

## 5

# Children's Innovative Verbs Versus Nouns: Structured Elicitations and Spontaneous Coinages

Ruth A. Berman  
*Tel Aviv University*

This chapter concerns derivational morphology, a domain that was marginal to the Berko wug task (3 or 4 of nearly 30 production items). Yet the research reported here derives directly from this classic study because it, too, makes use of structured elicitation for evaluating children's productive, rule-bound knowledge of morphological alternations. Two questions of principle serve as background to discussion of methodology in language acquisition research: how children construe nouns versus verbs as a universal linguistic contrast, and the impact on this process of language-particular factors in the acquisition of Hebrew as a first language. Findings from a structured elicitation task in which subjects coin new words from familiar lexical items are then compared with studies based on nonsense-words and with children's spontaneous lexical coinages.

### NOUNS VERSUS VERBS IN ACQUISITION

The distinction between how children acquire nouns and verbs has been considered from different perspectives: the relative order of noun and

verb acquisition at the one-word stage and the proportion of items from different word classes in children's early vocabulary in different languages (e.g., Bloom, Tinker, & Margulis, 1993; Gentner, 1982; Gopnik & Choi, 1995; Tardif, 1996; Tomasello & Farrar, 1986); the distribution of nouns as compared with verbs in early caregiver input (e.g., Goldfield, 1993; Slobin & Kuntay, 1995; Tardif, Shatz, & Naigles, 1997); and the acquisition of word classes as syntactic categories (e.g., Braine, 1987; Maratsos, 1988; Pinker, 1984; Tomasello, Akhtar, Dobson, & Rekau, 1997). The present analysis, in contrast, examines how children distinguish between nouns and verbs morphologically. Focus is thus on the word-internal form and structure of these two classes of words rather than on their syntactic distribution or their communicative function.

All languages appear to make a major lexical-class distinction between categories corresponding to nouns and verbs, although membership in the two classes does not fully overlap across languages (Anderson, 1985; Hopper & Thompson, 1984, 1985; Langacker, 1987).<sup>1</sup> This distinction falls into the category of what Chomsky (1965) termed "substantive" as compared with "formal" universals, akin to Keenan's (1975) idea of "naive universals" shared by all languages. The implication for acquisition, in this as in other areas of linguistic form/function mapping, is that children are from the start predisposed to attend to such distinctions (Berman, 1988, 1993a). What they need to learn is (a) how the relevant categorial distinctions are marked in the language they are acquiring, and (b) what lexical and grammatical consequences this has in their own target language

### NOUNS VERSUS VERBS IN HEBREW

Children acquiring Hebrew have both a relatively easy and a rather difficult task in distinguishing between verbs and nouns. Words in the two classes typically take different morphological forms, so children have formal surface cues to help them identify the class membership of the words they hear. From the point of view of comprehension, their task in a Semitic language may thus be simpler than it is for children learning a more analytic language such as English, in which there are often only syntactic cues to distinguish between, say, *to cook* ~ *a cook*; *his (shoe)laces* ~ *he laces*

<sup>1</sup> Maratsos (1991), in contrast, suggests that given languages like Tagalog, "the only candidate for a universal form-class category is nouns, and the only universal distinction, that of noun-other" (p. 68).

*his shoes*, compared with the corresponding Hebrew terms *le-vashel* ~ *bashlan*<sup>2</sup>, *ha-srox* ~ *sorex*. But in producing forms in a language with a rich bound morphology such as Hebrew, children cannot rely on simply using a given word as either a verb or a noun. Instead, they have to obey numerous language-specific constraints in order to produce words that are morphologically appropriate to a given word class (verb versus noun) and often also to a particular subgroup in that class (e.g., transitive versus intransitive verb, agent versus place noun).

Most content words in Hebrew—all verbs, and most nouns and adjectives—are made up of consonantal roots and associated affixal patterns. This is illustrated in (1) for verbs and nouns formed from the two roots *g-d-l* standing for something like "grow, increase in size" and *k-t-v* meaning "write, represent linguistic signs graphically." The symbol C stands for any root consonant; affixal consonants and vowels are represented with their phonetic values; verbs are listed in the masculine singular, third person, past tense; stress is word-final, except where marked by an acute accent on the penultimate vowel; and three dashes --- represent accidental gaps in the established lexicon.

#### (1) Verbs and Nouns based on the consonantal roots *g-d-l*, *k-t-b* ~ *x-t-v* [see note 2]:

	<i>g-d-l</i>	"grow"	<i>k-t-v</i>	"write"
<b>Verbs:</b>				
Pattern 1	<i>gadal</i>	"grow" [Intransitive]	<i>katav</i>	"write"
Pattern 2	---		<i>nixtav</i>	"be written" [Passive]
Pattern 3	<i>gidel</i>	"grow, raise" [Trans]	<i>kitev</i>	"write captions"
Pattern 4	<i>hitgadel</i>	"aggrandize" [Reflx]	<i>hitkatev</i>	"correspond"
[Reciprocal]				
Pattern 5	<i>higdil</i>	"enlarge, magnify"	<i>hixtiv</i>	"dictate" [Causative]
<b>Agent Nouns:</b> <sup>3</sup>				
	<i>megadel</i>	"grower, farmer"	<i>kotev</i>	"author"
	---		<i>mekutav</i>	"addressee"
<b>Action Nominals:</b>				
Pattern 1	<i>gdila</i>	"growing, growth"	<i>ktiv</i>	"writing, script"
Pattern 3	<i>gidul</i>	"growth, tumor"	<i>kituv-it</i>	"caption(izing)"
Pattern 4	<i>hitgadlut</i>	"aggrandizement"	<i>hitkatvut</i>	"corresponding/ence"
Pattern 5	<i>hagdala</i>	"enlarging/ment"	<i>haxtava</i>	"dictating/ion"

<sup>2</sup> The stop *b* and fricative *v* alternate in a relatively predictable way, which children attend to from very early on (and so, too, for the pairs *p/f*, *k/x*).

<sup>3</sup> These three agent nouns are the same as present-tense (participial) forms and in this sense can be said to be derived by zero derivation, or syntactic conversion from their associated verbs.

