman's (1978*b*) findings for her daughter Shelly and by Armon-Lotem's (1997)

TABLE 5. *First 20 verbs of Keren Dromi* (1;02–1;04)

Child's form	Corresponding adult form	Gloss	Tense/mood morphology	Agreement morphology
itó	lishtót	'to drink'	INF	
cét	lacét	'to go out'	INF	
níli	tni li	'give me!'	IMP	sg, fem.
kax	kax/kxi	'take!'	IMP	sg, masc./fem.
éde	larédet	'to descend'	INF	
inés	lehikanés	'to enter'	INF	
ibár	nishbár	'broke'	PST	
pes	(le)tapés	'to climb'	INF	
évet	lashévet	'to sit'	INF	
iposé	hitpocéc	'burst'	PST	
úax	liftóax	'to open'	INF	
pes	(le)xapés	'to look for'	INF	
áfa	áfa	'flew'	PST	3, sg, fem.
alá	naflá	'fell'	PST	3, sg, fem.
úsi	rútsi	'run!'	IMP	sg, fem.
id	lehoríd	'to put down'	INF	
usí	lehotsí	'to remove'	INF	
abís	(leh)albísh	'to dress'	INF	
lalót	la'alót	'to go up'	INF	
naké	lenakót	'to clean'	INF	

Key: INF – infinitive, IMP – imperative, PST – past.

findings for her son Yuval, as well as by analysis of the first month of recording in the longitudinal samples of three other Hebrew-speaking children aged between 1;6 and 3;0. The first 20 verbs recorded for these 5 children are given in Appendix. Due to the similarity across children a group analysis giving the general breakdown of all 120 verbs used together by the six children is presented below.

General breakdown of all 120 verbs

The results of our analysis of all 120 verbs are presented and discussed below for the following three dimensions: lexical and semantic distribution of the items analysed, verb pattern distribution and valence alternations, and inflectional markings. Individual differences in initial verb usage are noted where relevant.

Lexical and semantic distribution

Consider, first, the distribution of different lexemes across the six children in our sample, where 'lexeme' has the highly specific sense of a given verb root in a particular *binyan* verb conjugation pattern, irrespective of its inflectional

form. For example, from the root *n-g-v*, the transitive activity verb *le-nagev* 'to dry, to wipe' in the P3 pattern (represented as [*ngv3*]) and the reflexive *le-hitnagev* 'to dry oneself (with a towel)' in the P4 pattern [*ngv4*] are counted as two distinct lexemes. On the other hand, different inflected forms of the P3 pattern transitive *le-nagev* would all come under the heading of a shared lexeme, e.g. past tense 1st person *nigávti* 'I dried', present tense plural *menagvim* 'are drying', future tense 2nd person feminine *tenagvi* 'you + fem. will-dry.

This definition of a 'lexeme' is not meant to indicate that children know the relation between the different *binyan* patterns of the same root. For these children, each root plus *binyan* combination is a different entry, with no relations between verb lexemes sharing the same root. As for inflections, for each child, any given verb took only one form, but across children we did find some variability and considerable ambiguity. As for adults, so for these children, inflectional alternations do not count as constituting distinct lexemes or separate lexical entries.

The total 120 verb forms analysed for the six children in our sample include only 59 different lexemes, so defined. That is, there is a large shared lexical repertoire for these children, although they are of different sexes, from different locations in Israel, with different home backgrounds. Around half of these 59 verbs were 'idiosyncratic', that is, they were recorded for only one of the six children in our sample, although all are typical of children's early vocabulary and they show up in the following months in the repertoire of the other children as well. Another 20 were used by two or three of the six children, and the rest were used by as many as 4 or 5.

Semantically, 'most favoured' verbs share features known to be highly salient to young children. They include the transfer of location verbs for giving [*ntn1*] and taking [*lqx1*], as well as the verb for putting [*sym1*] (used by three children), verbs of moving [*zwz1*], of posture, e.g. sitting [*yšv1*], and many verbs of direction of movement like getting up [*qwm1*], down [*yrd1*], or out [*yca1*]. Less common are verbs that describe manner of motion, e.g. running [*rwc1*] and flying [*iyf1*]. This accords with what has been found for verb-framed languages, which convey information about direction of movement in the verb stem, in contrast to satellite-framed languages, which specify direction not in the verb stem, but in a particle or other satellite. In verb-framed languages, like Hebrew and Spanish, speakers focus on direction rather than manner of motion in their use of verbs (e.g. *lehikanes, entrar* 'to enter', *lacet, salir* 'to exit'). In contrast, speakers of satellite-framed languages, like English and German, focus on manner of motion in their use of verbs and mark direction by the particle (e.g. *go in*, *go out*, *hinain gehn*, *hinaus gehn*) (Berman & Slobin, 1994).

Another finding which is common to these Hebrew-speaking children and to young children acquiring other languages is that five of the children use

some form of the verb for open [*ptx1*] – not only for opening doors, windows, or other such objects, but also for the much more general notion of removal or separation – when talking about turning on a light, switching on a television set, untying the laces of shoes, unbuttoning a shirt, etc. (and see, further, on 'words for undoing actions', Clark, 1993). Hebrew lacks a special morpheme like English *un-* or French *de-* for expressing this range of notions, and in colloquial usage, speakers typically overextend the verb for opening to cover this conceptual domain.

Another shared feature is the general semantic classes of these verbs. They refer mainly to activities, both transitive and intransitive, carried out by an animate actor or agent, e.g. *cry*, *sleep*, *eat*, *throw*. A few refer to changes of state, mainly intransitive verbs meaning *fall* [*npl1*], *end* [*gmr2*], and *break* [*šbr2*], or *burst* [*pcc4*]. And a few are statives, usually modal in meaning, e.g. *want* [*rcy1*], *be able* [*ykl1*], *manage* [*clx5*], and the physical state verb *hurt* [*kav1*]. Interestingly, unlike what Ninio (1996) claims, these are not really 'light' or semantically-general path-breaking verbs (see Uziel-Karl, 2000). In sum, there is nothing particularly 'Hebrew' about the content of the verbs used by these children. Rather, as is to be expected, children talk about things that people do or that they want them to do or have done to themselves, and about things that happen, rather less about things that they feel or sense (Slobin, 1985).

Verb-pattern distribution and valence alternation

Verb pattern distribution in early verb usage is relevant to valence distinctions and hence also to verb argument structure. In Hebrew, a change in transitivity or voice is typically marked, in addition to permutations in the position and/or number of arguments, by a change in morphological pattern. Thus, English *shut* is rendered by one pattern form (P1) *sagar* if transitive, by another pattern (P2) *nisgar* if intransitive, and by the passive participial form *sagur* to express resultant endstate.

