THE ACQUISITION OF VERBS AND THEIR GRAMMAR:
THE EFFECT OF PARTICULAR LANGUAGES
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THE ACQUISITION
OF VERBS AND THEIR
GRAMMAR:
THE EFFECT OF
PARTICULAR
LANGUAGES

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Introduction

The present volume contains selected papers from the conference on the acquisition of verb grammar and verb arguments held at the Research Center for General Linguistics (ZAS), Berlin in November, 2001. The main aim of this conference was to provide a forum for researchers studying the (language-specific) acquisition of verbs and aspects of their grammar, such as inflection, finiteness, argument structure, etc. Of particular interest were the developmental processes at the interface of related components of verb grammar, such as lexicon and morphology, semantics and syntax, etc. Elucidating these issues should enhance our understanding of the development of particular verbal systems and of specific languages impact on this development.

The central role of the verb within a sentence has been acknowledged by most grammatical traditions and it is nowadays accepted by the two most prominent ‘poles’ in acquisition studies: the UG-based and the usage-based acquisition theories. These two psycholinguistic theories reflect two basic and opposed approaches to language. The first theory represents the most elaborated formalist approach (and provides corresponding accounts for language acquisition) while the second denies any principled difference between competence and performance and takes into consideration functions of the target language units the child has to acquire (cf. Newmeyer 2003 on the knowledge and use of language). Usage-based approaches may be generally characterized as emphasizing the crucial role of children’s linguistic experience (in particular, frequency, statistical patterns, etc.) on the development of grammar. Linguistic competence in these theories is seen as a dynamic system which is continually shaped by linguistic usage events. The role of rule-based linguistic representations at the early stages of language development is downplayed in favor of constraint-based systems whose structural properties actually emerge from usage (cf. among others Barlow 2000, Langacker 1987, Bybee 1995, etc.). Further, the communicative function of language also plays a crucial role in these accounts. Thus, Tomasello (2003) stresses that children focus on the acquisition of whole utterances and constructions, because utterances are “the primary reality of language from a communicative point of view” (Tomasello 2003: 326).
Formal theories, in contrast, tend to schematize a child language in terms of very abstract categories and formal representations, and they start from the premise that a child has (knowledge of) linguistic structures from birth. We suppose that in the present state-of-the-art of language acquisition science one cannot unequivocally and definitively solve the problems of this discussion. It seems that different elements of the language faculty (and extralinguistic reality) play more or less prominent roles in the different levels of the acquisitional process and, consequently, diverse explanatory mechanisms accounting for different phases in the acquisition of language, may be of stronger or weaker force.

Despite the different views on the nature of language, both theoretical approaches agree on the central role of verbs in a sentence and in the grammar. The contributions comprising this volume come from different theoretical backgrounds including the two contrasted above approaches and cover a wide range of issues in verb grammar; they all address the main issue of the book: the impact of specific languages on the acquisition of verbs and their grammar. Language specificity causes variation from the onset of children’s verbal behavior and affects the domains of (verb) grammar during the whole course of language acquisition. Although empirical evidence is given for both language-specific and more general processes (e.g. the developmental stages) in the acquisition of verbs, language-specific performance is more substantially observed and is registered from an age when the rule-governed behavior of children is just starting to develop (cf. for example, Bowerman and Levinson 2001, Naigles and Lehrer 2002). The contributors’ original empirical data show that rule-governed behavior and rule-based accounts of the acquisition process become essential later in development, when a certain number of abstract paradigmatic and syntagmatic operations have already been mastered. Within this major topic, which constitutes the ‘red-thread’ of this volume, several sub-issues define the further organization of the contributions. The first deals with the bootstrapping effect, the second explicates the role of frequency in the acquisitional process, and the third compares learner-specific courses of development within a single language.

The main goal of the book is thus not to confront the different acquisitional theories, but a) to bring more empirical longitudinal data on various languages into the discussion and to show both similar and divergent tendencies in these data, b) to show how different theoretical approaches interpret these data and account for the development of language (use and grammar), c) to demonstrate the validity of both approaches and their potential for compatibility, and in this way move theoreticians forward in their understanding of the phenomenon of language acquisition. The two latter goals seem to be best achieved by investigating an issue which is familiar to both theoretical approaches, namely, the development of
language-specific competence within the acquisitional process. Together with the focus on acquisition of the verb and its grammar research in this domain provides a fruitful basis for discussion.

The maturation model of language acquisition assumes that UG becomes the language specific grammar over time and that UG is entirely available only up until the time when the native language has been completely acquired (cf. Atkinson 1992, Wexler 1999). Constructivist models that may also be opposed to theories of UG alongside with the usage-based approaches mentioned above mostly elaborate on the early acquisition of spatial relations (e.g. Bowerman and Choi 2001, Sinha et al. 1999); however, two main hypotheses of this approach – a holistic view of universal spatial cognition and the language specific acquisition hypothesis – are beyond the main scope of this book.

The book presents original contributions based on analyses of naturalistic data from eleven languages: Croatian, Dutch, English, Estonian, French, German, Hebrew, Jakarta Indonesian, Japanese, Russian and Spanish. Three of the contributions make cross-linguistic comparisons – between English and Russian; English, German and Spanish; and German, Croatian and English. All papers in the volume investigate first language acquisition and one paper studies both first and second language acquisition. Different stages of ontogenesis are presented as well: from the first words, when word classes are not yet formed, to the period when children produce multi-word sentences with subjects, objects, and complements, and when the morphology of verbs can basically be said to have been acquired.