**Other Noun Patterns:**

CóCeC	<i>gódel</i>	"size"	---	
CCaC	---		<i>ktav</i>	"(hand)writing"
CCiC	---		<i>ktiv</i>	"spelling"
CaCCaC	---		<i>katav</i>	"correspondent,
reporter"				
CaCCaCa	---		<i>katava</i>	"(news) report"
CCuCa	<i>gdula</i>	"greatness"	<i>ktuba</i>	"marriage-contract"
CaCCan	---		<i>katvan</i>	"typist"
CaCCanut	---		<i>katvanut</i>	"typing, stenography"
CaCCut	<i>gadlut</i>	"grandeur"	---	
CCóvet	---		<i>któvet</i>	"address, inscription"
miCCaC	<i>migdal</i>	"tower"	<i>mixtav</i>	"letter, missive"
taCCiC	<i>tagdil</i>	"(photo) enlargement"	<i>taxtiv</i>	"(a) dictate"
maCCeCa	<i>magdela</i>	"enlarger"	<i>maxteva</i>	"writing-desk"
tiCCóCet	---		<i>tixtóvet</i>	"correspondence"

The forms in (1) illustrate several points relevant to the child's task in acquiring Hebrew derivational morphology. First, the system is not fully productive because there are many gaps for any one pairing of a given consonantal root plus affixal pattern. For example, the root *g-d-l* has no agent noun in the typically agentive pattern CaCCan (hypothetical "grower"), and neither *g-d-l* nor *k-t-v* occurs in the most common of all noun patterns: CéCeC (e.g., *kéšer* "knot" from the root *k-š-r* "tie"; *téfer* "stitch" from the root *t-f-r* "sew"). Second, the system is not fully regular because its form-meaning relations are often unpredictable. For example, both *g-d-l* and *k-t-v* happen to form nouns in the miCCaC pattern that have a product meaning (*migdal* "tower" and *mixtav* "letter"), but other nouns in the miCCaC pattern can belong to other semantic classes (e.g., place names such as *mitbax* "kitchen," *misrad* "office," and also *mispar* "number," *mišpat* "sentence"). Third, verbs must be constructed out of one of the five verb-pattern *binyan* conjugations (or in two passive conjugations not considered here). Nouns, in contrast, may be constructed outside of the classical root plus pattern processes, for example, by the word-based process of adding suffixes to stems, as in (1): *katvan-ut* "stenography" from *katvan* "typist," and *gadl-ut* "greatness" from the adjective *gadol* "big, great."

In learning how to form verbs, Hebrew-acquiring children must select one of a small, structurally defined set of patterns, all constructed out of consonantal roots plus associated internal vowel affixes and in some cases CV(C) prefixes. Nouns offer a much wider range of options. They

can be: non-root-based, underived forms (e.g., *ax* "brother," *sus* "horse"); in the linear form of an existing word plus suffix (e.g., *ax-yan* "nephew," *sus-on* "little horse"); in the form of blends or compounds (e.g., *axot-rax-maniya* "nursing sister," *sus-meruts* "race-horse"); loan words (e.g., the place noun *pitsariya*, the agent noun *šef* "chef"); and also in several dozen root plus affixal patterns. As a result, the Hebrew place noun *madaf* "shelf" could yield only a total of five well-formed, nonpassive verb coinages: in the three transitive patterns P1 *modef*, P3 *midef*, or P5 *himdif* meaning "shelve (something)," or in the intransitive P2 *nimdaf* or P4 *hit-madef* in the sense of "be shelved, get shelved, shelve oneself"; but the activity verb *le-vašel* "to cook" might give rise to dozens of possible innovative nouns, including place nouns such as *béšel*, *mivšal*, *mivšala*, *mavšela*, *bašaliya*, *bišuliya*, *bašlaniya*, *bašaleriya*, as well as, say, agent nouns like *bašal*, *bašil*, *béšel*, *bošlan*, *mevašlan*, *mevašler* (cf. established *bašlan* "gourmet cook," *mevašélet* "house-cook").

Two conflicting predictions emerge from the contrast between language-general factors and the Hebrew-particular facts noted here. On the one hand, across languages, children should find it easier to derive nouns than verbs because nouns serve the basic referential function of naming, whereas verbs are more abstract relational elements for which suppletive, general-purpose terms are readily available (e.g., *to bang*, *to hit* for the act of using a hammer; *to put in*, *put on* for placing something in a crate or on a shelf). On the other hand, Hebrew-acquiring children might find it easier to coin verbs than nouns because in their language verbs occur only in a small, restricted set of obligatory morphological patterns based on a consonantal root combined with interdigitated affixes, whereas nouns can take a far wider range of forms.

#### FROM KNOWN TO NEW: ELICITED INNOVATIONS

To test these predictions, I employed a research design first used by Clark and her associates in a range of studies with children speaking different languages (e.g., Clark & Hecht, 1981; see especially Clark, 1993), including Hebrew (e.g., Clark & Berman, 1984, 1987). In production tasks of the kind discussed here, children are given familiar words as source input items, and they are required to use these as a basis for coining innovative target output items. This design has formed the basis for several studies

on children's knowledge of derivational morphology in Hebrew (summed up in Berman, 1995), whereas studies based on Clark have served for cross-linguistic Hebrew-English comparison, as shown in (2).

## (2) Structured elicitations of Hebrew word formation:<sup>4</sup>

### 1. Domain: Verb-Transitivity Alternations [Berman, 1993a, 1993b]

Ages: 2, 3, 8, adults

Task: (a) Changing established intransitive verbs to their established transitive counterparts and vice versa (b) Coining novel intransitive verbs from established transitives and novel transitives from established intransitives

Example: (a) Source: "Here the mother is washing [= *roxétset*] the little boy, and here . . ."

Target: He's washing (himself) [= *mitraxets*].

(b) Source: "Here the little boy is crawling [= *zoxel*], and here . . ."

Target: His Daddy is crawling him [= *\*mazxil*, or *\*mezaxel*].

### 2. Domain: Endstate Resultatives = Passive Participles [Berman, 1994]

Ages: 2, 3, 4, 5, 7, adults

Task: Turning known active, transitive verbs to passive participles

Example: Source: "Here's a razor to shave [= *le-galéax*] the man, and here . . ."

Target: The man is shaven [= *megulax*].

### 3. Domain: Compound Nouns [Berman, 1987; Clark & Berman, 1987]

Ages: 3, 4, 5, 7, 9, adults

Task: Coining novel compounds from periphrastic phrases and clauses

Example: Source: "What would you call (a) blanket [= *smixa*] you use to cover a doll [= *buba*], a blanket that is for a doll?"

Target: *\*smixat + buba* "blanket + doll" = 'a doll-blanket'

### 4. Domain: Deverbal Noun Formation [Clark & Berman, 1984]

Ages: 3, 4, 5, 7, 9, adults

Task: Coining novel (agent, instrument, and place) nouns from established verbs

Example: Source: "What would you call a person whose job is to jump [= *likpoc*], someone who likes to jump?"

Targets: *\*kofec*, *\*kafcan*, *\*kapac*, *\*mekapcan*

### 5. Domain: Denominal Verb Formation [Berman, 1989; Berman & Clark, 1993]

Ages: 3, 4, 5, 7, 9, adults

Task: Coining novel verbs from established (place, object, instrument) nouns and (state to causative) adjectives

Example: Source: "I'm putting these beads in a box [= *kufsa*], what am I doing to the beads, what do I do with the beads when I put them in the box?"

Targets: *\*kofes*, *\*mekafes*, or *\*makfis*, *\*makpis*

Like the original Berko test, this design neutralizes the effect of rote learning of familiar vocabulary items that may be acquired and stored as unanalyzed amalgams, in order to examine children's creative knowledge of rule-based morphological processes. But these studies differ from the classic wug task in which the input items were mainly nonsense words that do not occur in the conventional lexicon. Following Berko, nonsense words have been used as input items for acquisition research in various domains of morpho-syntax. These include passives (Pinker, Lebeaux, & Frost, 1987), causatives (Maratsos, Gudeman, Gerard-Ngo, & DeHart, 1987), verb-argument relations (Braine, Brody, Fisch, & Weisberger, 1990), and the early lexicon (Tomasello & Akhtar, 1995).