In our sample, half the verbs (55%) are in the basic P1 *pa'al* conjugation, with another third (30%) in the two typically transitive patterns P3 *pi'el* and P5 *hif'il*. The remaining 15% are in the two intransitive patterns P4 *hitpa'el* and P2 *nif'al*. This breakdown closely parallels findings from cross-sectional studies for verb pattern distribution in Hebrew child language and corresponds remarkably to what has been documented for adult Hebrew (Berman, 1993). These findings confirm the special status of Pattern 1 as having highest frequency of usage for both type and token, in adult as well as children's Hebrew.

Within and across children, there is almost NO alternation of more than one verb pattern across the same verb root. Of the 59 verb lexemes we listed, only 6 share the same root in two patterns. For example, five of the

children use the root [*bwa*]; two of them use it both in P1, meaning 'come' (e.g. *boi* 'come! fem.' Shelli at 1;11 and *bo* 'come! masc.' Leor at 1;9) and also a few weeks later, in P5, for its causative counterpart 'bring' (e.g. *vili* 'bring to me!' Shelli at 2;00 and *vi* 'bring!' Leor at 1;10). Verb roots appear to occur with a single *binyan* pattern form that is initially favoured by children in their speech. For example, the verb root [*šbr*] for 'break' is used first in its intransitive P2 form and only later in its transitive P1 form; in contrast, the root [*zrq*] for 'throw' is used first in its transitive P1 form, only subsequently in the P2 sense of 'get/be thrown'. This lack of verb pattern alternation accords with previous, cross-sectional studies of Hebrew-speaking children's command of verb pattern alternations (Berman, 1993).

The question of what determines the INITIAL FORM lies beyond the scope of the present study. In all likelihood, it relates to a variety of factors such as pragmatic salience and frequency of usage, as well as form/function associations such as the relation between perfectivity (in Hebrew, expressed by past tense) and unaccusative or change of state verbs like intransitive P2 versions of 'break' or 'tear', or the initial inaccessibility of passives and avoidance of P2 forms of verbs like those meaning 'throw', 'take'. But it is clear that children cannot yet be credited with any kind of general, structural basis to the association between verb root and verb pattern. Motion verbs may sometimes be used both in their intransitive P1 and causative P5 forms right from the start, but there is no reason to suppose that children have as yet extracted any generalized form/function relation between such forms, e.g. *bo*(*'i*) 'come!' and *tavi* 'bring!', (*lar*)*éde*(*t*) '(to) get down' and (*lehor*)*id* '(to) take down'.

As for TRANSITIVITY, P1 *pa'al* is the only pattern which is equally accessible to both transitive and intransitive verbs. In our sample, about a third of the P1 verbs used were transitive, requiring a direct object (e.g. those meaning *open*, *put*, *give*, and *take*), several others take optional objects (e.g. *eat* or *write*), and the rest are intransitive, mainly verbs of motion. Thus, transitive and intransitive verbs divide up about equally in our sample of early verb usage. A developmental implication is that these children have a lexical basis for moving into the syntax of clauses with different types of argument structure.

Nor are children as yet relying on MORPHOLOGICAL clues to transitivity distinctions. They generally favour verbs in the transitivity neutral P1, and they use a few verbs in the two patterns which are clearly marked as intransitive (P2, P4). This accords with accounts that have been proposed for the fact that in early clause construction, Hebrew-speaking children mark transitivity distinctions syntactically but NOT also morphologically as required (Berman, 1993; Pye, 1993). Hebrew-speaking children at this early phase are like children speaking typologically quite distinct languages,

including English: they use both transitive and intransitive verbs without the obligatorily associated morphological alternations.

Inflectional alternations

The inflectional paradigms considered here refer to the five verb categories of mood and tense listed in the introduction, together with markings for number (if plural), gender (if feminine), and/or person (1st or 2nd compared with 3rd). The first finding is that we need to add a category to the five mood/tense categories listed in the introduction, to account for 'unclear' stemlike items, or what we term 'stripped' forms. 'Stripped forms' are ones that could stand for a variety of grammatical mood/tense categories of one root pattern combination. For example, *PES*, used for the verb root *x-p-s* in the P3 pattern 'seek, look for' by Lior, Smadar, and Keren, could in principle stand for infinitival *le-xapes* and also for the masculine singular forms of the other four categories listed in (2): imperative *xapes*, present tense *mexapes*, past tense *xipes*, and future *yexapes*, all of which are in the same pattern; *KAX*, for the verb root *l-k-x* 'take' in P1 *pa'al* (Smadar, Leor, Keren, and Yuval), could stand for infinitival *la-káxat*, imperative *kax*, past tense *lakax*, and future *yikax*; ***ZUZ*** for the root *z-w-z* 'move' [intransitive] in P1 *pa'al* (Lior, Leor, Yuval), could represent infinitival *la-zuz*, imperative *zuz*, and future *yazuz*; and *(R)ID*, for the root *y-r-d* in P5 *hif'il*, the causative 'make-descend' = 'take down, take off' (Leor, Keren, Yuval) could mean infinitive *lehorid*, imperative *torid*, present *morid*, past *horid*, and future *yorid*.

As predicted by Peters (1985) and the findings of Pye (1983) for early K'ichi' and Mithun (1989) for early Mohawk, these stripped forms all take the shape of the second, stem-final syllable – typically the stressed syllable, and hence most salient in the input language (Berman, 1977).[1] Such forms can be disambiguated in children's usage if they include, in addition to this stem element, some overt marking of the relevant grammatical category, e.g. prefixal *l-* marking the infinitive, or a suffixed feminine ending: stressed *-i* in Imperative or unstressed *-et* in the present.[2] Plural suffixes might also

[1] Stripped forms could be perceptually motivated, and so phonetic rather than morphological or phonological in origin. However, this does not appear to be the case. One of the boys, Raz, produced several stripped forms in the shape of nonfinal or nonstressed syllables. Second, Juergen Meisel (p.c.) has noted a similar phenomenon in acquisition of Basque, where children's early 'base-stems' were not necessarily related to phonologically stressed syllables.

[2] The stressed feminine suffix *-a* in past tense does not always disambiguate in the same way. It may incur vowel reduction in the preceding, stem-final syllable, yielding forms that are ambiguous for other reasons, e.g. children's surface *áfa* could stand for feminine *nafla* = past tense 'fell', as well as for *áfa* = feminine present or past tense 'fly, flew'; and *áxa* could stand for feminine past tense *halxa* 'went' or *lakxa* 'took'.

TABLE 6. *Breakdown of* 120 *verb forms by mood/tense and stripped stem forms* [*in percentages*]

Stripped	Infinitive	Imperative	Present	Past	Future
45	6	19	10	15	5

disambiguate these stem forms, stressed *-im* in present tense and *-u* in past tense, but these were rare in our sample.

Against this background, the five mood/tense categories with the addition of an unclear 'stripped' category were distributed across the six children as shown in Table 6.

The breakdown in Table 6 shows that less than a third (30%) of early verb forms are clearly marked for present, past, or future tense. Most favoured are the forms we call 'stripped', nearly half of all forms used by the six children (and a third of over 60 verb forms recorded for the seventh child Raz). Next in frequency are imperatives, which account for less than 20%, going by the formal criterion of an isolated, decontextualized surface form with an overt affixal marker for gender (feminine *-I*), number (suffixal *-u*), or person (prefixal *t-*).