**Part 1: Language-specific impact on the acquisition of Hebrew**

The volume begins with two articles investigating Hebrew. The first one treats verbal agreement from a generativist perspective and the second one deals with the acquisition of verb argument structure from a constructivist perspective. These two contributions thus represent opposing viewpoints and reflect the ongoing debate on the nature of the acquisitional process: ‘grammar-discovery’ (e.g. Pinker 1984, 1989; Gleitman 1990) vs. ‘grammar-construction’ (e.g. Tomasello 1992, 2003, Slobin 2003). Differences in theoretical explanations of the language acquisition process have their roots in the way that a researcher characterizes a target language. However, neither approach denies the impact that language-specific aspects have on the acquisitional process. While Uziel-Karl stresses the role of input and language use, Armon-Lotem leaves this issue open. These two theoretically different contributions show that the language-specific nature of Hebrew is more strongly reflected in the later phases of the acquisitional process when children move from concrete item-based entities to more general rule-based structures. The authors agree on the fact that, in the beginning, children do not possess grammatical knowledge about their language and either “restrict
their verb use to specific lexical items” (Uziel-Karl) or “generate smaller convergent trees” (Armon-Lotem). Within the course of language development children augment the diversity of argument types, as outlined by the first author, and/or enlarge the set of functional categories within a tree, as argued by the second author. In general, the increasing importance of the language specific structures and rules children have to acquire is presented in both papers, but the sources of growing linguistic competence and the mechanisms underlying this development are treated differently.

Specifically, **Uziel-Karl** argues for an item-based development of verb argument structure in a ‘bottom-up fashion’ and establishes three developmental phases in L1 acquisition of Hebrew: *Input-based, Bottom-up Construction of Generalizations, and from Generalizations to Rules*. Verb-specific ‘utterance schemas’ employing different nouns and increasing diversity of argument types follow the establishment of argument positions. This in turn leads to further development of the variation of verbs and induces further developmental steps on more abstract linguistic levels. Several issues which are relevant for further research, like the transition and overlap between developmental phases (cf. Kilani-Schoch et al. 1997 for the problems of demarcating the early stages of morphological development), the sensitivity of children to certain cues in the input at different developmental phases, etc. are sketched in the conclusion. **Armon-Lotem** analyses early utterances containing verbs and overt subjects and explores the impact of early verbal morphology on the acquisition of dependent verb constituents in Hebrew. She uses the “no Agr nodes” approach to account for the interrelation between the early appearance of verbal morphology and the early appearance of subjects and argues for a central role for verbs in the acquisition of phrase-markers. In particular, she highlights some agreement mismatches resulting from the overlap between a) the order of acquisition of agreement morphology (agreement markers for gender and number < appropriate use of tense morphology < agreement markers for person) and children’s early tendency to mark telic verbs for past tense and atelic verbs for present tense and b) the onset of the production of overt subjects.

**Part 2: Language-specific variation in the development of predication and verb semantics**

Despite the increasingly discussed phenomenon that ‘grammatical structures are remarkably similar across languages’ (Polinsky 2004: 437) one can find notable variation in the process of L1 acquisition. This variation comes to light and develops together with a child’s increasing competence in his native language. The articles in this part give an example of the outstandingly language-specific manner of acquisition within the domain of predication and
of verb semantics. The paper of Czinglar, Katičić, Köhler and Schaner-Wolles investigates copular(less) constructions in English, German and Croatian. These three languages differ with respect to their allowances for predication structures with and without a copula. No copula omission has been found for Croatian, whereas the two other languages exhibit a tendency for omission of the copula within certain predicate types, namely, locative (temporally bounded) predicates. The authors argue for interrelatedness between the presence of copulaless predication structures and the root infinitive phenomenon. In addition, the overwhelming majority of analyzed sentences with copulas in English and German contain the finite variant. Tsujimura’s paper shows that the L1 Japanese-speaking child does not learn all verbs with equal ease, but has a bias toward (morphologically marked) intransitive verbs. Early verbs predominantly denote motion with special path or definable goal. A language-specific principle focusing on result, rather than process, in describing an event is taken to be a cornerstone for this lexical bias. The author comes to general conclusions concerning the acquisition of language-specific features and their role in conceptual development.

**Part 3: Stages in the development of verb grammar and the role of semantic bootstrapping**

The contributions in this part deal with the bootstrapping mechanism in the acquisition of verb semantics and verb inflection and with the evaluation of periods in the acquisition of the verb and its forms. The notion of bootstrapping has been traditionally employed in formalist theories of language acquisition as a ‘step-link’ assisting children in learning new elements of grammar and in establishing connections between various grammar domains (cf. Weissenborn and Höhle 2001). Originating from Pinker’s (1984) semantic bootstrapping the concept of bootstrapping was extended to prosodic/phonological (Morgan and Demuth 1996), morphological and syntactic areas and is now used as an explanatory device outside generativist models of language acquisition. In this part of the book, the role of a bootstrap for the development of verb semantics and verb grammar is shown within the different periods of language acquisition. Herr-Israel and McCune observe the single word period when word classes are in the process of being formed and children use relational words as a bootstrap for verb meanings and early word combinations. The authors argue for a special single word period which they consider to be a crucial phase in the development of the use and understanding of verbs in multiword combinations. As shown in the paper, the investigated children express dynamic actions with relational words within the single word period. Primal
verbs overlap in meaning with relational words and, in the period of combining words, both relational words and primal verbs predominate over other lexical means.