However, a range of studies on Hebrew derivational morphology shows that children succeed in coining semantically appropriate and grammatically well-formed novel items earlier, and better, on the basis of familiar input items than when they are required to manipulate nonsense forms. Even 4-year-olds had difficulty in alternating verb patterns to reflect changes in transitivity in a Hebrew version of Braine et al.'s (1990) study (Alroy, 1992), whereas they succeed in tasks based on the methodology used here from age 3 or even younger (Berman, 1995). Difficulty was also shown by children age 4 and older in Sokolov's (1988) comprehension study of causative alternations using nonsense verbs based on established nouns. And in two separate studies that required children to alternate verb-pattern transitivity with both known and novel words, results were significantly higher for familiar than for nonsense items, including at school age (Berman, 1993b; Zadonasky-Ehrlich, 1995). Nonsense words used in such studies lack an established semantics, and thus require prior training in the

<sup>4</sup> An asterisk marks novel items not in the established lexicon.

sound-meaning relation in order to be elicited. In contrast, the methodology used here provides "strong clues as to the intended semantics of the words" (Levy, 1987, p. 73).

Additionally, studies of inflectional morphology using nonsense words (e.g., Hecht, 1985; Levy, 1987) indicate that children do better with real words than with nonsense words as source input items. Karmiloff-Smith (1986) argues that this discrepancy is due to the vulnerability of newly acquired knowledge prior to speakers' eventual automated, procedural performance based on fully consolidated, mature representations. Ravid (1995b) offers a similar explanation in her study of a wide range of inflectional alternations in Hebrew.

In contrast to studies using nonsense items as input, experimental studies like those reported here and by Clark (chapter 4, this volume) typically require children to coin new words from familiar lexical items, for example, nouns from verbs as in (2-4) and verbs from nouns as in (2-5). The task of having subjects devise novel target forms from established source forms that are already in their lexical repertoire ensures both "that children are not relying on rote-learning, since they have to apply their knowledge of form-meaning relations in interpreting and producing novel words . . . and that new words have established semantic associations to motivate their coining of new words" (Berman & Clark, 1992, p. 8). This procedure is particularly suitable in the domain of derivational morphology because it impels children to apply rules to items that do exist in the established lexicon but that happen not to undergo the particular alternation at issue (e.g., from intransitive verb or statal adjective to causative verb, or from verb to noun and noun to verb).

### FROM KNOWN TO NEW: SPONTANEOUS INNOVATIONS

Data from such structured elicitations (see subsequent discussion of the Structured Elicitation Test) were supplemented by innovative noun and verb usages from the naturalistic speech output of Hebrew-speaking children from 18 months through early school age. These coinages form part of a collection of nearly 1,000 unconventional lexical usages recorded from the longitudinal speech samples from six children age 1;6 to 3;6 and from diary data and parental reports for another two dozen children. Such data reflect children's natural propensity for coining new terms to name entities or to refer to situations for which they lack a readily accessible conventional label.

The need to fill gaps in one's personal lexical repertoire is the basis for lexical innovation in general. This is what adult speakers (particularly but not only those with an official concern for language usage, such as journalists, language-policy makers, and translators) do when they encounter a notion for which they do not have a lexicalized label. Children innovate for this reason as well. For example, Varda, age 5;7, coins a novel verb when she says to her mother: *telamni li et ha-te* "lemon + FEM my tea for me = put lemon in my tea," denominated from the noun *limon* "a lemon"; and 4-year-old Ronen makes up a new noun when he calls his father a good *taknay* "fixer" from the P3 verb *le-taken* "to fix." Children also coin words for referents that do have conventional terms in the current lexicon but that may be either not known or not accessible to them at the time of speaking. The asterisked forms in (3) illustrate such lexically unconventional, but structurally well-formed, Hebrew items—nouns in (3-1 – 3-3) and verbs in (3-4 – 3-6).

### (3) Nouns and verbs coined in spontaneous speech output:

1. *ha-\*nixut azra li kše hayiti ayef.* < *la-núax* "to rest"  
The *rest(ing)* helped me when I was tired cf. established *menuxa* "rest(ing)"  
[Matan, boy, 3;1]
2. *eyfo ha-\*ma'ataf la-matana?* < *la'atof* "to wrap"  
Where's the *wrapper* for the present? cf. *nyar-atifa* "wrapping paper"  
[Nir, boy, 3;9]
3. *ani meta mi-\*tsemi'ut, ani roca lishtot.* < *tsame* "thirsty"  
I'm dying of *thirstiness*, I want to drink. cf. *tsima'on* "thirst"  
[Shelli, girl, 5;0]
4. *uf, ima, at \*maxnik-a [P5+ FEM] oti kaxa!* cf. *xonek-et* [P1 + FEM]  
Oh, Mom, you're *making-choke* me now! "choke," TRANSITIVE  
[Hagar, girl, 4;0]
5. *ima \*mashtiya oti im ha-mits.* < *shota* [P1 + FEM] "drink,"  
Mom *makes/gives-drink* me the juice. INTRANS cf. *mashka*  
[Eshel, boy, 4;4] "water + TRANSITIVE"
6. *\*tesharveli li et ha-xultsa.* < *sharvul* "(a) sleeve"  
*Sleeve* my shirt for me. cf. *tekapli* "fold, roll-up"  
[Asaf, boy, 3;7] + FEM, IMPER

These coinages show that Hebrew-speaking children as young as age 3 coin words both to fill genuine lexical gaps and to replace conventional

terms in the adult lexicon. They produce both novel nouns and verbs. And they construct these items in keeping with Hebrew-specific constraints on combining consonantal roots with appropriate affixal patterns for new-word formation. Therefore, why not rely exclusively on this rich naturalistic, communicatively motivated data base to examine children's ability to "go from known to new" in innovating novel verbs and nouns? The answer lies in the general usefulness of structured elicitation tasks in acquisition research, particularly in the lexicon. Carefully designed tests ensure representativeness across children, across structural and/or lexical categories, and across test items, where naturalistic data are sporadic, incidental, and nonexhaustive in coverage.

The present study attempts to overcome what Karmiloff-Smith (1979) termed "the experimental dilemma," by considering findings for novel verbs and nouns coined in both structured and open-ended settings. To this end, the naturalistic database was a starting point for deciding which words to select as test items by serving (a) to check which words are typical of young children's speech output, (b) to ascertain what form-meaning slots create the lexical gaps that children try to fill spontaneously, and (c) as a basis for comparison with findings for the lexical coinages produced in a structured test situation.

### THE STRUCTURED ELICITATION TEST

The two tests illustrated in (2-4) and (2-5) in the previous discussion were given to the same group of 60 children, 12 at each age group: preschoolers age 3 (range 3;0 – 3;10, mean age 3;5), 4 (range 4;0 – 4;11, mean age 4;4), and 5 years (range 5;0 – 6;0, mean age 5;6); and schoolchildren age 7 (mean 7;5) and 9 years (mean 9;6—Grades 2 and 4), compared with 12 adults (mean age 35 years) with males and females balanced in each group.