The 'stripped' or 'stemlike' forms are syllables that show some or all the consonants with some or all of the interdigited vowels associated with the particular verb form, with no overt affixal indication of mood/tense category. The strategy adopted in such cases is to produce a CVC syllable, most typically reflecting a stressed syllable in the target language. The vowel of this syllable often mirrors the stem final element of the different *binyan* patterns. However, there is no one to one correspondence between the stressed vowel of these stripped forms and a given verb pattern. One reason is that Pattern 1 *pa'al*, semantically and syntactically the most basic pattern, with the highest frequency in children's and adult Hebrew, has three different stems; the vowel *o* marks its stem in irrealis forms (infinitive, imperative, and future), but the past and present have two different sets of vowels. Second, multisyllabic Pattern 4 *hitpa'el* shares the same stem-final *e* vowel with its transitive *pi'el* counterpart. Third, many of the most familiar, high frequency, verbs are constructed out of morphophonologically defective or 'weak' roots, and they show even more variable alternations between stem vowels and consonants, e.g. P1 *y-r-d* 'go down' yields juvenile *éde* for both the infinitive *la-rédet* and feminine present tense *yorédet*, and P1 *kam* 'get up' alternates between present and past tense *kam*.

As seen from Table 6, these unclear, stripped forms account for nearly one half of all forms listed in our sample. They range from a high of 13 and 14 of the 20 items listed for Smadar and Yuval (i.e. between two thirds to 70%), to Leor's 7 and Shelli's 5 (i.e. at least one quarter of their forms), and one third

of those used by Raz. This finding goes against the prediction that children acquiring a highly inflected, root-based language like Hebrew would avoid a 'stemlike' strategy. On the contrary, some of these children rely heavily in their initial verb production on forms that are superficially uninflected. To do so, they isolate a 'stemlike' syllable which is phonologically salient and semantically more informative than its associated affixes.

There could be several reasons for the difference between the Hebrew data here and that for other highly inflected languages. One might be the age difference in subjects studied. The subjects in the present study are possibly younger than subjects studied for other languages, and are thus at an earlier phase of linguistic development. A second potential factor is whether the languages are syllable-timed or stress-timed (Peters, 1985). Stress-timed languages will lead to extraction of single stressed syllables, whereas syllable-timed language will not show such preference. It is not obvious, however, that all 'stemlike' forms in the Hebrew data are stressed syllables. A third factor is the degree of fusion in the languages (e.g. Mithun, 1989). A fourth factor is obviously the root-and-pattern morphology of Hebrew vs. the fixed-unit morphology in other highly inflectional languages which have been studied.

The preference for stripped forms is evident from the paucity of overt inflectional affixes occurring in these early forms. For example, there were only 4 instances of the highly frequent and obligatory prefixal *l-* marker of infinitives; and three of these came from Leor, the child who was at a more advanced stage of language development than the others. Leor was also the only child to use a clear prefixal *t-* to mark future tense in the second person.

Affixes marking agreement for the categories of gender, number, and person could also in principle disambiguate otherwise 'stripped' forms. However, the only one of these that was widely used was that marking feminine gender, as follows. There were 32 such occurrences, mainly (over 70%) the stressed suffix *-i* in feminine imperative; half of these were from a single child, Shelli, and several (5 out of a total 23) co-occurred in other children's usage with the masculine, stem form of the imperative. Additionally, there were only 3 clear instances of unstressed *-et* in present tense (from Lior), and 4 of stressed *-a*. Suffixes marking plural number were very rare, only 4 in all, and there were no markers of person at all, although these are required in past and future tense.

Though these affix markings disambiguated the stripped forms, they showed up on only 25% of the verbal forms, and in many of these cases, they were used incorrectly. Thus, for example, none of the 4 plural markings is used in a context that requires a plural form, and on the other hand, in the few contexts where a plural was required (6 in all) plural forms where not used. The feminine marker *-et* is used by Lior while talking

about herself, but never in alternation with a masculine form, and the feminine marker *-a* is used with the verb *roca* 'want, sg, fem.' in a context which required feminine and otherwise in a masculine context. These findings suggest that the use of the morphological markers during this period does not correspond to grammatical knowledge of the function of the agreement forms.

Marking of feminine gender might thus appear the most salient and earliest to emerge in children's usage. But, here too, our data show no instances of productive alternation for either number or gender, apart from 5 alternations between 'stemlike' imperatives and their feminine counterparts with –i, and even these did not express regular form/function relations. For example, Smadar who has two older sisters who were often present during recordings, used a feminine imperative only twice in all, whereas Shelli, who used such forms in over half her 20 early verbs, used them indiscriminately when addressing her mother and father, her sister and her uncle. Thus, the general picture is of minimal alternation across inflectional forms within and across the children in our sample. This lack of formal alternations is in line with what has been shown for early phases of verb acquisition in other languages (Tomasello, 1992; Olguin & Tomasello, 1993; Lieven, Pine & Baldwin, 1997; Pine, Lieven & Rowland, 1998).

There are occasional instances where children do use more than one surface form of a single verb lexeme. Smadar, for example, used the stemlike *góax*∼*gor* for *lisgor* 'to-close' (cf. *liftóax* 'to-open'). These early, limited alternations could represent highly familiar items which provide a basis in child language for subsequent productive mastery of a grammatical system such as verb inflection, in line with a stepwise model that has been proposed by the second author for acquisition of different facets of linguistic knowledge including grammatical morphology (Berman, 1986), word class distinctions (Berman, 1988), syntax (Berman, 1990), and narrative construction (Berman, 1996).

Our general finding for lack of alternation of inflected forms across the same lexeme relates to a notion that has been defined in crosslinguistic studies of the acquisition of tense/mood/aspect as the 'aspect before tense' or the 'defective tense' hypothesis (Weist, 1986; Tsimpli, 1992). It is also in keeping with the predictions of the 'one form/one function' view of early acquisition (Slobin, 1973). The idea is that children's initial use of a given linguistic form has a restricted range of application, semantically, syntactically, and pragmatically.

This is by and large confirmed by the early use of tense morphology in our data. Tense morphology is used initially not to mark tense, but rather in a restricted aspectual sense with semantically limited sets of verbs. For example, in adult Hebrew, a past tense form indicates an event that took place and ended before speech time. This makes perfectivity part of the semantic

field of past tense. Our data shows that children narrow the use of the past tense form to perfective events in which prefectivity is part of the semantic field of the verb. Thus, the few cases of past tense forms occur with 'unaccusative' or semantically change of state, achievement verbs. Across the children, the verb meaning 'fall' [*npl1*] took a form of the past tense *nafal*, and this was true, too, of intransitive 'break' [*šbr2*], and 'burst' [*pcc3*], as well as the formulaic 1st person plural ending in *gamárnu* 'we've finished' = 'it's done, over'.