The notion of verb paradigm serves for Ingram, Welti and Priem as a basis for their model of verb acquisition. Proposing four stages in the acquisition of verb paradigms in Spanish, German and English, the authors found only partial evidence for the semantic bootstrapping strategy. They suggest that children may differ in the way that they exhibit the transition from one developmental period to another and in the way that they use bootstrapping mechanisms to learn their native language. The article also raises methodological questions in the study of verb acquisition. The authors first propose a feature – verbal syntactic type – to determine a child’s verb stage that is not tied to MLU. Secondly, they discuss the methodology of the recording, transcription, and storage of language samples on the basis of new techniques for the digitization of language samples. Their results are especially interesting in light of the fact that the three languages analyzed have different levels of morphological richness. However, all these languages exhibit a similar pattern with respect to developmental paradigms.

Dimroth and Jordens discuss the development of finiteness in L1 and L2 acquisition of Dutch. The understanding of finiteness falls into two parts, concerning the semantic concept of finiteness and its morphosyntactic marking. Given that finiteness carries the pragmatic function of assertion and relates the descriptive content of an utterance to its topic component, the authors propose three successive stages in the acquisition of finiteness. Comparison between L1 and L2 learning revealed similarities consisting of what authors named validation (or linking device). This expresses the relations between the topic and the state of affairs of an utterance and manifests itself in various ways during the proposed stages of the acquisition of finiteness.

Part 4: Language-specific variation and the role of frequency

Two papers in the fourth part of the volume contribute to the ongoing debate surrounding the role of input frequency in the acquisition process (Gil, Gülzow and Gagarina). Recent studies regard input frequency as an influential factor in the order of acquisition and the overall representation of linguistic elements in children’s early productions (cf. Rowland et al. 2003, Wijnen et al. 2001). Although no consensus is reached regarding the precise nature of how the input frequency of a certain linguistic element influences the way in which children learn their target language, most studies agree that high frequency contributes to an element’s salience (e.g. Bowerman 1990, Snyder and Stromswold 1997, cf. Gropen et al. 1991). In part, the diversity of
opinions expressed may be regarded as a result of the different theoretical perspectives that are adopted; frequency is discussed in input based approaches (for an overview see Rowland et al. 2003, Wijnen et al. 2001) as well as in studies simulating language use (e.g. Elman et al. 1998, Seidenberg and MacDonald 1999), or more generative approaches such as, for instance, Yang (2002), who combines a general learning approach with a UG-based hypothesis of language learning.

In the present volume, some studies follow approaches in which the focus is on the impact of frequency on the overall representation of certain linguistic elements in children’s utterances while other studies concentrate on the order of acquisition. Demuth (1989), for instance, has shown that children learning Sesotho as their first language mirror their target language in that they produce a larger number of passive structures than English children do at early stages of language acquisition. Gil argues along the same lines that the early and relatively numerous uses of voice prefixes in Jakarta Indonesian is an effect both of the semantic transparency of the prefixes and their high frequency in language addressed to children. The paper by Gil explores the acquisition of passive and active voice markers (voice morphology) in longitudinal data from eight children acquiring the Jakarta dialect of Indonesian. It is shown that some children acquire the two voice prefixes di- and N- very early (before the age of two) and that, generally, the acquisition of passive precedes the acquisition of active voice. The proposed account is based on two distinct factors, one pertaining to the high input frequency of voice prefixes, the other to their morphosemantic transparency.

Similar effects are also noted by researchers studying the acquisition of other linguistic elements: Mesook et al. (1999) demonstrate that L1-English speaking children and L1-Korean speaking children use locative verbs according to the structure of their target language from early on, Gathercole (1986) shows in a study on the acquisition of English that Scottish children use a greater number of verbal constructions involving the past participle than American children, and a comparison of English-speaking and Mandarin-speaking children revealed that the children produce nouns and verbs in context specific but target-like frequencies (Tardif et al. 1999).

Taking a related perspective, Gülzow and Gagarina argue for an interaction of the frequency effect with a given linguistic element’s semantic transparency or communicative relevance. Comparing the early verb use of Russian and English children, Gülzow and Gagarina find that the Russian and the English children’s use of main verb forms mirrors the relevant input frequencies from early on. This results in a more accurate structure for the Russian children’s verbal utterances, as they mainly produce the synthetic verb forms of verbal utterances with a single verb form. The English children produce many non-target verbal utterances, using the base form with no other
verbal element. However, all children in the study manifest short periods in which their use of non-finite verb forms is above the ratio of these verb forms in the speech addressed to them. While the degree of overrepresentation varies between the children and the individual verb forms, Gülzow and Gagarina argue that the underlying mechanism is the same: due to the increased salience (e.g. sentential position, prosodic stress) and frequency of non-finite verbal elements they have a greater impact on the process of language acquisition for a given period of time.