### Procedures

In the denominal task (which involved deriving a novel verb from a familiar place noun) subjects were told, for example, "I'm putting these beads in a box [in Hebrew, the loan-word *karton* "carton," *argaz* "crate," or *kufsa* "box"]; what am I doing to the beads?" A suitable response might be *mekarten*, *me'argez*, or *kofes / mekafes / makfis*, respectively;<sup>5</sup> to coin a new verb from a familiar instrument noun, children might be told,

"Here's a teddy bear who likes to use all kinds of things to do different jobs, he likes to use different instruments to do a lot of actions, what is he doing with the hammer [= *patish*?]" possible responses are *potesh*, *mefatesh*, or *maftish*, in three different verb patterns. Source items on the denominal test were in four semantic classes: place and instrument nouns as in these two examples, and also object nouns (e.g., "I'm giving this room a window [= *xalon*], a carpet [= *marvad*]; what am I doing to the room?") and adjectives (e.g., "This soup has no taste and no color; I want to help make it better to eat, I am going to make the soup sharp [= *xarif*,] or green [= *yarok*]; what am I doing to the soup?").

On the deverbal task, subjects were given familiar verbs in the three active, transitive *binyan* patterns, and they were required to derive novel target nouns and adjectives from them in four target semantic classes: place, instrument, and agent nouns; and resultative adjectives. For example, subjects were shown pictures of people in different states and performing different activities in unidentifiable places without any obvious instruments or means, and they were told to elicit place nouns, "What would you call a place that is used for buying, where people buy things [P1 infinitival *li-knot*, impersonal plural *konim*], for cooking, where people cook [P3 *le-vashel*, *mevashlim*]?"<sup>6</sup>; to elicit instrument nouns, "What would you call a thing, an instrument that is used for finding, that people find things with [P1 *li-mtso*, *mots'im*], for cleaning, that people clean with [P3 *le-nakot*, *menakim*]?"<sup>7</sup>; and for agent nouns, "What would you call a person whose job is to fix, who likes fixing things [P3 *le-taken*], or a person whose job is to boil, a person that works at boiling things [P5 *le-harti'ax*, *martixim*]?"<sup>6</sup>

All subjects were given both tests. Half were presented with the denominal test (to coin novel verbs) before the deverbal test (to coin novel nouns), and the other half were first given the deverbal task and then the denominal task.<sup>7</sup> Responses were elicited from preschool children through age 6 with the aid of props for the denominal test (beads that

<sup>5</sup> The input nouns *karton*, *argaz* contain more than the canonic three consonants (*k-r-t-n*, *?-r-g-z*), so they are most suited to verbs formed in the P3 *pi'el* activity pattern (chosen by all 12 adults on this test). The noun *kufsa* "can, box," in contrast, includes only three consonants (*k-f-s*), and so can be the basis for a verb in any of the three verb patterns illustrated here—not only P3 *mekafes* but also P1 *kofes* or P5 *makfis*.

<sup>6</sup> Verbs were always presented in the inflectionally marked forms of infinitives (with a prefixal *l-*) and impersonals (with a plural *-im* suffix) to avoid using the third person present tense or participial form of verbs as input, because these could serve as agent or instrument nouns (e.g., P3 *menake* "cleaner," P5 *martiax* "boiler").

<sup>7</sup> Preschoolers (age 3, 4, and 5) and in some cases 7-year-olds as well were given each test at a separate session, a day or two apart. Older subjects were given both tests at a single session.

were put in or on different places, a teddy bear wielding different instruments, a felt stick-on dollhouse for adding objects to) and using pictures for the deverbal test. For each semantic class of input item, subjects were given two sample coinages. On the denominal test, examples of novel verbs were given in the three *binyan* verb patterns used for activity verbs; on the deverbal task, examples of novel nouns were given in a range of noun patterns applicable to each class of item in the established lexicon.

## Results

To maximize comparability between the denominal and deverbal studies, results are presented for three of the four classes of input items in each test: verbs derived from instrument, object, and place nouns, and nouns derived from instrument, agent, and place nouns; Table 5.1 shows the breakdown of novel items produced by subjects when required to coin innovative verbs from familiar source nouns. These novel items were rated as "appropriate" when the form produced was in one of the three morphological patterns used for encoding activity verbs; "other" coinages were verbs in an intransitive pattern or with a morphologically indeterminate form; "ill-formed" responses either were not in any Hebrew verb pattern or violated phonological constraints on verb formation. The inverse of total coinages (not specified in the table) are "non-responses" of three kinds: no response, "don't know," or repetition of the input item.

Table 5.1 shows that by 4 years of age, children reach near ceiling (87%) in coining novel verbs in one of the five *binyan* verb patterns available for

TABLE 5.1  
Breakdown of Innovative Responses in Coining  
Verbs from 30 Familiar Nouns

Age	Appropriate	Other	Total Coinages	Ill Formed (%)
3 years	48	7	55	6
4 years	74	13	87	9
5 years	86	3	89	1
7 years	97	1	98	3
9 years	95	1	96	2
Adults	98	1	99	—

Note. N = 12 per age group.

constructing nonpassive verbs in their language. From 3 years of age, the vast bulk of these innovations were also semantically appropriate: They were formed in one of the three verb patterns for describing activities rather than change-of-state achievements. However, the 3-year-olds were able to perform this task appropriately only around half the time. That is, the youngest group had difficulty in coining novel verbs from familiar source nouns; although when they did so, it was overwhelmingly in accordance with the structural constraints dictated by the grammar of verb formation in their language. The proportion of ill-formed responses out of total innovations was very low, less than 5% overall, even among 3- and 4-year-olds, with a slight peak in amount of error at age 4. These errors typically violated morphophonological constraints within verb-pattern formation. There were very few instances of the non-Hebrew processes of zero derivation or of adding a prefix or suffix to the source noun (e.g., a verb prefix such as present-tense *me-* as in ill-formed \**mekise* from *kise* "chair" [Tal 7;0], cf. possible P3 *mekase*, or the infinitival prefix *le-* as in \**le'aron* from *aron* "closet" [Michal, 9;3], cf. possible P3 *le'aren*; or a nominal suffix to yield diminutive noun forms, impossible as verbs, e.g., *madaf-it* "shelfie" from *madaf* "shelf," *maxteron* "tiny needle" from *máxat* "needle" [Rotem, 4;4]). Overwhelmingly, when children produced novel verbs based on familiar source nouns, they constructed them in a form consistent with the morphological verb patterns stipulated by their grammar.

A different picture emerges for how the same subjects performed when asked to coin novel nouns from familiar verbs. Table 5.2 shows (a) the percentage of morphologically innovative noun forms given by each age

TABLE 5.2  
Breakdown of Innovative Responses in Coining Nouns  
from 30 Familiar Verbs

Age	Total Coinages	Ill formed (%)
3 years	83	19
4 years	88	32
5 years	87	18
7 years	89	17
9 years	86	4
Adults	98	2

Note. N = 12 per age group.

group, and (b) the proportion of these that were ill formed (i.e., they violated morpheme-structure rules constraining the form of possible nouns in Hebrew).