Similarly, durativity and modality are part of the semantic field of present tense forms, and an occasional present tense form was reserved for verbs with the modal meanings of 'want', 'be able', or else durative activities like those meaning 'cry'. Future forms were used with modal intent, as imperatives in the 2nd person, or as hortatives in the 1st person plural. For the rest, general activity verbs and motion verbs most markedly were used in some unclear, stripped form or in irrealis mode (imperative or infinitive) with no evidence for productive alternations of the same form with different meanings, or different forms being used with the same verb. This lack of alternation between different inflectional forms reflects a general developmental tendency in the initial phases of acquisition of any system to map a particular form onto a single restricted meaning.

The early verbs: summary

The items we analysed in this section were identified as verbs on both semantic and formal grounds. However, our findings show that these forms are best viewed as 'precursors' for several reasons: (1) children at this stage do not use these forms with overt syntactic marking of argument structure; (2) they fail to make productive use of inflections for alternation of tense/mood and agreement affixes; and (3) they do not use morphological verb pattern alternation for distinguishing different classes of predicates along the axis of transitivity. The proposition that 'early verbs' will be largely rote-learned or morphologically unanalysed is thus strongly attested. Children appear to rely quite heavily on stemlike elements in their initial production of verb forms. In this, their early use of verbs is not yet strongly impacted by the typology of the target language.

Where our Hebrew-acquiring children do produce forms which bear a clear marking for inflection, these are predominantly in the nonfinite, nontensed, semantically irrealis categories of infinitive and imperative. Where they use tense marked verbs, these are restricted to encoding aspectual values of durativity or perfectivity. In these respects, too, the findings for our children accord very closely with what has been found for children acquiring typologically distinct languages. At a slightly more advanced phase of development, around 2;0 for inflectional affixation and considerably later

TABLE 7. *Breakdown of 3 longitudinal samples analysed for the emergence of grammar*

Child	Age range	No. of transcripts	Range of child utterances across transcripts	Range of MLU across transcripts
Leor, boy	1;9.0–2;0.30	22	56–316	2·11–3·38
Lior, girl	1;5.19–1;11.30	82	68–256	1·13–2·22
Smadar, girl	1;4.14–1;11.18	21	76–280	1·34–3·57

(from 3;0) for verb pattern alternation, morphological cues interact increasingly with the acquisition of syntax in a language like Hebrew.

BEYOND THE EARLIEST VERBS: THE EMERGENCE OF GRAMMAR

Our analysis, so far, shows that children have a large repertoire of verbs even before they start combining words, and that these represent a range of predicate types: syntactically, both transitive and intransitive, and semantically, verbs which express activities, events, and even states. Children typically start with a verbal stem which is not inflected for tense or agreement morphology, but reveals some precursors for knowledge of mood and lexical aspect.

These findings answer the first question stated at the beginning of the introduction, showing what verb forms children initially select. Our analysis, so far, however, as not addressed the second question. In order to see how emergent grammar is reflected in the acquisition of fully inflected verb forms, this section moves beyond the one-word stage into the multi-word stage, where morphology plays a major role in Hebrew. At this stage, more and more evidence emerges for morphological alternations and children's knowledge is clearly productive. The question here is more of the nature of the link between the knowledge presented in the early verbs and the new morphosyntactic knowledge acquired at the multi-word stage.

Methodology

This section goes beyond the first 20 verbs noted above, to analysis of all the verbs occurring in the longitudinal samples of the three children from Table 3 (Lior, Smadar, and Leor). As noted, the three were recorded once a week in interaction with their parents (Leor, with his aunt), starting with their first word combinations. Sex, age range, number of transcripts analysed for this section and the range of child utterances per transcript for these transcripts are summarized in Table 7.

As noted, all three children produced at least 20 verb forms within the first two months of recording. The findings presented here cover the first four

to six months of recordings, starting at the period of first word combinations and ending when person, the last category to be acquired, is used productively. Three categories of analysis were applied to this period: distribution of verb tenses, use of person morphology, and marking of number and gender morphology. Each category was analysed for evidence of productive use, attested by the use of the same morpheme with different lexemes and of the same lexeme with different inflectional marking.

This later analysis was divided into the same six categories of tense/mood marking as in the earlier phase: the five inflectional categories of mood/tense and a sixth category for unclear forms; and the agreement categories of person, number, and gender.[3] For each month, all verb tokens were divided according to person, gender, and number categories (with the exception of feminine plural which is rarely used by young children), indicating the tense/mood category in which the various forms occurred. These included all distinct tokens of the same type, in order to represent the full range of inflections used by the child.

FINDINGS

The basis for emergence of grammar is revealed by the longitudinal findings for Smadar, Leor and Lior, as well as by Dromi's (1987) analysis for the one word stage and a cross-sectional study of children aged between 1;0 and 3;0 (Berman & Dromi, 1984). Recall that 'early' verb usage is mostly in infinitival and imperative forms, with occasional past and present tense forms, largely limited to aspectual usage, as noted for other languages too (Weist, 1986; Tsimpli, 1992). Here, too, discussion of aspect refers to lexical or inherent aspect (*Aktionsarten*) determined by the meaning of the verb, since Hebrew has no distinct morphological marking of grammatical aspect. Past tense forms are used for verbs which indicate perfectivity, e.g. *nafal* 'fell,' *nishbar* 'broke' and *nigmar* 'finished,' and present tense forms are used either in the progressive sense to indicate durative activity, e.g. *oxel* 'eating' and *boxe* 'crying,' or for durative states, to express modality, e.g. *roce* 'want' and *yaxol* 'can, be able to.' Each verb has only one form, which is used in all contexts. For example, *xel*, which stands for the present tense *oxel* 'eating', is used in contexts that require a past tense (*axal*) or imperative form (*toxli*). Verbal forms at this period are frozen. For example, children do not mark syntactic gender and use feminine forms for both feminine and masculine subjects and *vice versa*. Moreover, infinitives are used with a modal sense of 'I want to do it.'

[3] Hebrew marks person, number and gender on past and future forms but only gender and number on the present participial *benoni* form. The imperative is restricted, as in other languages, to second person, but in Hebrew it also varies in gender and number.

Subject–verb agreement in gender and number

'Emergent grammar' is first revealed when children manifest SUBJECT–VERB AGREEMENT in gender (and sometimes number). This morphological knowledge is limited to third person forms in the present tense and second person in the imperative. Initially, gender and number morphemes are used in a formulaic rather than a productive manner, which shows no agreement with the subject, using a verb with feminine inflections for a masculine subject and vice versa. This formulaic use of one form (either masculine or feminine for all subjects) gives way to a productive use of the same verb with both masculine and feminine morphology to agree with the subject. The examples in (1) show how Smadar's use of gender agreement at age 1;7 (MLU 1·9) is extended to five imperative forms within the period of a single month:

(1) *sim/símІ* 'put!' masc./fem.,
kax/kxi 'take!' masc./fem.,
vi/abí'i 'give (me)! bring!' masc./fem.,
ten/tni 'give!' masc./fem.
shev/shvi 'sit!' masc./fem. [Smadar 1;7]

Unlike her earlier random use of the feminine-inflected forms, by age 1;7 Smadar uses all these forms in the appropriate context.