In their study comparing the acquisition of Estonian in two boys, Vihman and Vija (see part 5 below) show that frequency may be responsible for the early emergence of certain verbal elements while other elements seem to remain unaffected. Estonian on ‘is’ is represented in high numbers in the input of one boy that Vihman and Vija studied and appears relatively early in the boy’s productions. The ratio of ma-infinitives versus da-infinitives, on the other hand, is not mirrored in the early language of the Estonian boy. A central aspect of the frequency debate that Vihman and Vija draw attention to is the attempt to pin down how frequency interacts with other properties that contribute to the salience of a given linguistic element. Type and token frequency alone do not explain why certain verb forms appear early while others do not. In Vihman and Vija’s study, which compares a monolingual boy with a bilingual boy acquiring Estonian and English, it is possible to relate the boys’ different paths to the parallel learning of two languages by the bilingual child.

Part 5: Language-specific and learner-specific peculiarities in the development of verbs and their grammar

Three contributions of the last part present data analyses of children acquiring Estonian, French and Russian as their L1. The papers deal with the emergence of verbs and their (contrastive) finite forms and find significant learner-specific variation in the course of language acquisition. It is shown that language- and learner-specific factors overlap but do not substantially affect the general path of language acquisition presented in the other chapters of the book. Analyzing the data of two boys acquiring Estonian, monolingual Andreas and bilingual Raivo, Vihman and Vija stress the fact that one child focuses on regular forms and productive ‘rule-based’ patterns while the other child instead focuses on irregular forms and item-based learning. The authors argue that learning only one vs. two languages is not necessarily the reason for such linguistic behaviour since another monolingual child could be shown to follow the path of the bilingual one.
INTRODUCTION

The study of Martinot examines the significance of first verbs in the development of grammar in French and thus approaches issues of the interface between the development of verbs and the child’s entire grammar. She addresses questions dealing with the prevalence of certain verbal forms and a) their comparative prevalence among the children investigated and b) their semantic conceptualization and the role they play in argument construction. Martinot finds that although children show individual differences in lexical diversity, they use language-specific light verbs, which play a crucial role in the process of language acquisition. Her analysis shows parallelism in morphological and lexical-grammatical development, even though the origin of acquisitional processes remains unclear.

Finally, Kiebzak-Mandera’s paper studies the emergence of finite verbal forms marked for person in Russian, with special emphasis on their function. The production of personal forms of verbs is compared with the usage of forms which are not marked for person, such as past and non-finite forms. The two children investigated show remarkable differences in coding speaker and addressee. These differences reflect two strategies existing in the target language: to name the addressee with first/second person forms or with the third person form. Rare and late occurrences of second person forms are not due to difficulties in learning but one due to the fact that children seldom address the interlocutor.

The contributions to this volume discussing different issues in the acquisition of verbs and their grammar in various languages provide an overview of their lexical, morphological, and syntactical peculiarities. We hope that this will, implicitly, provide a road map that leads the reader to the blind spots of our knowledge of how children discover the language-specific world of verbs. By presenting different theoretical accounts for a range of naturalistic data we have tried to sketch possible ways towards better understanding of (specific) language acquisition phenomena.

1. NOTES

1 Gentner and France (1988) posit the verb centrality under question.

2. REFERENCES


Part 1

Language-specific impact on the acquisition of Hebrew
ACQUISITION OF VERB ARGUMENT STRUCTURE FROM A DEVELOPMENTAL PERSPECTIVE

Evidence from Child Hebrew

Abstract. The present study proposes a developmental account of Verb Argument Acquisition based on analysis of longitudinal data from four Hebrew-speaking children aged 1;5 - 3;0 years. The following developmental trajectory emerges from the data: Verb argument structure is initially acquired in a bottom-up fashion, limited to specific lexical items. Children start out by rote-learning particular unanalyzed verb forms and verb-argument combinations (holophrases). Then, they start hypothesizing about argument positions, as attested by the use of “groping patterns” (Braine 1976). Once argument positions are set, children start producing verb-specific “utterance schemas” with a wide range of nouns. Gradually, they increase the variation in argument types. As children experience more and more verbs in a variety of communicative contexts, acquisition becomes more abstract and top-down. This is evident from their use of innovated verbs in familiar argument patterns, and from their overextension errors. The proposed account is in line with other input-based accounts of verb argument acquisition (e.g., Braine 1976; Tomasello 1992, 2000a,b).

1. INTRODUCTION

The present paper is concerned with how children develop their knowledge of Verb Argument Structure (VAS).

Two main groups of accounts relate to this question: Inside-Out and Outside-In (Hirsh-Pasek and Golinkoff 1996). Inside-Out accounts, represented by work like Pinker’s (1984, 1989) “semantic bootstrapping” and Gleitman’s (1990) “syntactic bootstrapping” accounts, contend that children are innately endowed with domain specific linguistic knowledge that enables them to properly map linguistic forms and functions. These accounts argue for a strong continuity between child and adult grammars, and emphasize grammar discovery rather than grammar construction.

In marked contrast, Outside-In accounts of various orientations assume no a priori language structure, and emphasize the role of input, actual language use, and communicative events in determining the child’s linguistic skills. These accounts focus on acquisition as an ongoing PROCESS, and contend that language acquisition takes place by means of domain-general procedures, initially in a bottom-up fashion (Bates and MacWhinney 1987,

Against this background, the present study proposes a developmental account of VAS acquisition based on longitudinal data from child Hebrew (see also Uziel-Karl 2001). The proposed account consists of three developmental phases: An initial **Input-based** phase, an intermediate phase of **Bottom-up Construction of Generalizations**, and a final phase from **Generalizations to Rules**. These are illustrated in Figure 1.

