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Part I

Learning Words

Personal Tribute

DEDRE GENTNER

When I think back to my first meetings with Melissa, two events fuse together into one brilliantly evocative memory. One was Melissa's talk "Learning the Structure of Causative Verbs" at the 1974 Stanford Child Language Research Forum. This talk was intensely exciting to me. I was working on verb semantics also, and this work was so rich that I had dozens of questions and speculations, all of which I wanted to try out on Melissa that very night. Not long after, Melissa visited the University of Washington (where I was an assistant professor), and Phil Dale, my generous senior colleague, invited me to his house to meet her. I appeared at his door bearing a huge stack of papers and books. (I was obviously none too swift at catching on to the appropriate behavior for assistant professors, but luckily Phil was an unusually kind and supportive senior colleague.) Melissa, not one to hold back, dived right in, and soon we had covered Phil's living room floor with notes and diagrams, while Phil benignly looked on. It was then that we took up the great question of "Factorialization: Creeping or Sweeping?"—our code name for whether semantic reorganization occurs in tiny local increments or instead in one moment of grand insight. Needless to say, this question needed a lot of refining, and over the years we kept working away at it.

We continued to meet in various ways—one vivid memory is of my practicing Melissa's talk as we hurtled through the dark toward Stanford, where she was supposed to give a talk that she feared she would be too hoarse to deliver. Although we repeatedly squandered her precious remaining voice on digressions and moments of hilarity, in the end she somehow managed to give the talk herself, to great effect. In 1984, after Melissa had joined the Max Planck Institute, I visited her for a longer stay with the goal of planning joint research. We talked about dozens of possibilities and finally settled on comparing the systems of spatial prepositions in Dutch and English, something Melissa had already begun to work on.

Over the next few years we designed and ran an elicitation study with 50 Dutch children and 50 American children, ranging from 2 to 5 years of age. We focused

on the acquisition of terms for support (lexicalized as *on* in English, and as three narrower categories—*op, aan, om,* in Dutch). Our results were very strong and clear, although not quite what either of us had predicted. These puzzling results fortuitously provided us with the need to meet each year to analyze and reanalyze the data and work on how to write about it, and to polish our small but serviceable repertoire of duets for voice and flute. (Now that we've actually written a version, I can only hope we quickly develop another long-term project!) Our meetings were often at the Max Planck Institute in Nijmegen, where Melissa was always the center of a dozen fascinating research interactions. Other times we met in various spots around the globe (the oddest of which perhaps was a former utopian settlement called New Harmony). Here the main distraction from finishing the paper was the fascinating discussions we had on everything from how children connect language to the world (the topic of this chapter) to mental models of contagion to a theory of humor—never forgetting the great question of semantic reorganization during language learning, which had now metamorphosed from "creeping or sweeping" into a set of more specific processing questions.

Of the many things I am grateful for in my career, my friendship and colleagueship with Melissa rank in the very top set. It's a great gift to have a friend who is not only a deep, incisive thinker with comprehensive knowledge of her field, but who also possesses a wonderfully original turn of mind and a lively intellectual curiosity about everything under the sun.

Melissa's ground-breaking work on crosslinguistic semantic differences and their implications for language learning have had a profound impact on theories of cognitive and linguistic development. As her friend I've been lucky enough to experience her insights first-hand, and in the most delightful way. I'm honored to be part of this Festschrift volume.

1

Early Acquisition of Nouns and Verbs
Evidence from Navajo

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Which words do children learn earliest, and why? These questions bear on the developmental origin of language and its connection to thought. The striking dominance of nouns in early English vocabularies has led researchers to ask whether there is something special about the link between nouns and concrete objects (e.g., Gleitman, Cassidy, Papafragou, Nappa, & Trueswell, 2005; Kako, 2004; Macnamara, 1972). Gentner (1982) proposed a conceptual explanation for this early noun dominance: The mapping between words and experience is easier for nouns because of the greater perceptual learnability of their referents in children's early experience.

Gentner proposed two interrelated hypotheses concerning learnability: the *natural partitions hypothesis* and the *relational relativity hypothesis*. The *natural partitions hypothesis* states that concrete objects and entities are easier to individuate in the world (and therefore easier to label) than are the relational constellations that form the referents of verbs or prepositions (Gentner, 1981, 1982; Gentner & Boroditsky, 2001). This is in part a specific case of a general pattern referred to as the *relational shift* in cognitive development (Gentner, 1988; Halford, 1992). Relations require the presence of the entities they link; thus it appears that entities are psychologically represented before the relations between them. For example, young children given a similarity task often respond according to object similarity, even when they are given repeated feedback that the correct response should be based on relational similarity. In contrast, older children can readily focus on

relational similarity (Gentner & Rattermann, 1991; Rattermann & Gentner, 1998). Further, there is evidence that in adult encoding of scenes, object attributes are encoded before the relations between them (Sloutsky & Yarlas, in preparation). The early object advantage in part reflects this priority of entities over the relations between them. But another contributor to the object advantage is relational relativity.

The *relational relativity hypothesis* states that verb meanings are more variably composed across languages than are noun meanings—that is, relational terms such as verbs and prepositions vary crosslinguistically in their meanings to a greater degree than do concrete nouns. Because objects are readily individuated in the world, the denotations of concrete nouns can be derived by linking a word with an existing concept. But the meanings of verbs and prepositions (even in concrete perceptual arenas) are not "out there" in the same sense. This means that children cannot learn verbs from the word-to-world mapping alone; they must discover how their particular language chooses to combine the elements of experience into verb meanings.

A related approach has been taken by Markman (1989) and Waxman (1990), who have argued for early constraints or linkages relating nouns to objects and categories. For example, Markman's whole-object constraint refers to a child's tendency to assume that a novel word applied to an object refers to the whole object, rather than some part or characteristic of the object. This is clearly related to the natural partitions hypothesis, except that under that hypothesis, not all objects are equally likely to be taken as wholes. As discussed later, some entities are more readily individuated than others. Another related proposal is Markman's taxonomic constraint, which refers to a child's willingness to extend a novel label for an object to other objects of the same kind (and not, for example, to those that are thematically linked). Likewise, Waxman (1990) proposes an early noun-category linkage that forms the basis for further more differentiated language learning. Like the natural partitions hypothesis, these early linkages or constraints would predict an initial advantage for nouns that name concrete objects and entities. However there are some differences between these positions. The taxonomic constraint and the noun-object linkage both propose an innate or very early linkage between words and *categories.* The natural partitions hypothesis concerns the relation between a word and a referent; there is no theoretical commitment to the early existence of categories. We suggest that early categories arise out of the process of word extension, rather than determining the set of extensions.