The other girl, Lior, at age 1;6.13 (MLU 1·14) shows similar alternations in the imperative, as well as a possible alternation in the present tense form *pes(?)/péset* 'climbs masc.(?)/fem.'; and a month later (Lior 1;7.16, MLU 1·31), she also uses present tense *boxé/boxá* 'cries masc./fem.', although it is unclear from the context whether she is making the gender distinction. Only at 1;8.0 (MLU 1·58), does Lior makes gender alternations productively in the present tense, e.g. *koes/koéset* 'is angry masc./fem.' Since the recordings of the boy, Leor, start at a slightly older age (1;9, MLU 2·11), there is no evidence for ungrammatical use of gender. Rather, from the first session, he makes appropriate use of masculine and feminine forms of the imperative.

While gender marking is used from the first sessions by all children, number occurs later for Smadar (at age 1;10, MLU 3·1), while Leor, the boy, whose records start at 1;9, used plural forms from the very first sessions. The other girl, Lior seems to use the paradigm properly by age 1;7 (MLU 1·31), around the same time as gender, e.g. *zuz/zuzi/zuzu* 'move!, sg,ms/sg, fem./pl.' Since person is not marked in Hebrew present tense, children appear to use these forms properly at this point. However, the forms they use are still aspectually limited to durative activities, regardless of the time of the event in relation to speech time. That is, verbs encoding durative activities (e.g. eating, crying) are still limited to present forms and do not occur in the past form, while verbs encoding a perfective action (e.g. fell, closed) show up only with a past form.

Tense morphology

About a month after gender agreement is used productively, an upsurge in the use of past and present tense forms is observed. A comparison of the use of UNCLEAR forms, IRREALIS forms (infinitives and imperatives), and FINITE forms (present, past and future) shows a remarkable change. For example, at age 1;7 (MLU 1·9), tensed forms constitute only 22% of Smadar's verbal forms, and these are limited to perfective verbs in the past or durative verbs in the present, whereas one month later, by age 1;8, and especially at age 1;10 (MLU 3·1), tensed forms constitute 80% of her verbal forms (45 out of 55). That these verbs indicate tense rather than lexical aspect is evident from the use of the same lexeme in both past and present tense as well as from the use of durative verbs in the past and of change-of-state unaccusative verbs in the present tense. This increase in tensed forms correlates with a decrease in the percentage of unclear forms. This begins when Smadar is 1;8, but only at 1;10 does she reveal past/present contrasts. For example, the verb 'eat' shows the following breakdown:

(2) *le'exol* 'to eat,' *oxélet* 'eating sg, fem.', *axá(l)ti* 'I ate,'
toxlí 'you (fem.) will eat,' also imperative 'eat!'
[Smadar 1;10]

At this stage, the major developmental change in Smadar's verb usage is that unclear forms are replaced by finite forms. This interaction indicates that the unclear forms are not a manifestation of an articulatory deficit, but rather of syntactic deficits. Again, as was the case for number and gender, this pattern of unclear giving way to finite verb forms holds not only for Smadar, but for all the children in our sample.

Subject–verb agreement in person

The last acquisition during this period is of first and second person marking. For the first three months, while inflection for gender and number as well as tense are acquired, Smadar makes a sporadic use of first person singular in the past, once per month in what looks like rote-learned forms (Berman, 1986). By 1;10 (MLU 3·1) this has become a robust phenomenon which applies to seven different tokens in a single session, suggesting that it has become productive rather than rote-learned. This also holds for second person in the past and first and second person in the future. Second person for non-imperative forms is acquired only after person is well established.

Smadar's pattern, starting with a sporadic use of first person and moving to a robust use of this same agreement marker, is not necessarily typical of the other children. Lior aged 1;7 (MLU 1·31) and 1;8 (MLU 1·58) uses just one verb in second person in the past tense: *asit* 'made, fem.' which appears

TABLE 8. *Order of acquisition of agreement and tense for the three children (by age with MLU in brackets)*

Child	Gender agreement	Tense	Person agreement
Leor	1;9 (MLU 2·1)	1;11 (MLU 3·0)	2;1 (MLU 2·4)
Lior	1;7 (MLU 1·3)	1;9 (MLU 1·7)	1;11 (MLU 2·2)
Smadar	1;7 (MLU 1·9)	1;8 (MLU 1·6)	1;10 (MLU 3·1)

in the frozen *asit káki* 'you dirtied your pants.' Only at age 1;9 (MLU 1·72) does she use this form of the verb with another lexeme in (*na*)*falt* 'fell, 2,sg, fem.' She uses both forms *asit* and (*na*)*falt*, which have feminine second person morphology to refer to herself in a first person sense. Lior at 1;8 (MLU 1·58) also shows some evidence for use of first person plural in the past *bikárnu* 'we visited,' but again this is limited to a single form which could well be rote-learned. On the other hand, by age 1;11 (MLU 2·21) person has become a robust phenomenon which is used productively, and second person is used with the proper referent, as shown in (3) for the verb 'finish':

(3) *gamárti* 'I finished,' *gamárta* 'you (ms.) finished,'
gamart 'you (fem.) finished,' *gamárnu* 'we finished'
[Lior, 1;11]

For Lior, as for Smadar, the acquisition of person morphology, as evident from the productive use of these morphemes in the appropriate contexts, is chronologically later than the sporadic use of past/present before 1;8 and the explosion of tense/mood at 1;9.

A similar order of acquisition is observed in Leor's data. Though he seems to be using the inflection for first person plural from the first recordings (at age 1;9), this is limited to a single verb and is not used to refer to plural *we*, but in an imperative sense, e.g. *sagarnu* 'we closed' is used when he wants someone to close or turn off something. For him, as for the girls, productive use of person follows productive use of tense. This suggests that although the initial nonproductive use of person inflection follows a different pattern for each child, as is to be expected from a rote-learned phenomenon, the order of acquisition of tense and person inflections follows a similar pattern for all three children.

In sum, the order in which the three inflectional categories which are morphologically marked on Hebrew verbs – gender/number, tense/mood and person – is the same for all three children, as shown in Table 8. The term 'acquisition' here refers to usage that is clearly robust and productive,

measured by the use of the same inflection with different verbs and the same verb with different inflections in a variety of combinations, rather than occasional, sporadic, inappropriate, or rote-learned.

For each of the three children, gender (and to a lesser extent number) marking is the first to emerge. This is followed by tense/mood distinctions, while (past tense) suffixes and (future tense) prefixes marking first person in contrast with second and third person are the last to be acquired.