![Figure 1. Developmental Phases in VAS Acquisition](image)

The first two phases are “verb-bound”, as they revolve mainly around the verb – its morphology, semantics, and initial argument structure. They mark the transition from rote-learning to rule formation. The **input-based** period involves mainly accumulation of input to serve as the basis for subsequent generalizations. During this period, verbs and verb-containing expressions are rote-learned as unanalyzed amalgams in that children do not seem to be aware of their internal structure yet (MacWhinney 1978, 1982; Bowerman 1982). For example, children acquiring Hebrew as their first language seem to acquire verbs like *rāxāc* ‘wash’ (P1 *pa’al*) and *hitrāxēc* ‘wash oneself’ (P4 *hitpa’el*) as two separate verbs, without realizing that they share the same root *r*-x-c, conjugated in two different verb-patterns (Berman 1986).

The period of **Bottom-up construction of generalizations** forms a link between the initial and subsequent periods of VAS acquisition. During this period children show evidence for preliminary organization and analysis of linguistic data, but they still do not formulate rules. In this sense, the initial organization of input into structure is a process of approximation, or schema formation (Bybee and Slobin 1982) that proceeds in a bottom-up fashion (Berman 1993a; Braine 1976; Schlesinger 1988; Tomasello 1992).

The third phase, from **generalizations to rules**, relates to the “verb at large”, i.e., to the verb and its expanded argument structure. Before this period, children tend to replicate the structures modeled by individual verbs
in their repertoire. After they have accumulated sufficient data, and generalized it, they start to formulate rules. From this point on, acquisition proceeds top-down, as children associate abstract argument structures from their repertoire with new verbs that enter their lexicon. During this period, innovations and overextensions occur, to be resolved as children encounter more exemplars while at the same time becoming more proficient in other relevant linguistic modules like morphology and semantics. In this sense, this period marks a shift from partial to full productivity in VAS acquisition.

The proposed account is in line with other *Outside-In* accounts of VAS in emphasizing the role of input and actual language use in early acquisition (e.g., Braine 1976; Tomasello 1992, 2000a,b). Likewise, it assumes that children initially operate within different psycholinguistic units than adults, and that VAS acquisition is initially verb-dependent, and proceeds in a bottom-up fashion (cf. also Armon-Lotem; Ingram, Welti and Priem, this volume).

### 2. METHOD

To support my account, I use naturalistic longitudinal speech samples collected on a weekly basis from four Hebrew-speaking children, 3 girls (Hagar, Smadar and Lior), and a boy (Leor), aged 1;5 - 3;0 years. The corpus from which my data were extracted was recorded and transcribed as part of the Crosslinguistic Language Acquisition Project conducted by Berman and Weissenborn (1991).

The children were audio-recorded at home during interactions with their parents and siblings. Each child was recorded for approximately one hour a week in a variety of situations, and in more than one session. The girls were recorded by their mothers, and the boy by his aunt, all graduate students of Linguistics at Tel Aviv University at the time.

The present study analyzes data from transcripts of sessions recorded twice a month, at intervals of 10-14 days. These intervals are sufficiently short not to miss significant developmental changes in the children’s language, yet extended enough to allow such changes to take place. Information about the subjects and database is summarized in Table 1.
Table 1. Subjects and Database

<table>
<thead>
<tr>
<th>Child</th>
<th>Sex</th>
<th>Age Range</th>
<th>No. of Transcripts</th>
<th>Mean Utterances per Transcript</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lior</td>
<td>Female</td>
<td>1;5-3;0</td>
<td>32</td>
<td>168</td>
</tr>
<tr>
<td>Smadar</td>
<td>Female</td>
<td>1;5-2;4</td>
<td>13</td>
<td>230</td>
</tr>
<tr>
<td>Hagar</td>
<td>Female</td>
<td>1;7-3;0</td>
<td>35</td>
<td>173</td>
</tr>
<tr>
<td>Leor</td>
<td>Male</td>
<td>1;9-3;0</td>
<td>32</td>
<td>203</td>
</tr>
</tbody>
</table>

Table 1 shows that the mean number of transcripts per child is close to 30 (M = 28.5), and the mean number of utterances per transcript is close to 200 (M = 193.5), which make the database large enough to draw generalizations.

The data were transcribed and coded using CHILDES (MacWhinney 1995) with adaptations to Hebrew. Analysis included all verb-containing utterances in the children’s data, with the exclusion of unintelligible utterances, and utterances which did not contain a lexical verb.

All verbs in the database were coded for lexical category (verb), lexeme (root + verb-pattern), and inflectional morphology (number, gender, person and tense/mood), as shown in example (1).

(1) Child utterance: *boi*
Gloss:        come-2S:FEM:IMP
Lexical coding: V:bwa1
Morphological coding: V:2S:FEM:IMP

In example (1), the verb *boi* ‘come-2S:FEM:IMP’ is lexically coded as V:bwa, where V stands for Verb, bwa is the verb’s root, and 1 stands for the pa’al (P1) verb-pattern (see section 3.3.2). Morphologically, the verb is in the 2nd person, singular, feminine, imperative form.