The position of noun dominance in children's early word learning has amassed considerable empirical support. In English, nouns predominate in early production (Gentner, 1982; Huttenlocher, 1974; Nelson, 1973) and in comprehension (Goldin-Meadow, Seligman, & Gelman, 1976). The use of a novel word directs children's attention toward object meanings (Markman, 1989; Markman & Hutchinson, 1984; Waxman, 1990) even as early as 13 months of age (Waxman & Markow, 1995). Further, Gentner (1982) produced evidence that the noun advantage holds across several languages, and here too there is supporting evidence (Au, Dapretto, & Song, 1994; Bates, Bretherton & Snyder, 1988; Bornstein et al., 2004; Caselli et al., 1995; Dromi, 1987; Kim, McGregor & Thompson, 2000; Ogura, Dale, Yamashita, Murase, & Mahieu, 2006).

Yet despite this support, the universality of a noun bias in early vocabularies has received a good share of controversy. On theoretical grounds, Nelson (1973) and Gopnik and Meltzoff (1993) have argued that children's well-attested interest in dynamic changes, motion, and causality should lead them to name the kinds of concepts that are usually conveyed by verbs. Furthermore, some researchers have argued that the noun advantage in English results from features of the linguistic input that make nouns salient to children, rather than from semantic-conceptual regularities (Gopnik & Choi, 1995; Tardif, 1996).

Gentner (1982) had considered this possibility and noted that there are at least four nonsemantic features of English that could account for the noun advantage in early vocabulary. These include word frequency, word order, morphological transparency, and patterns of language teaching. She argued that the frequency possibility—that nouns are learned before verbs because they are more frequent in English input—is unlikely, because nouns represent only 6% of the most frequent words used in the English language, as compared to verbs at 20%. More convincingly, an advantage for nouns over verbs has been found for learning new words in studies that controlled frequency and position in sentence (Childers & Tomasello, 2002; Schwartz & Leonard, 1980) as well as phonology (Camarata & Leonard, 1986). Gentner also considered morphological transparency—that is, how easily a root can be perceived within the surrounding word. In English (as in many languages) verbs can take a greater variety of affixes and inflections than nouns; hence the sound–meaning relation may be more difficult to perceive for verbs, resulting in a disadvantage in acquisition. To test whether the early noun advantage results from greater morphological transparency, she considered Mandarin Chinese, in which verbs and nouns have equivalent morphological transparency (Mandarin having virtually no inflections). Data collected by Erbaugh show a strong advantage for nouns in early Mandarin (Erbaugh, 1992); this suggested that differential morphological transparency cannot be the whole explanation for the noun advantage. Indeed, as discussed below, Imai, Haryu, Okada, Li, & Shigematsu (2006) suggest that Mandarin's lack of morphological difference between nouns and verbs may actually make verbs harder to learn. The third factor considered by Gentner was patterns of teaching—the possibility that American parents lead their children to focus on object names by our practice of labeling objects for children. However, even in Kaluli, in which cultural practice does not emphasize the teaching of object names (Schieffelin, 1985), children still showed twice as many nominals as predicates in their early vocabularies.

The fourth factor considered was word order. As Slobin (1973) has pointed out, words in utterance-final position are highly salient to children and especially likely to be learned. Thus the early noun advantage in English might be a result of its SVO word order. Gentner attempted to rule out this possibility by considering languages such as Japanese, Turkish, Kaluli, and German, in which verbs tend to appear in final positions. Since the early noun advantage persisted even in these languages, the conclusion was that word order cannot be the sole cause of the early noun dominance in English. Thus, Gentner concluded that although word order and other input factors have important effects on children's learning, they do not by themselves account for early noun dominance. Semantic and conceptual factors must be part of the explanation.

These conclusions, however, must be regarded as provisional. The crosslinguistic data were provided by different researchers, most of whose projects were not specifically directed at early vocabulary acquisition. Further, these data were collected prior to the introduction of the MacArthur checklist. The methods varied considerably across studies, and included taped sessions, ongoing journals, and retrospective reports.

Fortunately, the paucity of crucial data in this arena has not gone unaddressed. The past decade has seen direct investigations of patterns of vocabulary growth in languages of varied typology (e.g., Au et al., 1994; Choi & Gopnik, 1995; Gopnik & Choi, 1995; Pae, 1993; Tardif, 1996). Researchers have sought out "verb friendly" languages such as Mandarin and Korean—languages whose input features should act to promote verb learning. Gentner and Boroditsky (2001) reviewed this work and concluded that the best available data bear out the hypothesis: Nouns predominate in early vocabularies in Chinese and Korean as well as in Indo-European languages (see also Bornstein et al., 2004). But even if this conclusion holds up, it still rests on a relatively small sample of the world's languages. To determine whether early noun dominance is a universal pattern, we need a broader sample of languages. In this chapter we investigate early word learning in Navajo, a language that is typologically different from those studied to date. We begin with a brief reprise of the theoretical claims, whose inception owed much to the work of Melissa Bowerman.