DISCUSSION

Brown (1973) noted that English speaking children used the suffixes *-ing* and *-ed* for marking durativity and perfectivity, respectively, before they used them for marking tense. This observation came to be termed the 'aspect before tense' hypothesis (Weist, 1986; Tsimpli, 1992). The findings from Hebrew clearly support this observation, showing that the initial use of tense for aspectually defined verbs is subsequently extended to full use of tenses. Our findings show a chronological link between this process and the acquisition of agreement morphology, where gender and number are used before person. Our findings further suggest that these two processes are chronologically interrelated, with aspectually limited use of tense markings preceding the productive use of number which, in turn, precedes the productive use of tenses, all of which precede the productive use of person.

This order of acquisition raises several questions from both a typological and a functional perspective. Why is gender acquired before person? Is it a matter of saliency, where gender and number are more salient than person? Is tense a prerequisite for person, or is it just that it happens to be acquired earlier? And if tense is a prerequisite for using person, why is this the case? Is this phenomenon specific to Hebrew, where the use of person crucially depends on the use of past and future forms of the verb? And if it is not specific to Hebrew, as we will suggest below, why is person acquired last?

Gender and number morphology is highly salient in Hebrew, applying across the board to all open-class items – nouns, verbs and adjectives – as well as to demonstratives, while person agreement is restricted to only two particular tenses in a single (lexical) category: verbs. The saliency of gender and number morphology is measured not only by the potential frequency of occurrence, but also by the marking of number as potential and of gender as inherent for every noun in the lexicon.

This saliency of gender and number agreement is not unique to Hebrew. For example, the limited use of person to particular tenses is found in other Semitic languages, too. Moreover, as the form used to mark present tense in Hebrew, which is not marked for person, is one and the same as the participial form (Berman, 1978*a*), this distribution of first and second person

agreement for past and future, but not for the participial form, seems not to be unique to Hebrew. Across languages, participles tend to follow the nominal agreement pattern (of nouns and adjectives), with no person marking. Thus, relative crosslinguistic lack of saliency could account for the fact that person is acquired later than gender and number. However, it does not explain why none of the verbs with inherent lexical aspect that show up with past tense morphology, is marked productively for person, before tense is acquired.

Armon-Lotem (1997) has proposed that across languages, tense is a universal prerequisite for the appearance of person morphology. For example, a language may have inflectional marking for tense and no person agreement, but no language can show person morphology without tense marking. Our findings suggest that when children acquire verbal morphology, they first attend to the universal properties of the system and only later acquire the language particular features. Thus, together, the saliency of aspect over tense, the saliency of gender and number over person, and the transition from universal properties of verb morphology to language particular patterning can account for our findings.

Our database also seems to provide evidence for the claim that children start out with rote-learned lexical items (MacWhinney, 1978; Berman, 1986). This seems to be true at all steps in the acquisition of verbal morphology. Moreover, it seems that progress from one step to the next follows the transition from rote to rule, that is, from rote-learned forms to a rule-based system. According to Berman (1986, 1993) language acquisition is a problem solving task in addressing which children use a confluence of linguistic cues. Our analysis of the present database suggests that children initially restrict themselves to lexical-based use of any novel structure. It is only when the novel structure becomes productive that they will attempt to apply rules for producing a more complex structure, following the same process of initial lexically-based learning each time they embark on a new domain of their grammar.

CONCLUDING COMMENTS

The first 20 items analysed for each of the six children at the outset of this article were identified as both semantic and formal 'precursors' of verbs, confirming the prediction that 'early verbs' are largely rote-learned or morphologically unanalysed. While 'early verb' use is not yet strongly affected by the typology of the target language, we have shown that the acquisition of the inflectional paradigm naturally manifests the powerful impact of typology. Hebrew-speaking children acquire the verbal inflectional paradigm of their language in a way that integrates the relative saliency of the different parts of this paradigm with a typological learning strategy.

Aspect is used in this paper to refer to lexical or inherent aspect (*Aktionsarten*) which is determined by the meaning of the verb, e.g. 'shut' and 'fall' where perfectivity is part of the semantic field of the verb, or 'eat' and 'cry' where durativity is part of the semantic field. Lexical or inherent aspect is more salient than the tense of a verb since it does not vary with tense. The act of 'eating' in itself is durative inherently, whether it in the past or in the future. This saliency may explain why tense marking is first used to mark lexical aspect rather than tense. Similarly, gender is a salient feature of Hebrew, used across the board for grammatical agreement in nouns, verbs, and adjectives, while tense is limited to verbs. The factor of saliency explains why aspect precedes tense and why gender precedes person.

The typological learning strategy accounts for the relative order of acquisition between tense and person. In Hebrew, there is no way to mark a verb for person but not for tense, while it is possible to mark tense without indicating person. For example, present tense verbs have no person marking at all, and in past tense, only first and second person verbs are marked by distinct person suffixes. Moreover, tense is a universal property of languages, while person is a highly language-particular phenomenon (Bybee, 1985). This suggests that children not only first acquire more salient properties of linguistic systems, but that they also acquire the universal properties of the target language before its language particular features.

To conclude, their initial repertoire of verbs suggests that from very early on children clearly have a strong basis for moving into the expression of a variety of semantic roles and the syntax of a range of different verb argument structures. On the other hand, their initial use of verbs demonstrates that children still need to acquire considerable language particular grammatical knowledge in order to encode such relations explicitly. This language-particular knowledge demonstrates a clear pattern of acquisition, in which aspect precedes gender, followed by tense, and eventually by person.

This pattern, as noted earlier, is not specific to Hebrew. Rather, it suggests that across languages, morphology is acquired by a variety of perceptual, formal and semantic cues as well as by universal properties of human language. Evidence for an emergent grammar can be found in the earliest verbal forms, in the lexical and aspectual distribution of verbs, as well as in the variety of verb patterns which children produce from the very start. The acquisition of the full set of verbal inflections demonstrates how these precursors evolve, stepwise, yet rapidly, into the adult grammar.

REFERENCES

Aksu-Koç, A. (1988). *The acquisition of aspect and modality*. Cambridge: CUP.

Armon-Lotem, S. (1997). *A parametric approach to functional heads and the acquisition of Hebrew*. Doctoral dissertation, Tel-Aviv University, Israel, June.