All utterances that contained a lexical verb were coded for potential and realized argument structure. Potential argument structure refers to idealized, fully spelled-out sets of argument structures that include all obligatory arguments required by a particular verb. For example, the potential argument structures for the verbs *give*, *wash*, and *arrive* are SVOI, SVO and SV, respectively. Coding of potential argument structure was based on prior analyses of VAS in Hebrew (Berman 1982; Armon-Lotem 1997; Stern 1979, 1981), and on my intuitions as a native speaker.

The potential argument structure of a verb may be realized in full or in part in different conversational contexts. Thus, coding of realized argument
structure was based on children’s actual production data. A sample coding is provided in (2).

(2) Child Utterance: *roce mayim*

Gloss: want-S:MASC:PRES water

VAS: SVO:EVO

In example (2), the potential argument structure of the verb *roce* ‘want’ is SVO, and the realized argument structure is VO. The $E$ stands for Empty, since the child used the verb without an overt subject.

Each verb-containing utterance was also coded for whether it was self-initiated by the child, exact imitation, or partial imitation of parental input. Children’s utterances were classified as partial imitations if they varied from adult utterances in verb morphology (3), or in number of arguments (4).

(3) Adult: *azarti lax*

help-1S:PAST to you-2S:FEM

‘I helped you’

Child: *la’azor lax*

help-INF to you-2S:FEM

‘to help you (= me)’

(4) Adult: *ata roce le’exol?*

you-2S:MASC want-S:MASC:PRES eat-INF

‘Do you want to eat?’

Child: *le’exol*

eat-INF

‘to eat’

In example (3), the adult uses the verb ‘help’ in the past tense, while the child uses it in the infinitival form. In example (4) the adult uses an overt subject and a complex verb ‘want to eat’, while the child reproduces only the main verb ‘to eat’, and leaves out the subject and modal verb ‘want’.

Finally, the data were coded for errors relating to VAS such as word order and overextension errors (for the latter see examples (23)-(27)).

Productivity was measured by: (1) the consistent occurrence of self-initiated, correctly ordered verb-argument combinations for a particular verb across at least three consecutive sessions; (2) use of different arguments (i.e., type variation) with a particular verb across consecutive sessions; or
(3) occurrence of a particular argument structure with two or more verbs across at least three consecutive sessions.

3. RESULTS

This section presents evidence from child Hebrew to support the developmental trajectory outlined at the outset of this study. The section is divided into three parts: An Input-based phase (3.1), Bottom-up Construction of Generalizations (3.2), and from Generalizations to Rules (3.3).

3.1. An Input-Based Phase

Several kinds of evidence support the initial Input-based period of VAS acquisition as characterized above. These include: the distribution of early verb-forms (3.1.1), the early use of “holophrases” (3.1.2), and the effects of parental input on early acquisition of verbs and VAS (3.1.3).

3.1.1. Distribution of Early Verb Forms

Researchers in the field of language acquisition argue that young children’s grammatical knowledge is initially organized around specific lexical items (Akhtar 1999; Akhtar and Tomasello 1997; Clark 1995; Lieven, Pine and Baldwin, 1997; Tomasello and Brooks 1999). Similarly, the following data from child Hebrew suggest that children initially rote-learn certain verbs as unanalyzed amalgams in that each verb is acquired in a particular morphological form (i.e., unique number, gender, person, and tense configuration), and children are not aware of its internal structure (i.e., root + verb-pattern).

Table 2 shows the distribution of preferred verb forms (i.e., particular number, gender, person and tense configuration) for six verbs that were among the earliest and most frequently used by the children in my sample between ages 1;5 - 1;11, when they were in a transition from the single-word stage to multiple word combinations (see also Berman and Armon-Lotem 1996). The Table specifies the total number of tokens for each verb, and the morphological form in which the four children (combined) used it most frequently.
Table 2. Distribution of Verb Forms for Six Early Verbs in the Children’s Data [1;5 - 1;11]

<table>
<thead>
<tr>
<th>Verb Form</th>
<th>Verb Morphology</th>
<th>No. of Tokens</th>
<th>Distribution of Preferred Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>tni ‘give’</td>
<td>2S:FEM:IMP</td>
<td>20</td>
<td>70%</td>
</tr>
<tr>
<td>nafal ‘fall’</td>
<td>3S:MASC:PAST</td>
<td>43</td>
<td>93%</td>
</tr>
<tr>
<td>bo/boi ‘come’</td>
<td>2S:MASC/FEM:IMP</td>
<td>62</td>
<td>68%</td>
</tr>
<tr>
<td>roce/roca ‘want’</td>
<td>S:MASC/FEM:PRES</td>
<td>209</td>
<td>99%</td>
</tr>
<tr>
<td>gamarnu ‘finish’</td>
<td>1P:PAST</td>
<td>35</td>
<td>77%</td>
</tr>
<tr>
<td>(la)sim ‘put’</td>
<td>INF/2S:MASC:IMP</td>
<td>64</td>
<td>89%</td>
</tr>
</tbody>
</table>