THEORY

Gentner's (1981, 1982, 2006) hypothesis concerns the mapping from language to the world. It has two parts: natural partitions and relational relativity. The first has been widely noted, but the second has often been overlooked; yet it is, to our thinking, the more interesting of the two claims. The natural partitions hypothesis is that

> …there are in the experiential flow certain highly cohesive collections of percepts that are universally conceptualized as objects, and that these tend to be lexicalized as nouns across languages. Children learning language have already isolated these cohesive packages—the concrete objects and individuals—from their surroundings. Because the language they are learning will have selected the same set of concrete objects as its nominal referents, children need only match preconceived objects with co-occurring words. (Gentner, 1982, p. 324)

The relational relativity hypothesis is the other essential element of this position:

> In a given perceptual scene, different languages tend to agree in the way in which they conflate perceptual information into concrete objects, which are then lexicalized as nouns. There is more variation in the way in which languages conflate relational components into the meanings of verbs and other predicates…. Loosely speaking, noun meanings are given to us by the world; verb meanings are more free to vary across languages. (Gentner, 1981, p. 169)

To motivate the relational relativity hypothesis, consider that the child's task during word learning is to discover the mapping between words in the stream of speech and their referents in the stream of experience. The idea that this might be especially difficult for relational terms was inspired in large part by Melissa Bowerman's (1974, 1976, 1982) seminal research on children's learning of verbs and other relational terms. She found that children make semantic errors with verbs and other relational terms—even quite late in language learning, and often after a period of correct but rather conservative usage. Some of these errors involve creating causative usages, such as "But I can't eat her!" (meaning "I can't make her eat") and "Don't dead him" (as mother picks up a spider). Others seem to draw on a space–time analogy that the child has generalized beyond its adult borders, as in "Can I have some candy behind dinner?" Such errors drive home the challenges children face in fully mastering the semantic systems governing verbs in their language.

Another motivation for this idea was the work of Talmy (1975), which showed that the meanings of verbs and other relational terms differ markedly across languages (see also Bowerman, 1985; Clark, 1993; Maratsos & Chalkley, 1980; Slobin, 1996). Talmy showed that languages differ in which semantic elements are incorporated into motion verbs: the path of the moving figure (as in Spanish), the manner of its motion (as in English), or the shape of the moving figure (as in Atsugewi). Further research has shown many more examples of crosslinguistic variability in the semantics of relational terms. For example, differences from English have been found in the spatial semantics of Mayan languages such as Tzeltal (e.g., Bohnemeyer, 1997; Brown, 1994, 1998; de Leon, 2001; Levinson, 1996) and Cora (Casad & Langacker, 1985) and in verbs of support and containment in Korean (Bowerman & Choi, 2003; Choi & Bowerman, 1991).

Talmy did not himself claim that verbs are more variable in their semantics than nouns. But his findings for verbs offered a path toward understanding why children learn nouns before verbs. If verb meanings are linguistically shaped, then learning how verbs refer is embedded in language learning. In contrast, if at least some noun meanings are "given by the world," then these nouns can be learned before the infant has penetrated the semantics of her language. This means that to bind a relational term to its referent the child must not only pick out the word but must also discover which particular set of the available conceptual elements is included in verb meaning in his or her language. In contrast, for entities that can be individuated prelinguistically, the mapping of word to world reduces to the task of matching the linguistic label to a preexisting concept.

The chief prediction of the NP/RR hypothesis is that there will be a predominance of names for objects and individuals over names for relations in very early vocabularies. A second prediction follows from the conjecture that "Object-reference mappings may provide natural entry points into language—an initial set of fixed hooks with which children can bootstrap themselves into a position to learn the less transparent aspects of language" (Gentner, 1982, p. 329). This suggests that as vocabulary size increases, there should be an increase in the proportion of relational terms.

A third prediction applies *within* the noun class, rather than between form classes. If conceptual individuability is what drives the noun advantage, there should be differential acquisition *within* the noun class, as well as between nouns and verbs. Names for entities that are easily individuated should be acquired before names for entities that are not. How might we decide which these should be? Gentner and Boroditsky (2001) suggested three sources of insight into individuability: (1) Gestalt principles of good objecthood; (2) findings from infancy as to which kinds of objects are individuated early; and (3) crosslinguistic regularities as to which kinds of entities tend to be treated as individuals for grammatical purposes. Gestalt perceptual principles include *common fate*—a propensity for the parts to move together—and *coherence*—the perceived organization of parts into a whole. Animate beings are likely to be high in both of these. Research on prelinguistic infants suggests that they expect continued "objecthood" when they perceive a stable perceptual structure moving against a background (common fate), and later come to use perceptual well-formedness or coherence as a predictor of continued stability (Baillargeon, 1987; Spelke, 1990). Taken together, these suggest that animate beings might be especially easy to individuate. The third line of evidence as to what is naturally individuated, though indirect, is intriguingly consistent with the above patterns. Linguistic analyses of grammatical patterns across languages suggest a continuum of individuation in which animate beings (especially humans) are the most likely entities to be grammatically individuated (i.e., countable and pluralizable) across languages, with concrete objects and substances (in that order) less likely to be individuated (Croft, 1990; Lucy, 1992; see Imai & Gentner, 1997).

This line of reasoning implies that within the noun class, the proportion of terms for animates should be especially large early on. Of course, this prediction is not unique to the NP/RR account. Names for people and other living beings might be learned early in part because of their social–emotive salience (e.g., Nelson, 1973). A predominance of names for animate beings—including names for individuals—would therefore be consistent with the NP/RR account, but not uniquely so.

We can distill the above predictions as follows: (1) Names for objects and entities should predominate over verbs in early vocabulary; (2) as vocabulary increases, the proportion of verbs should increase; (3) among nominals, names for animate entities, including proper names, should be strongly represented in early vocabulary.

NAVAJO

In this chapter we consider the acquisition of Navajo. The Navajo language is of interest because it represents a language type about which little is known with respect to vocabulary acquisition. Navajo is a member of the Athapaskan language group, along with Apache, Chipewyan, Tlingit, and others. Athapaskan is a widespread family, extending from northwestern Canada and Alaska south to northern Mexico. Unlike many Amerindian languages, Navajo is still a healthy language being acquired naturally by children. Further, Navajo has several properties that may favor verbs in early acquisition, as discussed below.