Berman, R. A. (1977). Natural phonological processes at the one word stage. *Lingua* **43**, 1–21.
Berman, R. A. (1978*a*). *Modern Hebrew structure*. Tel Aviv: Universities Publishing.
Berman, R. A. (1978*b*). Early verbs: how a child uses her first words. *International Journal of Psycholinguistics* **5**, 21–39.
Berman, R. A. (1985). Acquisition of Hebrew. In D. I. Slobin (ed.), *The crosslinguistic study of language acquisition*. Hillsdale, NJ: Erlbaum.
Berman, R. A. (1986). A step by step model of language learning. In I. Levin (ed.), *Stage and structure: re-opening the debate*. Norwood, NJ: Ablex.
Berman, R. A. (1988). Word class distinctions in developing grammars. In Y. Levy, I. M. Schlesinger & M. D. S. Braine (eds), *Categories and processes in language acquisition*. Hillsdale, NJ: Erlbaum.
Berman, R. A. (1990). Acquiring an (S)VO language: subjectless sentences in children's Hebrew. *Linguistics* **28**, 1135–66.
Berman, R. A. (1993). Developmental perspectives on transitivity: a confluence of cues. In Y. Levy (ed.), *Other children, other languages: issues in the theory of language acquisition*. Hillsdale, NJ: Erlbaum.
Berman, R. A. (1996). Form and function in developing narrative abilities: the case of 'and'. In D. Slobin, J. Gerhardt, A. Kyratzis & J. Guo (eds), *Social interaction, social context, and language: essays in honor of Susan Ervin-Tripp*. Mahwah, NJ: Erlbaum.
Berman, R. A. & Armon-Lotem, S. (1997). How grammatical are early verbs? In Claire Martinot (ed.), *Actes du colloque international sur l'acquisition de la syntaxe en langue maternelle et en langue etrangère. Annales Littéraires de l'Université de Franche-Comté* **631**, 17–59.
Berman, R. A. & Dromi, E. (1984). On marking time without aspect in child language. *Papers and Reports on Child Language Development* **23**, 23–32.
Berman, R. A. & Slobin, D. I. (1994). *Relating events in narrative: a crosslinguistic developmental study*. Hillsdale, NJ: Erlbaum.
Bloom, L. (1991). *Language development from two to three*. Cambridge: CUP.
Brown, R. (1973). *A first language: the early stages*. Harvard University Press.
Bybee, J. L. (1985). *Morphology: a study of the relation between meaning and form*. Amsterdam: John Benjamins.
Clark, E. V. (1993). *The lexicon in acquisition*. CUP.
Deuchar, M. (1995). First verbs by M. Tomasello: a reply to Pine. *First Language* **15**, 103–9.
Dromi, E. (1987). *Early lexical development*. Cambridge: CUP, 170–9.
Guasti, M. T. (1994). Verb syntax in Italian child language. *Language Acquisition* **4**.
Hyams, N. (1994). VP, null arguments, and COMP projection. In T. Hoekstra & B. D. Schwartz (eds), *Language acquisition studies in generative grammar*. Amsterdam: John Benjamins.
Lieven, E. V. M., Pine, J. M. & Baldwin, G. M. (1997). Lexically-based learning and early grammatical development. *Journal of Child Language* **24**, 187–219.
MacWhinney, B. (1978). The acquisition of morphology. *Monographs of the Society for Research in Child Development* **43**.
Mithun, M. (1989). The acquisition of polysynthesis. *Journal of Child Language* **16**, 285–312.
Ninio, A. (1996). Pathbreaking verbs in syntactic development. Paper presented at the Seventh International Congress for the Study of Child Language, Istanbul, Turkey.
Olguin, R. & Tomasello, M. (1993). Twenty-five-month-old children do not have a grammatical category of verb. *Cognitive Development* **8**, 245–72.
Peters, A. (1985). Language segmentation: operating principles for the perception and analysis of language. In D. Slobin (ed.), *The crosslinguistic studies of language acquisition, vol. 2*. Hillsdale, NJ: Erlbaum.
Pine, J. M. (1995). First verbs and what they tell us. *First Language* **15**, 77–101.
Pine, J. M., Lieven, E. V. M. & Rowland, C. F. (1998). Comparing different models of the development of the English verb category. *Linguistics* **36**, 807–30.
Pizzuto, E. & Caselli, M. C. (1993). The acquisition of Italian morphology in crosslinguistic perspective. In Y. Levy (ed.), *Other children, other languages: issues in the theory of language acquisition*. Hillsdale, NJ: Erlbaum.

Pye, C. (1983). Mayan telegraphese. *Language* **59**, 583–604.
Pye, C. (1993). A crosslinguistic approach to the causative alternation. In Y. Levy (ed.), *Other children, other languages: issues in the theory of language acquisition*. Hillsdale, NJ: Erlbaum.
Ravid, D. (1995). *Language change in child and adult Hebrew: a psycholinguistic perspective*. Oxford: Oxford University Press.
Rollins, P. R., Snow, C. E. & Willett, J. B. (1996). Predictors of MLU: semantic and morphological development. *First Language* **16**, 243–59.
Slobin, D. I. (1973). Cognitive prerequisites for the development of grammar. In Ferguson, C. A. & D. I. Slobin (eds), *Studies in child language development*. New York: Holt, Rinehart, Winston.
Slobin, D. I. (1985). Crosslinguistic evidence for the language-making capacity. In *The crosslinguistic studies of language acquisition, vol. 2*. Hillsdale, NJ: Erlbaum.
Stephany, U. (1981). Verbal grammar in Modern Greek early language. In P. Dale & D. Ingram (eds), *Child language: an international perspective*. Baltimore: University Park.
Tomasello, M. (1992). *First verbs: a case study of early grammatical development*. Cambridge: CUP.
Tomasello, M. & Merriman, E. (eds), (1995). *Beyond names for things: young children's acquisition of verbs*. Hillsdale, NJ: Erlbaum.
Tsimpli, I. M. (1992). *Functional categories and maturation: the prefunctional stage of language acquisition*. University College, London, doctoral dissertation.
Uziel-Karl, S. (2000). The early make-up of children's verb lexicons. In E. V. Clark (ed.), The Proceedings of the 30th Child Language Research Forum, Stanford.
Verrips, M. & Weissenborn, J. (1992). Routes to verb placement in early German and French: the independence of finiteness and agreement. In J. Meisel (ed.), *The acquisition of verb placement*. Dordrecht: Kluwer.
Weist, R. (1986). Tense/aspect. In P. Fletcher & M. Garman (eds), *Language Acquisition, 2nd edition*. Cambridge: CUP.

APPENDIX 1

FIRST 20 VERBS RECORDED FOR 5 ISRAELI CHILDREN

The transcription is broadly phonetic, or roughly phonemic. It represents the current pronunciation of educated speakers of standard Hebrew – like the parents and other primary caretakers of the children in our sample – and ignores abstract historical distinctions still manifested in the orthography (Ravid, 1995).

Stress: An *accent aigu* indicates penultimate stress, elsewhere stress is word final.

Verbs are listed in the form and order of their first occurrence in our recordings (except for Child 3, Yuval; in his case, the list includes all of the 22 verbs he used prior to the emergence of word combinations; only 18 verbs are listed for Child 2, Smadar, since these all appeared in a single month). Each entry consists of three items:

I. The form as first PRONOUNCED by the child – notated as follows:
~stands for (apparent) free variation between forms
>stands for later pronunciation of same target word

II. The TARGET form attributed to the child, interpreted by reference to the linguistic and situational context in which the form was produced.