The findings in Table 5.2 strongly confirm the prediction that children will coin novel nouns very readily. Even the youngest group, the 3-year-olds, reached ceiling in amount of total coinages (83% compared with only 55% verb coinages from the same children). Yet they often violate structural constraints in doing so, an average 23% of all innovations from age 3 through 7 years. Responses revealed three main deviations from conventional noun-formation, which we defined as ill-formed: (a) forms that violate morphophonological constraints on the syllable structure of possible words in Hebrew (e.g., *ritiax* for a person whose job is to boil things — *le-hartiax* [Tom, 5;11]; *ramdedant* for an instrument used for putting people to sleep — *le-hardim* [Lior, 3;10]); (b) words that use verbal affixes with nounlike stems (e.g., the infinitival prefix *le-* in *le'acbon* for an instrument used for irritating people, from the verb *le-acben* [Omer, 3;10]; *le-hashkeket* for a place for watering from the verb *le-hashkot* [Amit, 3;9]); and (c) words that are structurally well formed as nouns but inappropriate for a given semantic class (e.g., the passive participle form *merutax* “(that has been) boiled” to name a person whose job is to boil things, *le-hartiax* [Tomer, 4;0], or the coinages *bishlut* [Naama, 5;2] and *mevashlan* [Yaniv, 5;5], both possible nouns in Hebrew but suited to naming an abstract state with the *-ut* suffix or an agent with *-an*, respectively, and both misapplied here to name a place where people perform the activity of *le-vashel* “cooking.”<sup>8</sup>

The fact that until as late as age 7 nearly one quarter of the novel output nouns produced in response to familiar input verbs were what we characterized as ill formed, and as many as one third of the innovative responses produced at age 4, suggests that children find it hard to coin novel nouns that meet the structural and semantic constraints on form-meaning relations in Hebrew nominal patterning. And it contrasts markedly with the performance of the same children in producing novel verbs, where from age 3 they only occasionally, and from age 5 almost never, violated constraints on semantically and structurally appropriate verb formation in their language.

<sup>8</sup> Several responses involved two or all three of these deviations. For example, for a place where people waste things or are busy wasting—*le-bazbez*—the response *lebazbezan* [Naama, 4;1] is an impossible word in Hebrew, because it combines the verbal prefix *le-* with the nominal suffix *-an*, the favored device for innovative agent and occasionally for instrument nouns, but not used to name places.

## VERB AND NOUN INNOVATIONS IN SPONTANEOUS SPEECH OUTPUT

Items characterized as noun or verb coinages were analyzed from our corpus of unconventional lexical usages recorded from Hebrew-speaking children (see previous section “From Known to New”). This yielded a total of some 500 innovative items, nearly 60% (285 out of 493) verbs and 40% nouns. This appears to contradict the findings for coinages in these two classes in the structured elicitation tests. On the tests, 3-year-olds coined far fewer verbs than nouns, whereas children across ages 3 to 7 years coined on average the same amount of verbs as nouns (82% versus 86%, respectively). Note, however, that many of the children’s spontaneous coinages were form-meaning pairings for which a conventional item is available in the established lexicon of Hebrew (e.g., *mashketa* for conventional *mamtera* “sprinkler,” cf. *le-hashkot* “to water”). If we compare the proportion of genuine gap-filling innovations, rather than forms coined as alternatives to items in the established lexicon, the proportion of innovative verbs versus nouns is quite consistent across the two types of data—the structured elicitation test and the spontaneous speech samples, respectively.

Extreme caution is necessary in making such comparisons for methodological reasons. In the structured elicitation tests, care was taken to ensure equal representation of specific morphological and semantic classes of input items so that the forms produced by subjects could unambiguously be related to a given source or input form. The rich but sporadic set of spontaneous innovations that constitute the naturalistic database, in contrast, could not guarantee a representative sampling of form-meaning matchings. No less important, there is no unequivocal way of deciding what the source item was for any given coinage, because in most cases this is not specified in the context in which a child happens to produce a given innovation. Besides, this type of sampling does not allow for reliable developmental claims because unlike the structured elicitation tests, there was no preselection of children by age group.

Such difficulties are inherent in attempting to seek parallels between spontaneous speech sampling and structured elicitation tests in new-word formation, as in other domains of acquisition. Yet naturalistic data like these provide a rich supplementary source of information on how young children relate to form-meaning matchings outside the conventional word-stock of their language. And some comparisons between the two types of



situations do suggest themselves. For example, one explanation for the relatively larger number of verb coinages in the spontaneous speech sample could be that most (67%) appeared to be related to other verbs rather than derived denominally (from established nouns), as was required by the test.

Examples of spontaneous coinages that were clearly denominal include: the P1 verb *la-tsun* "to put sheep into the fold" from the noun *tson* "sheep" [Itamar, 3;11], P3 *mexalel* "spacing, revolving" for a rocket moving in outer space = *xalal* [Asaf, 5;8], and P5 *mashligim* "sliding in the snow" from the noun *shéleg* "snow" [Nir, 4;1]. Apart from denominated forms like these, three main types of verb coinages occurred in the naturalistic sample: pattern switching, overmarking, and gap filling. (a) In pattern switching, children innovate by using a verb pattern different from the one used for that form-meaning slot in the established lexicon. For example, Ran, age 5;9, says *ha-tmunot* P2 *nexlafot* "the pictures change" of a board with pictures that switch when one turns a button (cf. conventional P4 *mitxalfot*), from causative P5 *maxlif* "to switch" + TRANSITIVE, root *x-l-f*; and in the opposite direction, Erez, age 5;6, tells his mother that he needs *le-hitrashem* [P2] = "to sign up for school" (cf. conventional P4 intransitive *le-herashem*), from P1 transitive *lirshom*, root *r-š-m*. (b) In overmarking, children explicitly mark verbs from the basic P1 pattern to indicate change-of-state unaccusativity with the P2 or P4 patterns if intransitive, and for causativity using the P3 and P5 pattern if transitive. For example, Keren, age 3;6, says she went swimming in deep water and yet *lo* P2 *nitbáti* "I did not be-drowned" in place of conventional *taváti* "I drowned"; and Ran, age 4;9, says that the sun *mamash* P5 *masrif oti* "really makes-burn-up me" in place of conventional P1 *soref*. (c) In gap filling, around 20% of the verb-based unconventional verbs coined by children fill genuine gaps in the established lexicon. For example, Hila, age 3;4, creates an onomatopoeic verb in P3 in the form *meyamem* for a cat that meows all the time; and Nir, age 4;3, coins a causative P5 verb to describe someone who makes the chair creak, *maxrik* (cf. conventional P1 *xorek*), as does Shelli, age 4;7, when complaining that her mother causes her to dive down, P5 *matslila*, in the bathtub (cf. conventional P1 *tsolel*).