In Navajo, as in other Athapaskan languages, verbs are heavily inflected. Each verb has 14 to 16 prefix positions, each reserved for a class of morphemes, though positions need not necessarily be filled. The full description of these prefix positions is beyond the scope of this chapter (see Young & Morgan, 1987, for details). Verb prefixes represent subject and object (direct and indirect), subaspect and mode (functionally similar to tense in English), and a variety of adverbial and thematic concepts. A full range of sentential variation can be expressed by deleting, adding, or substituting prefixes as exemplified below. Verbs can also be suffixed by clause subordinators, nominalizers, framing elements, or any of a small number of adverbial enclitics. Examples are:

(1) a. bitsuarharshfararh
  b. Third person object + 'away from, separating from P' + 'one after another' + first person singular subject + transitive, caused + 'gather, collect object'
  c. 'I pick them out of it one after another' (e.g., burrs from a fleece). (Lit: I collect them away from it one after another)

(2) a. arzaashtuap
  b. 'own' + 'mouth' + first person singular subject + transitive, caused + perfective, 'handle solid roundish object'
  c. 'I put it (a solid roundish object, e.g., a piece of candy) into my mouth.'

(3) a. bizaashjoof
  b. Third person possessor + 'mouth' + first person singular subject + transitive, caused + imperfective, 'handle noncompact matter'
  c. 'I am putting it (noncompact matter, e.g. hay) into its (his, her) mouth.'

(4) a. bizaashkaah
  b. Third person possessor + 'mouth' + first person singular subject + ? + imperfective, 'handle something in an open container'
  c. 'I am pouring it (something in an open container, e.g., a glass of water) into its (his, her) mouth.'

(5) a. bighadiunishtuaah
  b. Third person object + 'away from P (coercively)' + 'related to oral noise' + third person indefinite object + imperfective + first person singular subject + transitive, caused + 'handle solid roundish object'
  c. 'I am trying to persuade her.' (Lit: I am getting something away from her in a way that involves oral noise.)

(6) a. ahidaaftuer
  b. 'each other' + distributive plural + ? + active voice? + 'be, become'
  c. 'They resemble each other.'

(7) a. chuirnirnarardiunirfdlarard
  b. 'horizontally outward' + reversionary, 'back' + 'again' + 'fire or light' + perfective + third person subject + caused + perfective, 'rip, tear, crack, break'
  c. 'The sun came back out again.' (Lit: It caused light to break back out again horizontally.)

Navajo verb morphology is more productive than its noun morphology. For example, Young and Morgan's (1992) *Analytical Lexicon of Navajo* contains approximately 6,245 nouns, as compared with some 9,000 verb bases (analogous to English infinitives). Moreover, a large proportion of nouns appear to be formed from verbs. The lexicon contains only 265 stem nouns, "many of which also function as verb stems," from which about 2,245 nouns are derived through compounding and inflection (Young & Morgan, p. 961). In contrast, there are about 4,000 entries for "verbal nouns," including nominalized verbs and compounds of nominal and verbal stems (pp. 964–965). Navajo thus contrasts strongly with many of the languages in which vocabulary acquisition has been studied (e.g., English, Italian, Korean and Mandarin) in its morphological complexity overall, and especially in the verb.

How does the structure of Navajo affect input to children? First, since Navajo verbs incorporate obligatory pronominal prefixes, verbs can stand alone as sentences. This fact that verbs can stand alone as acceptable utterances (as in Italian, Korean, and Mandarin) might make verbs more accessible in the input (Au et al., 1994; Caselli et al., 1995; Choi & Gopnik, 1995). Another input factor that may favor verbs in Navajo acquisition is word order. In subject-verb-object (SVO) languages like English, nouns frequently occur in the salient sentence-final position (Slobin, 1973). Navajo is an SOV language (or perhaps more properly, a topic/object/verb language) (Young & Morgan, 1992). Thus verbs ordinarily occur in the salient sentence-final position.

Another factor that could affect acquisition is the relative morphological transparency of nouns versus verbs—the degree to which children can perceive the same stem across different uses (Gentner, 1982). On this count the Navajo language is mixed. As in most languages, verbs take a greater variety of affixes than nouns.[1] As mentioned above, verbs can take up to 14 to 16 prefix positions, and use of 11 prefixes is fairly typical. Navajo nouns have fewer markings. They can be inflected for possession and plural,[2] and stem nouns[3] may also take other suffixes, including particularizers and a small number of adjectival enclitics, perhaps coming to four or five affixes. But although verbs have greater morphological complexity than nouns, they may have the advantage over nouns on another aspect of morphological transparency. Most affixes to verbs come before the verb, so that

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[1] In Navajo (as in other highly morphologized polysynthetic languages), distinctions in complexity between verbal and nominal inflection systems are sometimes obscured by the difficulty of drawing a clear distinction between morphology and syntax. However, the conclusion appears safe that verbs take more markings than nouns.

[2] Possession is obligatory for some nouns, including kin terms, anatomical terms, and habitats. Only kinship terms and names of age-sex groups form simple plurals, but many nouns form distributive plurals.

[3] Verbal nouns can (and sometimes must) have verbal inflection patterns; e.g.,

teacher = *baruorftauir* (for-her-she-learns-[nominalizer]).
my teacher = *shibaruorftauir* (my + baruorftauir)
OR *irirnirshtauir* (for-her-I-learn-[nominalizer])

This would of course add to the overall complexity of noun marking patterns. However, the constituents of most verbal nouns are likely to be slightly more conventionalized or "frozen" than those of the verb proper.

the root of a Navajo verb almost always occupies the salient word-final position. Nouns are more prone to take affixes at the end, thus making the root more difficult to perceive within the surrounding word (Watson, 1976). On balance, we would consider Navajo somewhat more verb-friendly than noun-friendly.

The semantic properties of Navajo verbs are also worth noting. Navajo verbs with their rich morphology seem more semantically complex—particularly in incorporating features of the object noun—than, say, English verbs, and this might make them harder to learn. On the other hand, as Brown (1998) has suggested, "heavy" verbs that are semantically rich may be easier to acquire than leaner verbs, because they require less abstraction from context (see also Gentner & Boroditsky, 2001; Tardif, 2005). To investigate the effects of this combination of input factors on language acquisition, we conducted a study of early child vocabulary in Navajo. Navajo provides a new entry to the annals of nouns and verbs in early vocabulary.