Table 2 reveals that until around age 1;11 when there is evidence for initial productivity in use of grammatical subjects and morphological inflections, each verb is used in a particular morphological form. For example, Lior initially uses the verb bwa1 ‘come’ as bo in the imperative masculine form even when referring to her mother. She does not alternate the gender of the verb by the context of use. She uses the verb np1 ‘fall down’ as nafal in the 3rd person masculine singular to refer to everything that falls down be it feminine, masculine, plural or singular. She uses the verb ntn1 as tni li ‘gimme’ in the imperative feminine form, and the verb rcy1 ‘want’ as roca in the feminine singular present tense. She uses the verb gmr1 ‘finish, end’ as gamarnu, in the 1st person plural past tense, and the verb ily1 ‘go up’ as la’a lot in the infinitive in all contexts. Smadar uses the forms shev ‘sit down’ and sim ‘put’ repeatedly to refer to her mother (e.g., shev ima ‘sit down mommy’, ima sim (mi)ta sus ‘mommy put bed horse = mommy put the horse on the bed’) although these forms, if analyzable at all, are closest to the masculine singular imperative form (cf. sim ‘put-2S:MASC:IMP’, shev ‘sit-2S:MASC:IMP’). Thus, the vast majority of occurrences of each verb are in a single preferred morphological form with almost no alternations or governing rules, regardless of the agreement and tense marking required by the context (see also Berman and Armon-Lotem 1996; Uziel-Karl 1997). The lack of variation in verb morphology throughout the examined period suggests that these verbs are initially rote-learned as unanalyzed elements. These findings corroborate research on the early acquisition of verbs in other languages like Italian (Pizzuto and Caselli 1992, 1993), Spanish (Gathercole, Sebastian and Soto 1995), and Inuktitut (Allen 1996).

The data also suggest that there is no correlation between a verb’s initial morphological form and its transitivity value or semantic class. That is, not all transitive or all intransitive verbs are used in the same inflectional configuration. For example, the verbs rcy1 ‘want’ and gmr1 ‘finish’ which are both transitive, are used with different tenses. Similarly, verbs which
share a semantic class are not necessarily acquired with the same morphological form, e.g., the verbs *ntn1* ‘give’ and *sym1* ‘put’ which are both transfer verbs, are used with different tenses. These findings suggest that Hebrew-speaking children initially acquire each of these verbs individually.

Two exceptions need to be accounted for – the use the verbs *rcy1* ‘want’ and *sym1* ‘put’. The verb *rcy1* ‘want’ is used both in the masculine (*roce*) and feminine (*roca*). Leor, the boy, uses only the masculine form a large number of times, while the girls Hagar, Smadar and Lior use only the feminine. All uses of the verb are in the present tense. The gender of *rcy1* ‘want’ in the children’s data has to do with their sex, as follows. At its early phases, acquisition is assumed to depend to a large extent on parental input. In Hebrew this input differs according to the sex of the addressee, so that boys are addressed in the masculine and girls in the feminine. As a result, boys produce the verb in the masculine form first, while girls initially produce it in the feminine. In the case of *sim/lasim* ‘put’ these two forms can be attributed to a certain degree of ambiguity, since *sim* could be either a bare infinitive, without the infinitival marker *le*- ‘to’ or the masculine singular imperative. Since the period of early verbs is transitory with respect to the use of unclear forms, some occurrences of *sim* could be taken to be truncated versions of *lasim* ‘to put’.

The following two Tables compare the number of different verb forms for each child across two age periods 1;5 - 1;11 (Table 3) and 2;0 - 3;0 (Table 4). In the present analysis, for any given verb, 2S:*MASC:*IMP and 2S:*FEM:*IMP and 1S:*US:*PAST and 1S:*US:*FUT constitute four distinct verb-forms. In contrast, repeated occurrences of a particular form like S:*MASC:*PRES are counted as a single form.

### Table 3. Distribution of Verb Forms for Four Children [1;5 - 1;11]

<table>
<thead>
<tr>
<th>Lexeme</th>
<th>Smadar</th>
<th>Lior</th>
<th>Leor</th>
<th>Hagar</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>ntn1</em> ‘give’</td>
<td>1</td>
<td>2</td>
<td>—</td>
<td>1</td>
</tr>
<tr>
<td><em>npl1</em> ‘fall’</td>
<td>3</td>
<td>3</td>
<td>—</td>
<td>2</td>
</tr>
<tr>
<td><em>bwa1</em> ‘come’</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td><em>rcy1</em> ‘want’</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td><em>gmr1</em> ‘finish’</td>
<td>—</td>
<td>1</td>
<td>—</td>
<td>2</td>
</tr>
<tr>
<td><em>sym1</em> ‘put’</td>
<td>2</td>
<td>—</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 3 reveals that the overall number of distinct verb forms for each of the six verbs (*ntn1* ‘give’, *npl1* ‘fall’, *bwa1* ‘come’, *rcy1* ‘want’, *gmr1* ‘finish’, *sym1* ‘put’) is initially very small. Yet, certain verbs, e.g., *bwa1* ‘come’ tend to occur in different verb forms earlier than others, e.g., *gmr1*
‘finish’. This may be attributed to the semantic properties of the verb (e.g., semantic class, specificity) rather than to its morphological (e.g., verb-pattern) or syntactic properties (e.g., verb argument structure). For example, the verb *bwa1* ‘come’ belongs to the class of general-purpose verbs, which has been noted to have particular properties that make it favored for early acquisition (Clark 1993; Ninio 1999; Pinker 1989; Uziel-Karl 2000). As a consequence of its early and frequent use, this verb may initially be prone to greater variation than verbs belonging to other semantic classes.