These examples suggest that children find it natural to coin new verbs from familiar verbs by moving across and between the five verb patterns. As noted, they tend less to use familiar nouns as a basis for verb coining, the task required by the test. This accords well with the finding that the task of denominal verb formation appeared quite difficult for the 3-year-

olds (only 55% of their responses took the form of verb coinages). Besides, in the naturalistic sample, less than one third of the noun-based verb coinages were recorded from children age 2 to 4, in contrast to well over half the verb-related verb coinages. In general, then, in Hebrew, younger children might tend more naturally to coin verbs from inside the verb system by following the typically Semitic device of verb-pattern alternation or innovation, rather than by deriving them from nouns or adjectives.

In contrast to innovative verbs, the bulk of the noun coinages in the naturalistic sample fill genuine gaps. That is, they name objects or states that lack conventional labels, rather than replacing established lexical items. Spontaneously innovated nouns further contrast with verb innovations because they reveal considerable variety, in both content and form. Semantic innovations included instrument, agent, and place nouns, action nominals, and abstract states, illustrated in (4).

#### (4) Innovative nouns in spontaneous speech

1. *ani carix \*makneax.* < P3 *le-kaneax* "wipe (one's nose)"  
I need (a) wiper. [Ran, boy, 4;11] cf. *memxata* "handkerchief"
2. *aba, ani rotse et ha-\*maglexa selxa.* < P4 *le-hitgaleax* "shave (oneself)"  
Dad, I want your shaver. [Uri, boy, 3;6] cf. *mexonat-giluax* "shaving machine = razor = razor"
3. *hi mamash \*mats'anit, Miri.* < P1 *li-mtso* "to find"  
She's a real finder, Miri. [Hila, girl, 3;9] (speaking about her babysitter, who is good at finding things)
4. *aba sheli hu \*kavar shel ha-xayot shelanu.* < P1 *li-kvor* "to bury"  
My dad is the burier of our dead pets. cf. *kavar* "gravedigger"  
[Shelli, girl, 4;10]
5. *ze bet-sefer le-\*neginut.* < P3 *le-nagen* "to play  
It's a school for instrumenting. (musical instruments)"  
[Sivan, girl, 4;8] cf. *negina* "playing instruments, making music"
6. *at cerixa la-tet li kley-\*negiva.* < P3 *le-nagev* "to wipe"  
You have to give me objects of wipery. cf. *niguv* "(act of) wiping"  
[Ben, boy, 5;1]

The most favored noun coinages were objects, particularly instruments, one third of all noun coinages, as in (4-1, 4-2); about 20% were agent-nouns, as in (4-3, 4-4); and next most common were abstract action

or state nominals, as in (4-5,4-6). Children coined relatively few place nouns, although on the structured test they coined the same amount of place nouns as instrument and agent nouns.

Analysis of naturalistic coinages thus appears to offer partial support for the trends revealed by the structured elicitations, both in (a) overall proportion of verbs versus nouns that were innovated, and (b) subdivision of these items into semantic classes. In morphological structure, too, spontaneous innovations are on the whole consistent with those elicited by the tests. Verbs were without exception coined in one of the five verb patterns, and nearly all denominal coinages were in the P3 activity pattern, as they were on the test. Nouns, in contrast, were innovated in dozens of different forms, both on the test and in the spontaneous coinages, reflecting the much more open-ended range of possible noun structures in the target language. And in both the test and the spontaneous sample, most took the form of some possible root plus affixal noun-pattern combination (e.g., maCCeC(a) or miCCaCa for instruments and places; CaCaC, CoCCan, or CaCCan for agents; CiCuC, C6CeC, or CCIca, haCCaCa for abstract action or state nominals): over two thirds (69%) on the test and three quarters (75%) in the spontaneous sample. Far fewer coinages (31% and 25%, respectively) took the form of a stem plus suffix (e.g., *-it* for instruments, *-ay*, *-on* for agents, *-iya* for place nouns, or *-ut* for abstract nominals). Also, both samples yielded very few noun coinages in the present tense or participial *benoni* form, which is available for zero derivation of agent or instrument nouns from the corresponding verb form. Finally, both the test and the spontaneous speech sample contained relatively few items that were morphologically ill formed in the sense that they violated constraints on the form of a possible word in Hebrew. Naturalistic coinages included only an occasional ungrammatical verb and rather more ill-formed nouns: around 2% compared with 5% of verbs produced by 3- to 7-year-olds on the test, and around 9% compared with nearly 20% of the nouns they produced on the test.

Thus, despite the cautionary note that the two databases are not strictly comparable—in terms of representation of structural and semantic categories, communicative situation, and population selection—findings for noun and verb coinages among Hebrew-speaking children do reveal generally consistent patterns across the two contexts of naturalistic speech output and structured elicitation. Additionally, certain patterns that failed to emerge in the deliberately restricted structured elicitations could be detected in the spontaneous speech sample. For example, children appear to find it easier or more natural to coin verbs that relate to existing verbs in

the language rather than deriving them from nouns. And a larger proportion of children's innovations, both verbs and nouns, appear to fill temporary gaps, substituting for words in the established lexicon, rather than being "creative" new words that lack conventional labels in the target language.

## DISCUSSION

The wug technique was adopted for present purposes as highly appropriate for examining children's knowledge of rule-dependent versus rote-bound linguistic structure. In the area of derivational morphology, however, grammatical rule and lexical convention and accident interact in complex ways. Accordingly, it has proved useful to tap this aspect of linguistic knowledge by enabling children to go "from known to new," by requiring them to derive innovative terms from familiar lexical items. This procedure makes it possible to compare how the same children coin new verbs from old nouns as against how they coin new nouns from old verbs. Results of these structured elicitations also provide important support for findings about how and where children spontaneously coin innovative verbs and nouns when faced with the need to fill a genuine, often temporary gap in the course of their natural speech production.

To conclude, I consider implications of these analyses for children's command of word-formation constraints from the perspectives of language development and language typology, on the one hand, and of methodological principles in the study of language production, on the other.

In terms of developmental trends, the present study confirms earlier findings along two important lines (Berman, 1995). Command of derivational morphology typically follows, and is embedded in, mastery of basic clause structure, including such domains as word order, case marking, and inflectional marking of agreement (in the case of Hebrew—number, gender, and person) and tense/mood distinctions. I suggest that irrespective of their particular target language, children around age 2 to 3 years focus on morphology as it interacts with the grammar of clause structure more than in relation to the structure of the lexicon and vocabulary extension. Thus, structural overregularizations and other creative errors will initially be found mainly in the domain of grammatical inflection, and only subsequently in the area of lexical innovation.

Children appear to start working seriously on derivational morphology from age 3 up, busying themselves with analyzing word forms into their component roots, stems, and affixes in terms of lexical

form–meaning mappings, and in relation to categories such as causativity or inchoativity in the verb system, or of agent, instrument, and location in the noun system. Developmentally, age 4 emerges as a period of instability: 4-year-olds indulge in considerable experimentation with word-formation conventions, they reveal the highest degree of across-child and across-item variability, and they tend to also produce the most grammatically ill-formed coinages. These patterns provide evidence for the superficially U-shaped developmental curve that I have argued for in different domains of language acquisition (Berman, 1986, 1987, 1990). In the area under discussion, 2-year-olds by and large do not yet analyze the internal, derivational structure of words; 3-year-olds begin making creative errors; 4-year-olds are the most productive but the least constrained by conventionality in the sense of the form–meaning relations specified in the established lexicon (Clark, 1993); and from age 5, children show an almost adult command of lexical structure and are increasingly bound by lexical convention.