Our method of approach was to create a Navajo checklist modeled after the MacArthur Communicative Development Inventory for Infants (MCDI). The MCDI and its variants have proven to be an invaluable tool for the assessment of early vocabulary learning and for crosslinguistic comparison. A variety of methods has been used to assess early word learning, but the two methods most commonly used are transcriptions of taped sessions and retrospective reports of the child's vocabulary, generally using a checklist. Other forms of retrospective report, such as asking parents to recall and list their children's words, are sometimes used, but the checklist method has the advantage of being a recognition task; recognition provides a more sensitive memory assessment than does recall. The checklist method also has several important advantages over the transcript method (as amplified in the "Discussion"). For these reasons, the checklist method seemed best for our purposes.

Checklist construction is guided by the psychology of parental report. The basic premise is that recognition (while not perfect) is in general far more sensitive than recall. Therefore, the first goal of checklist construction is to ensure that *all* the words a child may say are on the list. Having extra words on the list, to which parents mostly say no, is not a problem (unless of course the number is so large that the task becomes too onerous to the parent). Indeed, it is important that there be some words to which a given parent says no, to ensure that she or he is not simply saying yes to everything. But if words are missing, the cost is greater. For missing words, the burden is on the parent to realize this and to somehow dredge the word out of her mind. Any such missing words are effectively being tested in a relatively insensitive recall task instead of a sensitive recognition task. In sum, the penalty is high for an error of exclusion and low for an error of inclusion. Because of these considerations, in checklist research, it is common to report the "percent opportunity filled" measure introduced by Caselli et al. (1995)—the percentage of a given class checked off for a given child. A very high percentage is cause for concern that the child's vocabulary may have exceeded the checklist's capacity.

With this logic in mind, and because our hypothesis was that verb acquisition would lag behind noun acquisition, a key goal was to ensure that all possible verbs a child would say were included on the list. We began with the English version of the MacArthur Communicative Development Inventory for Infants. We increased

the proportion of verbs on the list by adding 73 verbs that were used in a Korean checklist by Au et al. (1994) as well as 13 additional verbs adapted from Gopnik and Choi (1995). Of course, when the large list was translated into Navajo (in stage 1 of the checklist construction, described below), some of these verbs were rejected as unnatural; but others did have equivalent or related Navaho forms, and still others reminded the translators of other Navajo verbs.

The Checklist

To prepare a checklist appropriate for Navajo, we consulted with Navajo language researchers and educators (Werner, Morgan, & Nichols), with several first-language speakers of Navajo, and with expert translators (Shorty, Yazzi, King, & Begaye). Several stages of adaptation were necessary. We began with the English version of the MacArthur Communicative Development Inventory for Infants. We then increased the number of verbs in a rather indiscriminate way (knowing that refinements would occur later) with 86 Korean verbs taken from Au et al. (1994) and from Gopnik and Choi (1995).

The checklist was translated in three stages. In stage 1, the initial translation was done by Anthony Yazzi, a native Navajo speaker residing in the Chicago area, and Bill Nichols, a graduate student of Navajo. Anthony Yazzi added further words, including child forms of many words and other words that are specific to Navajo culture (e.g., *coyote*). Stage 2 was carried out on the reservation by Nichols and Begaye. They elicited from several speakers, including parents not included in the study, the forms typically used by children, as well as other words likely to be known by children. We adopted a liberal criterion for verb forms and included all forms of a given verb that speakers considered likely to be present in children's vocabularies. This was done both for methodological reasons (to ensure that any bias was in favor of verbs)[4] and on the theoretical grounds that children may learn different verb forms as separate words (Tomasello, 2000). In stage 3, the revised checklist was again vetted by several native speakers, notably by William Morgan, a Navajo researcher educator and coauthor of the *Analytical Lexicon of Navajo* (Young & Morgan, 1992).[5]

The final checklist contained 479 words frequently found in children's vocabularies: 239 nouns and 163 verbs. The checklist was divided in the fashion of the MacArthur inventory into 19 sections, such as Animal words, Vehicle words, and

[4] Of course, this runs the risk of overestimating the child's verb knowledge, because two forms of the same verb could be counted as two different verbs.

[5] As would be predicted from the relational relativity hypothesis, nouns were fairly easy to translate into Navajo, but verbs were more difficult, and sometimes required an idiomatic or metaphoric expression. To deal with these complexities, for each English verb we constructed a naturalistic sentence in which it might occur in English speech to children. Then, the Navajo informants constructed equivalent Navajo sentence(s), and the Navajo verb that best carried the sense of the English verb was chosen and rendered in a form that would be natural in speech with very young children. Similar procedures were followed for adjectives. Many English adjectives are realized as nominalized descriptive verbs in Navajo. As in Korean, this acts to increase the size of the verb class in Navajo.

Action words (see Table 1.1). Note that the total number of verbs (163) is greater than the number of Action words in the table (135) because not all verbs are action verbs. The final step was to have the checklist and instructions tape-recorded by Ed Shorty, a local radio broadcaster. This was done so that literacy would not be necessary for participation—an important step, because relatively few people are literate in Navajo. Caretakers were provided with the taped version along with the paper version of the checklist. A sample of roughly one-fifth of the checklist is given in appendix A, along with English translations and our categorization as to noun, verb, or other. The entire checklist can be obtained by request.

Site and Subject Selection

The Navajo reservation straddles the state lines of Utah, New Mexico, and Arizona, and has 150,000 to 250,000 residents. The number of Navajo monolinguals is rapidly declining, and many young people communicate primarily in English. To find infants with monolingual caretakers, the experimenters contacted workers at Navajo Women Infant Children (WIC) clinics in two rural chapters (local governmental districts). For the same reason, we sought families in relatively remote locations. WIC clinicians referred us to four of the families on the basis of their known proficiency in Navajo and likelihood of monolingual experience. A fifth subject was referred to us by an interview candidate.

Experiment 1a

Method

Experimenters. Two experimenters conducted research on the Navajo reservation with Northwestern's Ethnographic Field School under the direction of Dr. Oswald Werner. Both experimenters (Bill Nichols and Nathan Bush) were graduate students in anthropology studying with Dr. Werner. The senior experimenter, Bill Nichols, was the Deputy Director of the Field School, with three seasons' experience conducting cultural research on the Navajo reservation.