Table 4. Distribution of Verb Forms for Four Children [2;0 - 3;0]

<table>
<thead>
<tr>
<th>Lexeme</th>
<th>Smadar</th>
<th>Lior</th>
<th>Leor</th>
<th>Hagar</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>ntn1</em> ‘give’</td>
<td>10</td>
<td>6</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td><em>npl1</em> ‘fall’</td>
<td>4</td>
<td>5</td>
<td>11</td>
<td>8</td>
</tr>
<tr>
<td><em>bwa1</em> ‘come’</td>
<td>4</td>
<td>8</td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td><em>rcy1</em> ‘want’</td>
<td>4</td>
<td>6</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td><em>gmr1</em> ‘finish’</td>
<td>4</td>
<td>4</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td><em>sym1</em> ‘put’</td>
<td>10</td>
<td>7</td>
<td>14</td>
<td>11</td>
</tr>
</tbody>
</table>

A comparison between Tables 3 and 4 reveals that the number of different verb forms for each lexeme increases dramatically with age, and that this trend characterizes all four children. That is, as acquisition proceeds, children stop using verbs as unanalyzed amalgams; rather, a variety of morphological forms are acquired, and verbs occur in different tenses and with different inflectional markers of agreement (see section 3.2.4 for a detailed discussion). This developmental trend appears to be shared across languages, as evident from studies on the acquisition of verb-paradigms in languages like Spanish, English and German (see Ingram et al., this volume).

3.1.2. Early Use of Holophrases

Along with or shortly after children start using bare verbs in particular morphological forms, they start producing “holophrases”. Holophrases are frozen phrases that result when children attempt to reproduce entire adult utterances, but do so with only partial success (Barrett 1982). Table 5 shows the distribution of frequently used holophrases in my data before age 2;0.
Table 5. Distribution of Frequently Used Holophrases before Age 2;0

<table>
<thead>
<tr>
<th>Child</th>
<th>Holophrase</th>
<th>Gloss</th>
<th>Use of particular construction</th>
<th>Total occurrences of Verb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lior</td>
<td>azor lax</td>
<td>‘help you = me’</td>
<td>69%</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td>loh roca</td>
<td>‘don’t want’</td>
<td>63%</td>
<td>16</td>
</tr>
<tr>
<td>Smadar</td>
<td>sim po</td>
<td>‘put here’</td>
<td>68%</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>loh yoda’at</td>
<td>‘don’t know’</td>
<td>88%</td>
<td>18</td>
</tr>
<tr>
<td>Leor</td>
<td>sagarnu or</td>
<td>‘(we) turned off light’</td>
<td>70%</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>roce musika</td>
<td>‘wants music’</td>
<td>90%</td>
<td>10</td>
</tr>
</tbody>
</table>

Table 5 reveals that each child produces his or her own holophrases. Each holophrase consists of a [verb + particular lexical item] (Noun, Pronoun, Adverb, Negation), which does not change across repeated uses, suggesting that these expressions are used nonproductively. For example, Leor uses the noun musika ‘music’ in 9 out of 10 occurrences of the verb roce ‘want’ (90%) before age 2, and Smadar uses the negation word loh ‘not’ in 16 out of 18 occurrences of the verb yoda’at ‘know’ (88%) during that period.

Additional examples of children’s holophrases are listed in (5)-(10) below.

(5) Mother: ma ze, Lior, ma at osa?
   what this, Lior, what you-2S:FEM do-S:FEM:PRES
   ‘What’s this, Lior, what are you doing?’

   Lior: tusa [: at osa]³
   you-2S:FEM+do-S:FEM:PRES
   ‘you+do’  [1;6]

(6) Mother: ani e’ezor lax?
   I help-1S:FUT you-2S:FEM
   ‘I’ll help you’

   Lior: azor [: la’azor] lax
   help-INF you-2S:FEM
   ‘to help you (instead of me)’  [1;7]

(7) Mother: ma nafal?
   what fall-down-3S:MASC:PAST
   ‘What fell down?’
Examples (5) and (8) show that children pronounce some of these early combinations as morpho-phonological amalgams, for example, torá ‘you + see’ instead of àt roá ‘you see’. Example (6) shows that children do not inflect pronouns for the correct person, as in azor lax ‘help you’. In this example, Lior repeats the 2nd person pronoun lax ‘to you-2S:FEM’, used by her mother, to talk about herself, instead of using the required 1st person pronoun li ‘to me’ (cf. azor li ‘help me’). Example (10) shows that children use excerpts from nursery rhymes, e.g., bo elay ‘come to-me’ is part of a nursery rhyme in which a child asks a butterfly to come and sit on her hand. Each holophrase is used with a single verb in a unique morphological form and with a single pronoun. Its constituent order is fixed, and it does not extend to other verbs or to other lexical items. It thus appears that children acquire each holophrase as an unanalyzed amalgam. This lends further support to the claim that early acquisition of VAS is nonproductive, initially based on rote-learning. These data corroborate findings on the acquisition of inflectional morphology, and early word-combinations in other languages (Bowerman 1982; MacWhinney 1978, 1982; Tomasello 2000a,b).