This yields certain predictions about the nature of vocabulary development during and beyond the preschool years. Children early on gain command of the grammatically determined structural constraints on possible word structure in their language; and the stronger the constraints (as in the Hebrew verb system), the earlier will they be mastered. Appropriate form–meaning mappings take longer to develop, so that lexical semantics in this sense follows rather than precedes grammar. When the conventional lexicon starts expanding with school-age developments and the impact of increased literacy, children's creativity takes a dip. Only much later, with the consolidation of metalinguistic skills, do word coinages reveal an upsurge among some although not all speaker-writers, in a conscious attempt to meet genuine lexical gaps in such specialized areas as linguistic humor, advertising, scholarly terminology, and innovative media usage.

These developmental generalizations are constrained by target-language typology and are manifested in ways and at times relative to the particular form–function mappings between the morphological structure of words and the syntactic, semantic, and lexical categories that they encode in different types of languages. The findings of this study reaffirm a view of acquisition that has emerged from cross-linguistic studies in various domains. Work on children's encoding of spatial distinctions comparing languages such as English and Dutch with Korean or Tzeltal (Bowerman, 1996), on children's narrative development in five different languages (Berman & Slobin, 1994), and on compound formation and

noun and verb coinages in English compared with Hebrew (Berman & Clark, 1993; Clark & Berman, 1984, 1987) converges to suggest that children from a very young age are attuned to the language–particular way of encoding form-meaning relations in their language. Exactly, when this type of sensitivity finds expression depends on general developmental processes, so that the spatial distinctions noted by Bowerman tend to precede command of derivational marking of linguistic subcategories, and these in turn emerge earlier than rhetorical mastery of form–function relations in extended narrative.

Of all linguistic domains, morphology is the area where cross-linguistic variation is most marked. A reasonable hypothesis might be that universally, in order to coin new words, children initially favor morphologically simple processes such as syntactic conversion (zero derivation) and/or choose the semantically transparent path of adding external affixes to an existing word. Work with Clark has shown that comparing acquisition of derivational morphology in English and Hebrew is particularly fruitful, because the two languages are so different in this respect. Thus, as shown by Clark's (1993) naturalistic data, in English even 2-year-olds rely widely on the linear device of affixing to a stem with suffixes such as *-y* for innovating denominal adjectives, and with *-er* for coining agent and instrument nouns from familiar verbs. Moreover, in deriving verbs from nouns, English-speaking children can and do rely on zero derivation. In contrast, Hebrew-speaking children from the start coin all verbs and most nouns like adult speakers of their language, by combining familiar consonantal roots with a given set of affixal patterns. They avoid syntactic conversion, and they use root plus affix formations exclusively for verbs and very widely for nouns. This suggests that a-priori notions of what might be easier or more complex for children must be evaluated in terms of the particular target language to which they are exposed. Each language early on provides children with particular expectations as to the possible, structurally constrained form of words and the preferred, usage-bound form–meaning associations in its current lexicon.

The results of this study suggest that typological factors also play a critical role in how children treat verbs versus nouns in acquisition. As Maratsos (1991) concludes from his cross-linguistically motivated comparison of the acquisition of nouns versus verbs, "we should not expect children's evolution of formal categories to be uniform" (p. 82). On the one hand, Hebrew-speaking children are similar to speakers of any language in that universally they recognize that (a) verbs mark activities, events, and states, and (b) nouns can be coined to name objects, people,

places, and abstract situations. And they are like other children in that once they are able to analyze word structure they show an ability for lexical coinage, forming "new words from old" in their language. On the other hand, Hebrew-speaking children, in both structured elicitations and naturalistic speech, restrict the verbs they coin to a small set of root plus affix based patterns, whereas they coin nouns in a wide and heterogeneous range of forms, not all of which conform to the structural constraints on possible word formation in their language. This difference between how they innovate verbs compared with nouns makes them more similar to adult speakers of their own language than to children acquiring a language such as English.

The data reported here point to an area in which further analysis might help to characterize patterns of lexical innovation in adult as well as children's usage, in Hebrew compared with other languages. The sample of spontaneous coinages used here indicates that Hebrew-speaking children derive verbs by relating them to one another, rather than by denominating them from the nouns in their vocabulary. But they prefer to produce nouns from verbs and adjectives to name objects and states that lack established labels. It is not immediately obvious whether in this they are observing preferences for new-word formation in contemporary Hebrew usage in general. The question might be partially resolved by dictionary searches to ascertain the distribution patterns of relatively recent innovations in the current Hebrew lexicon. But such survey data would need to be refined by structured elicitations comparing (a) how children and adult speakers of typologically distinct languages derive new verbs both from other, established verbs and from nouns, with (b) how they coin novel nouns from established terms in each of the two major classes of the lexicon.

As a final note on methodology, in order to avoid both under- or over-estimation of children's knowledge and abilities, research should ideally follow the advice I give my graduate students. Start with the richest naturalistic data available as a basis for hypothesis making. Next, design carefully constructed experiments to test your predictions. Afterwards, if possible, go back to check the applicability of your findings in a range of communicative contexts—interactional conversation, elicited narratives, and even, in the case of older children, monologic expository texts. In a domain like the lexicon, where conventionality and representativeness are particularly relevant, it might even be worth checking distributions of form-meaning mappings in established dictionaries and existent corpora of child and adult language usage.