Participants. Five Navajo caretakers—mothers and grandmothers of infants aged 18 to 26 months—participated in this study. The infants were two boys and three girls who lived in remote locations on the Western part of the reservation and were being raised primarily monolingual in Navajo.

Materials and Procedure. For three of the children the interviews were conducted at the children's homes. For the other two, the interviews were conducted in a WIC clinic. Caretakers were told that the experimenters were interested in the early vocabularies of babies being raised in Navajo. The caretakers were given the Navajo checklist and the study was explained. The tape of the words was played for them as they went through the checklist. They were encouraged to pause, ask questions, or review the tape at their discretion. For each word on the checklist, caretakers were asked to indicate (1) whether the child understands the word, and

TABLE 1.1 Navajo Children's Productive Vocabulary: Numbers of Words Acquired per Checklist Category

Category (number of possible responses)	Child Gender/Age in months				
	1 M/23	2 F/18	3 F/25	4 F/19	5 M/26
Animal sounds (9)	3	4	4	6	6
Animals (36)	4	6	13	12	13
Vehicles (9)	0	0	0	1	1
Toys (8)	1	0	1	1	1
Food (31)	4	0	5	12	9
Clothing (19)	0	0	1	6	5
Body parts (20)	0	0	1	12	11
Rooms & furniture (25)	0	0	1	3	7
Household items (34)	0	0	0	6	1
Things in nature (27)	1	1	1	6	3
People (20)	2	0	4	8	14
Games & routines (24)	7	6	7	13	18
Action words (135)	2	2	1	22	34
Temporal words (8)	0	0	0	0	0
Descriptive words (37)	0	1	2	7	11
Possessives (11)	0	7	2	5	9
Question words (6)	0	0	0	3	4
Prepositions (11)	0	2	2	2	2
Quantifiers (8)	1	2	2	2	2
Words added by caretakers	8	2	7	7	54
Total productive vocabulary	33	31	47	134	205

Note Numbers in the table are the number of words reported in each category. Numbers in parentheses next to the category descriptions represent the total number of possible responses in that category. Words added by caretakers are listed separately at the bottom of the table.

(2) whether he or she also spontaneously says the word. They were also asked to tell the experimenter if any checklist item reminded them of some item not on the checklist that they had forgotten to mention. For three of the children, the caretakers were also asked to recall as many as possible of the words they had heard their child say, whether in Navajo or in another language, before they filled out the checklist.[6]

[6] Due to experimenter error, this was not done for two children (child #2 and child #3). This meant that proper names were not collected for these two children, probably resulting in an undercounting of their animate nouns. (The number of proper nouns for people ranged from 2 to 12 among the other three children.)

Results The infants' productive vocabulary in Navajo ranged from 31 to 205 words. Table 1.1 shows a breakdown of the infants' words in each of the CDI categories, as well as the number of words added by parents. As Figure 1.1a shows, all five infants produced more nouns than verbs, $t(4)=3.52$, $p < .05$. (All tests are two-tailed.) The mean noun–verb ratio was 3.26:1 overall. This finding is consistent with the central prediction of the natural partitions/relational relativity hypothesis that nouns for objects and entities should be acquired earlier than verbs and other relational terms. This was true in our data, even though we adopted a very liberal criterion for scoring vocabulary items as verbs. Many descriptive terms and adjectival expressions (e.g., 'it is red') were included as verbs in our counts.

The second prediction of the NP/RR hypothesis is that as vocabulary size increases, so should the proportion of relational terms. Consistent with this prediction, the results show that the greater the child's total Navajo productive vocabulary, the greater was the proportion of verbs, $r = .981$, $p = .003$, $N = 5$.

Figure 1.1b shows the children's total Navajo vocabularies—both words produced and words comprehended but not produced. Here too the pattern of results supports the prediction. Nouns predominate in the smallest vocabularies; only the one child who attained a productive vocabulary of over 200 Navajo words shows a proportion of verbs comprehended and produced that is equal to or greater than that for nouns.

A third prediction of the NP/RR hypothesis is that names for animate entities (including proper names) will be especially prominent early in acquisition. Figure 1.2 shows the proportion of animate nouns among nouns in children's vocabularies. As predicted, names for animate entities comprised a substantial proportion (a mean of 66.3% overall) of the early noun vocabularies. Considering the initial dominance of animate nouns in early vocabularies, it would also be expected that the proportion of animate nouns should decrease with increasing vocabulary. Figure 1.2 shows a nonsignificant trend in this direction.

Percent Opportunity Filled A possible concern is that the noun advantage was an artifact of our having too few verbs (relative to the nouns) on our checklist. We believe such a ceiling effect is unlikely, because even the child with the largest vocabulary was reported to produce less than a third of the verbs on the checklist. However, to be certain, we applied the "percent opportunity filled" measure to the children's productive vocabularies. If the noun advantage results from the artifact of having included too few verbs on the checklist, then the percent opportunity filled will be higher for verbs than for nouns. Reassuringly, the results showed a trend in the opposite direction. The mean percent opportunity filled for nouns (14.8%) was actually higher than that for verbs (10.8%), marginally significant, $t(4) = 2.27$, $p = .09$.) Thus the observed noun advantage did not result from an insufficient number of verbs on the checklist.

Added English Words As noted above, for three of the five children, additional Navajo words were reported by caretakers. Many of these words were names of relatives and other items commonly added to checklists. However, there were also some added English words (not included in the data reported above). The English