III. An approximate English GLOSS, as follows:

!	= imperative	CS	= causative
to-	= infinitive	FEM	= feminine fender
Verb stem	= truncated or 'stripped' form	IT	= intransitive
Verb + s	= present tense	JV	= juvenile, nursery word
Verb in past	= past tense	PL	= plural number
will Verb	= future	RF	= reflexive
		TR	= transitive

1) LIOR, girl, aged between 1;5 and 1;6, in interaction with her mother

I = CHILD	II = TARGET	III = GLOSS
ni	tni	'give + FEM.!'
nánu > gamánu	gamárnu	'finished, TR + 1 PL'
fal	nafal	'fell'
bo ~ bói	bo, bói	'come!, come + FEM.!'
xol ~ xal	(le')exol	'eat/ate'
pes	(le)tapes	'climb'
ve	ko'ev	'(it) hurts, is sore'
(mi) ba	mi ba	'(who's) coming?'
seye	letsayer	'to-draw, paint'
zuz	(la)zuz	'move, IT'
góax	(li)ftoax	'open, TR'
xek	(le)saxek	'play (a game)'
niga	nigmar	'finished, IT = is over'
shon	(li)shon	'sleep'
dédet	(la)rédet/yorédet	'descend'/'descends + FEM.'
kum	(la)kum	'rise = get up'
boxe	boxe	'cries, is crying'
gor	(li)sgor	'close/shut, TR'
péset	metapéset	'climbs, is-climbing + FEM.'
nédet	menadnédet/mitnadnédet	'swings, is-swinging, TR/IT'

Notes on Glosses [of target forms]:

(a) The bare, uninflected stem form of an English verb (e.g. climb, play) is used where the child's form could stand for a variety of target forms.

(b) A gloss with 'to-' is used only for forms that are clearly infinitival in shape, even when they lack an overt prefixal *le-* (or its alternants *li-* and *la-*) to mark them as such.

(c) The English glosses give monolexemic equivalents for verbs that indicate direction of motion, e.g. *exit* for 'go out', *ascend* for 'go up', *seek* for 'look for', *awaken* for 'wake up'. These are everyday, not of high register as suggested by the English versions.

2) SMADAR, girl, aged between 1;5 and 1;7, with her mother and older sisters

I = CHILD	II = TARGET	III = GLOSS
shev	(la)shév(et)	'sit'
sim	(la)sim	'put'
pes	(le)xapes	'seek' = 'look for'
fox	(la)hafox	'invert' = 'turn over, TR'
tóax	(li)ftóax	'to-open, TR'
góax > gor	(li)sgor	'to-close/shut, TR'
ala	halax	'went (away), left'
xi	kxi	'take + FEM.!'
sim ~ sImi	(la)sim, sImi	'put, put + FEM.!'
fal	nafal	'fell'
Iax	hicliax	'succeeded, managed'
nigor	nisgor	'we'll-close' = 'let's close'
per	(le)saper	'tell, say'
vi	tavi('i)	'bring (+ FEM.)!'
bosh	(li)lbosh	'wear, put-on'
ci	(le)hoci	'extract, take out'
his	(le)haxnis	'insert, put in'
(t)itax ~ nitax	ti- ~ yi- ~ niftax	'open, TR!'/'will-open, IT'
xel	oxel	'eats, is-eating'
kax	(la)kaxat	'take ~ take!'

3) LEOR, boy, aged between 1;9 and 1;10, in interaction with his maternal aunt

I = CHILD	II = TARGET	III = GLOSS
segánu	sagárnu (or)	'closed [= turned off] + 1st PL (light)'
(r)ose	rotse	'wants'
tax	niftax	'opened, IT'
kax > káxat	kax, lakáxat	'take!', 'to-take'
dedef ~ dáde	(le)dafdef	'page' = 'turn pages of book'
mimar	nigmar	'finished, IT' = 'all done'
megéax	mitgaléax	'shaves, is-shaving, RF'
ose	ose	'does, is-doing', 'makes, is-making'
lasim	lasim	'to-put'
te'e	tir'e	'look!'
vi ~ tavi	tavi	'bring!'
laédet	larédet	'to-descend = to get down'
óid ~ oídi	(le)horid, torídi	'to-descend [= take down], CS ~ + FEM.!'
labish ~ babish	(le)halbish	'(to-)dress, CS'
osi	(le)hotsi	'to-exit, CS = extract, take out'
bo	bo	'come!'
tafsíyi	tafsíki	'stop + FEM.!, TR'
xu	kxu	'take + PL'
gor	(lis)gor	'shut, close'
kum	(la)kum	'rise = get up'

4) YUVAL, boy, aged between 1;4 and 1;9, youngest child of first author (Armon-Lotem, 1997)

I = CHILD	II = TARGET	III = GLOSS
éde	(la)rédet	'to-descend' ~ 'to-exit' = 'go out ~ down'
ed	(leh)orid	'descend ~ CS = go down ~ take down'
bó(i)	bo ~ bói	'come! (+ FEM.)' [with and without fem. suffix]
te	shev	'sit!'
ga	kax	'take!'
gen	(le)nagen	'play (musical instrument)'
ke	(le)nakot, nake	'(to-) clean'
do	(li)gzor	'cut (paper)'
ke	(le)taken	'fix, repair' [later pronounced ken]
to	(li)xtov	'write'
du(i)	zuz ~ zúzi	'move!(+FEM.),IT' [with and without suffix]
be	(le)hitlabesh	'dress, RF'
bi	hirbic (li)	'hit, PAST (me)'
kum	(la)kum	'rise = get up'
se	(la)cet	'exit = go out'
i > ti	tir'i	'look + FEM.!' [first without initial t-]
lóce	lo roce	'not wants' = 'I don't want'
mima	nigmar	'finished, IT' = 'all done'
ga	gamárnu	'finished, TR + 1st PL' = 'we've finished' [= wants to finish]
ta	tiftax, liftóax	'open, TR'
kra	tikra, (li)kro	'read'
ba	nishbar/nishpax	'broke, IT ~ spilt IT'

5) SHELLI, 1;11–2;1, daughter of second author (Berman, 1978*b*)

I = CHILD	II = TARGET	III = GLOSS
kli	tistakli	'look + FEM.!'
súsi	zuzi	'move + FEM.!'
xi	kxi	'take + FEM.!'
tiri	tir'i	'see + FEM.!' = 'look!'
ni	tni	'give + FEM.!'
bói	bó'i	'come + FEM.!'
shími	sími	'put + FEM.!'
éde	larédet	'to-descend' = 'to get down'
shon	(li)shon	'sleep'
xol	(le')exol	'eat'
shev	(la)shévet	'sit'
éxi	lexi	'go (away) + FEM.!'
yími	tarimi	'raise + FEM.!' = 'lift, pick up'
víli	tavi'i li	'bring + FEM.! to-me'
kúmi	(ta)kumi	'rise + FEM.! = get up!'
rok	(li)zrok	'throw'
fal	nafal	'fell'
xa	boxa	'cries, is-crying + FEM.'
osa	rotsa	'wants + FEM.'
xola	yexola	'can, is-able + FEM.'