## REFERENCES

- Aloy, O. (1992). Morphological marking of causativity by Hebrew-speaking children and adults. Unpublished Master's thesis (in Hebrew), Tel Aviv University.
- Anderson, S. (1985). Inflectional morphology. In T. Shopen (Ed.), *Language, typology, and syntactic description: Vol. 2* (pp. 150–201). Cambridge: Cambridge University Press.
- Berman, R. A. (1986). A step-by-step model of language learning. In I. Levin, ed. *Stage and structure: Re-opening the debate* (pp. 191–219). Norwood, NJ: Ablex.
- Berman, R. A. (1987). A developmental route: Form and use of complex nominals. *Linguistics*, 27, 547–568.
- 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* (pp. 45–72). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Berman, R. A. (1989, October). *Children's knowledge of verb structure: Insights from Hebrew*. Paper presented at the Boston University Conference on Child Language Development.
- Berman, R. A. (1990). Acquiring an (S)V O language: Subjectless sentences in children's Hebrew. *Linguistics*, 28, 1135–1166.
- Berman, R. A. (1993a). Developmental perspectives on transitivity: A confluence of cues. In Y. Levy (Ed.) *Other children, other languages: Issues in the theory of language acquisition* (pp. 189–241). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Berman, R. A. (1993b). Marking of verb transitivity by Hebrew-speaking children. *Journal of Child Language*, 20, 641–669.
- Berman, R. A. (1994). Formal, lexical, and semantic factors in acquisition of Hebrew resultative participles. In S. Gahl, A. Dolbey, & C. Johnson (eds.), *Berkeley Linguistic Society*, 20, 82–92.
- Berman, R. A. (1995). Word-formation as evidence. In D. McLaughlin & S. McEwan (Eds.), *Proceedings of the 19th Annual Boston University Conference on Language Development: Vol. 1* (pp. 82–95). Somerville, MA: Cascadilla Press.
- Berman, R. A., & Clark, E. V. (1992). Lexical productivity in children and adults. *Final Report*. Jerusalem: Binational Science Foundation (BSF).
- Berman, R. A., & Clark, E. V. (1993, July). *What children know about coining verbs in English and Hebrew*. Paper presented at the 6th International Congress for Study of Child Language, Trieste.
- Berman, R. A., & Slobin, D. I., (1994). *Relating events in narrative: A crosslinguistic developmental study*. Hillsdale, NJ: Lawrence Erlbaum Associates.
- Bloom, L., Tinker, E., & Margulis, C. (1993). The words children learn: Evidence against a noun bias in early vocabularies. *Cognitive Development*, 8, 431–450.
- Bowerman, M. (1996). Learning how to structure space for language: A crosslinguistic perspective. In P. Bloom, M. Peterson, L. Nadel, & M. Garrett (Eds.), *Language and space*. Cambridge, MA: MIT Press.
- Braine, M. D. S. (1987). What is learned in acquiring word classes: A step towards an acquisition theory. In B. MacWhinney (ed.), *Mechanisms of language acquisition* (pp. 65–88). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Braine, M. D. S., Brody, R. E., Fisch, M. S., & Weisberger, M. J. (1990). Can children use a verb without exposure to its argument structure? *Journal of Child Language*, 17, 313–342.
- Chomsky, N. (1965). *Aspects of the theory of syntax*. Cambridge, MA: MIT Press.
- Clark, E. V. (1993). *The lexicon in acquisition*. Cambridge: Cambridge University Press.
- Clark, E. V., & Berman, R. A. (1984). Structure and use in the acquisition of word-formation. *Language*, 60, 542–590.
- Clark, E. V., & Berman, R. A. (1987). Types of linguistic knowledge: Interpreting and producing compound nouns. *Journal of Child Language*, 14, 547–568.
- Clark, E. V., & Hecht, B. (1981). Learning to coin agent and instrument nouns. *Cognition*, 12, 1–24.
- Gentner, D. (1982). Why nouns are learned before verbs: Linguistic relativity versus natural partitioning. In S. Kuczaj (ed.), *Language development: Vol. 2* (pp. 301–334). Hillsdale, NJ: Lawrence Erlbaum Associates.

- Goldfield, B. (1993). Noun bias in maternal speech to one-year-olds. *Journal of Child Language*, 20, 85–99.
- Gopnik, A., & Choi, S. (1995). Names, relational words, and cognitive development in English and Korean: Nouns are not always learned before verbs. In M. Tomasello & W. E. Merriman (Eds.), *Beyond names for things: Young children's acquisition of verbs* (pp. 63–80). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Hecht, B. F. (1985). Situations and language: Children's use of plural allomorphs in familiar and unfamiliar settings. Unpublished doctoral dissertation, Stanford University.
- Hopper, P. J., & Thompson, S. A. (1984). The discourse basis for lexical categorization in universal grammar. *Language*, 60, 703–752.
- Hopper, P. J., & Thompson, S. A., 1985. The iconicity of the universal categories "noun" and "verb." In J. Haiman (Ed.), *Iconicity in syntax* (pp. 151–186). Amsterdam: John Benjamins.
- Karmiloff-Smith, A. (1979). *A functional approach to child language*. Cambridge: Cambridge University Press.
- Karmiloff-Smith, A. (1986). Stage/structure versus phase/process in modelling linguistic and cognitive development. In I. Levin (Ed.), *Stage and structure: Re-opening the debate* (pp. 164–190). Ablex.
- Keenan, E. L. (1975). Logical expressive power and syntactic variation in natural language. In E. L. Keenan (ed.), *Formal semantics of natural languages* (pp. 406–421). Cambridge: Cambridge University Press.
- Langacker, R. (1987). Nouns and verbs. *Language*, 63, 53–94.
- Levy, Y. (1987). The wug technique revisited. *Cognitive Development*, 2, 71–87.
- Maratsos, M. (1988). The acquisition of formal word classes. In Y. Levy, I. M. Schlesinger, & M. D. Braine (Eds.), *Categories and processes in language acquisition* (pp. 31–44). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Maratsos, M. (1991). How the acquisition of nouns may be different from that of verbs. In N. A., Krasnegor, D. M. Rumbaugh, R. L. Schiefelbusch, & M. Studdert-Kennedy (Eds.), *Biological and behavioral determinants of language development* (pp. 67–89). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Maratsos, M., Gudeman, R., Gerard-Ngo, P., & DeHart, G. (1987). A study in novel word learning: the productivity of the causative. In B. MacWhinney (Ed.), *Mechanisms of language acquisition* (pp. 89–114). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Pinker, S. (1984). *Language learnability and language development*. Cambridge, MA: Harvard University Press.
- Pinker, S., Lebeaux, D. S., & Frost, L. A. (1987). Productivity and constraints in the acquisition of the passive. *Cognition*, 26, 195–267.
- Ravid, D. (1995a). The acquisition of morphological junctions in Modern Hebrew: The interface of rule and rote. In H. Pishwa & K. Maroldt (Eds.), *The development of morphological systematicity* (pp. 55–77). Tübingen: Gunter Narr Verlag.
- Ravid, D. (1995b). *Language change in child and adult Hebrew: A psycholinguistic perspective*. New York: Oxford University Press.
- Slobin, D. I., & Kuntay, A. (1995). Nouns and verbs in Turkish child-directed speech. In D. MacLaughlin & S. McEwen (Eds.), *Proceedings of the 19th Annual Boston University Conference on Language Development: Vol. 1* (pp. 323–334). Somerville, MA: Cascadilla Press.
- Sokolov, J. (1988). Cue validity in Hebrew sentence comprehension. *Journal of Child Language*, 15, 129–156.
- Tardif, T. (1996). Nouns are not always learned before verbs, but why? Evidence from Mandarin speakers' early vocabulary. *Developmental Psychology*, 32, 492–504.
- Tardif, T., Shatz, M., & Naigles, L. (1997). Caregiver speech and children's use of nouns versus verbs: A comparison of English, Italian, and Mandarin. *Journal of Child Language*, 24, 535–66.

- Tomasello, M., & Akhtar, N. (1995). Two-year-olds use pragmatic cues to differentiate reference to objects and actions. *Cognitive Development*, 201–224.
- Tomasello, M., Akhtar, N., Dobson, K., & Rekau, L. (1997). Differential productivity in young children's use of nouns and verbs. *Journal of Child Language*, 24, 373–388.
- Tomasello, M., & Farrar, M. J., (1986). Joint attention in early language. *Child Development*, 57, 1454–1463.
- Zadonasky-Ehrlich, S. (1995). "Bootstrapping" morfologi birxishat ha'ivrit kisfat em [Morphological bootstrapping in acquisition of Hebrew as a first language]. Unpublished master's thesis, Tel Aviv University.