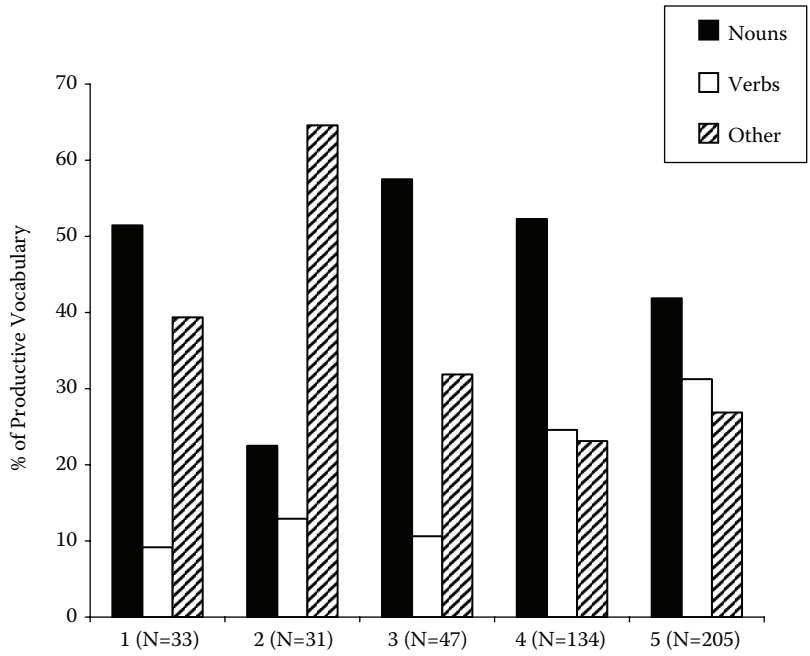

Figure 1.1a Proportions of nouns and verbs in Navajo productive vocabulary.

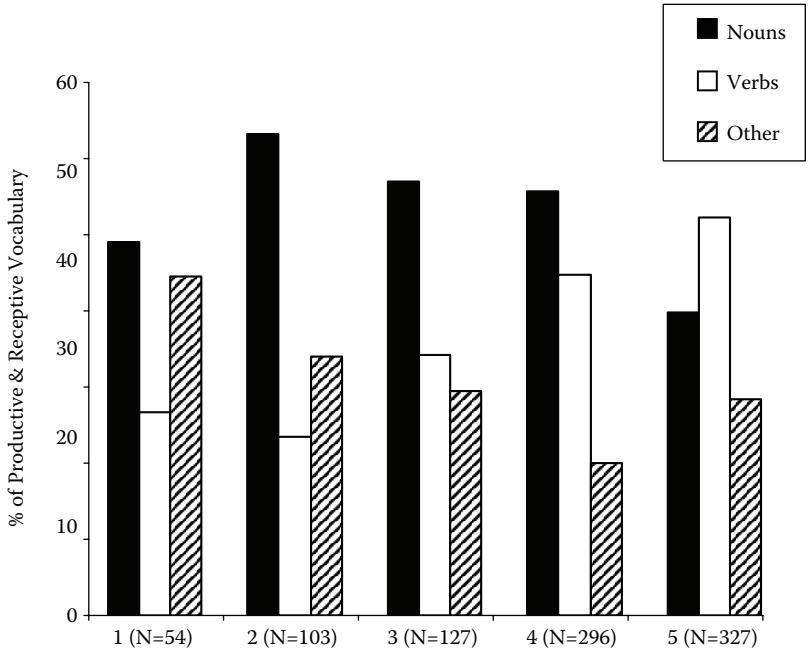

Figure 1.1b Proportions of nouns and verbs in Navajo productive and receptive vocabulary.

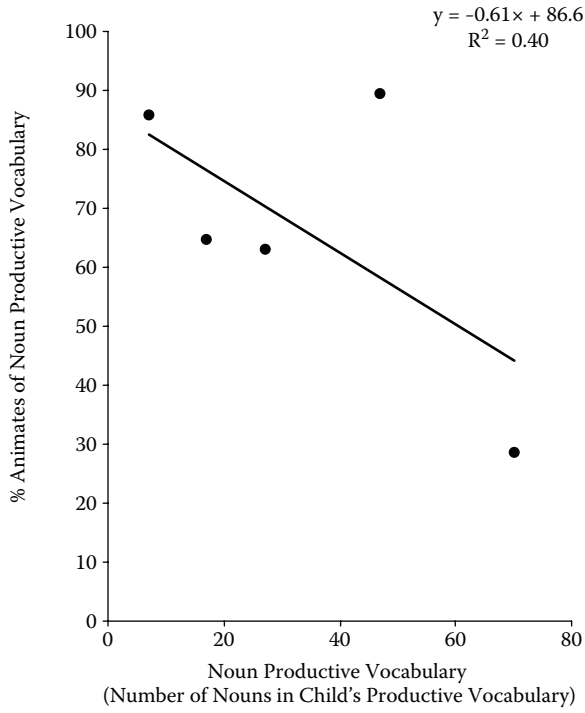

Figure 1.2 Proportion of animate nouns plotted against vocabulary size.

(and Navajo) productive vocabulary sizes were 8 (33) for child 1; 50 (134) for child 4; and 125 (205) for child 5. This led to a concern: Were these English words evidence that the children were not truly monolingual, or were these words simply English loan words into Navajo that the children had learned in the course of normal Navajo discourse?

Like other Amerindian languages, Navajo has borrowed many items from English (Young & Morgan, 1992). In child language, these include *ouch*, *OK*, *ice cream*, *TV*, *duck duck goose*, and *Hey, man*. The bulk of the children's English words (63%) were nouns. This is consistent with the possibility that the English words are loan words; crosslinguistically, nouns are the grammatical class most likely to be borrowed in language contact (Haugen, 1950; see also Gentner, 1981). To assess whether the words that showed up in children's vocabularies were in fact loan words, we conducted a follow-up study.

Experiment 1b

We constructed a questionnaire containing all the English words reported by caretakers. To operationalize the idea of linguistic borrowing, we asked an expert Navajo rater to assess the likelihood that a Navajo speaker would use the

English word in the course of a Navajo conversation (a scale of 1 = very likely to 7 = very unlikely was used). Ratings were obtained in an interview with an expert informant, Larry King, a Navajo language tutor who lives in Shiprock. Over 70% of the English words added by caretakers were rated as very likely to be borrowings (rated as 1 or 2). It is very likely, then, that the children learned these words in the course of normal Navajo acquisition.

Discussion

We began with three predictions: (1) Nouns should predominate in early vocabulary; (2) the proportion of verbs should be low initially and should increase with vocabulary size; and (3) among nouns, terms for animates should be acquired especially early. We found evidence for all three of these. Nouns outnumbered verbs in early Navajo vocabulary by a factor of over 3 to 1. The proportion of verbs began low and increased with vocabulary size. Finally, although strong conclusions regarding developmental change must await a larger sample, the results showed the predicted pattern that among nouns, terms for animate beings predominated in early vocabulary and tended to decrease as vocabulary increased.

These findings are consistent with the hypotheses of natural partitions and relational relativity, according to which object names are learned earlier than relational terms because objects are more easily individuated than are the referents of relational terms. According to this hypothesis, relational terms have two strikes against them: First, relations in general are typically noticed and encoded after the objects they apply to; and, second, because relational terms differ crosslinguistically (relational relativity), learning their meanings requires some experience with the semantic patterns of the language.

Comparison with Other Findings

The question of noun dominance in early vocabulary acquisition has been intensely debated over the last decade. This controversy has had the valuable effect of inspiring the investigation of languages that differ from English in their typological properties, particularly those that seem likely to make the language "verb-friendly" for infants learning their first words. There is general agreement that input factors should have some influence, from Gentner's (1982) paper through the present. The question is whether semantic factors in the early word-to-world mapping also play a substantial role, or whether the findings can be explained most economically in terms of input factors that favor verbs or nouns.

Unfortunately, these studies have led to differing conclusions among different researchers (and in some cases even the *same* researchers) studying the same language. We believe these difficulties stem largely from differences in methodology that have led to non-commensurable results. In hopes of achieving greater convergence, we briefly review two prominent cases of verb-friendly languages: Korean and Mandarin.

Korean

Korean is a clear candidate for a verb-friendly language and has recently been examined extensively. It has SOV word order and is a pro-drop language,

so verbs often appear alone or in the salient utterance-final position. Choi and Gopnik (1995) examined a sample of Korean adult speech to children and found almost twice as many verbs as nouns (19.8 verbs vs. 11.9 nouns per 100 utterances). Thus if input factors dominate, Korean children should learn verbs earlier than nouns. Choi and Gopnik examined children's early vocabularies by analyzing spontaneous speech samples and by asking Korean parents to report on their children's vocabularies, using a modified version of Gopnik's relational inventory questionnaire and encouraging parents to list other words their children said. They found that the proportions of nouns (excluding proper nouns) and verbs in the first 50 words were 44% and 31%, respectively. This proportion for nouns is substantially lower than the 60 to 70% range typically found in English, suggesting that input factors determine infants' first words.

However, other studies of Korean have reached different conclusions. Au et al. (1994) first confirmed Choi and Gopnik's finding that Korean input to children is verb-favored. Verbs were four times more likely than nouns to appear in the salient final position in Korean language to children (46% vs. 10%). In English, the reverse was found: Verbs occupied 9% of the utterance-final positions, and nouns 30%. But despite this verb advantage in input, when Au and her colleagues examined early vocabularies of Korean children (using an adapted MacArthur CDI parental checklist) they found a noun to verb advantage of roughly 4 to 1. Strikingly, Korean children produced four times as many nouns as verbs despite an equally strong input advantage in the reverse direction. Pae (1993) corroborated this finding of noun dominance in her comprehensive study of early Korean acquisition. She used a MacArthur checklist adapted for Korean to assess the vocabularies of 90 children living in Seoul between the ages of 12 and 23 months. She found a strong noun advantage throughout, comparable to that for English. Most children (87 of the 90) used a noun as their first word, and none had a verb as first word. Nouns increased rapidly; at 51 to 100 words, the productive vocabularies contained 50 to 60% nouns and about 5% verbs. Overall, Pae found a large advantage for nouns over verbs in Korean early vocabularies, roughly equivalent to that found in a comparable English sample. Finally, Bornstein, Cote et al. (2004), in a large crosslinguistic study of early vocabularies, also found that nouns outnumbered verbs in early Korean. What gives rise to these divergent results? Studies of Mandarin, another "verb-friendly" language, may shed light on this issue.

Mandarin In Mandarin, verbs and nouns have equivalent morphological transparency in that neither nouns nor verbs are inflected. Mandarin is also a pro-drop language: The subject of a sentence can often be omitted. Word order is SVO, just as in English, but subject-dropping creates verb-initial (VO) and verb-only sentences, both of which give the verb a more salient position than the middle position it occupies in the English SVO sentence (Slobin, 1973). Tardif (1996) hypothesized that these input factors would promote the acquisition of verbs. She estimated the vocabularies of 10 Mandarin-speaking infants using one-hour taped transcriptions of their spontaneous interactions with caregivers. She reported a mean of 19 nouns (13.8 with proper names excluded) and 19.1 main verbs. Tardif concluded that the

early noun advantage is not universal, and that the relative rate of acquisition of nouns and verbs depends on linguistic factors.

Fortunately, the work did not end there. In an important study, Tardif, Gelman, and Xu (1999) revisited early Mandarin acquisition and compared spontaneous speech samples taken in different contexts with the results of a checklist task. They established two important findings: (1) Spontaneous speech samples are highly vulnerable to contextual variability, and (2) spontaneous speech samples are likely to severely underestimate children's vocabularies. Their results further suggested that this underestimation is likely to be particularly severe for nouns. Tardif and her colleagues tape-recorded 20-month-old English and Mandarin children in naturalistic interactions with caregivers in three controlled contexts: noun-favorable (reading a picture book together), verb-favorable (playing with a mechanical toy that offered several different activities), and neutral (playing with various toys). The observational (transcript) data showed striking variability across contexts. The noun-to-verb ratios for Mandarin children were 2.2, .62, and .51 for noun-friendly, neutral, and verb-friendly contexts, respectively. The English children's transcript results showed comparably high variability, with N/V ratios of 3.3, 1.0, and .7 for noun-friendly, neutral, and verb-friendly contexts. These finding demonstrate the problems with using small samples of transcribed speech to assess total vocabulary. A researcher who relied on transcript data could conclude that Mandarin children have twice as many nouns as verbs, or half as many, depending on which context happened to occur. Indeed, depending on the context, one could even conclude that English, a notoriously noun-friendly language, shows a verb advantage in early vocabularies.

Tardif et al. then compared these transcript results with the results of checklists applied to the same Mandarin and English children. They found that the transcript results were far less comprehensive than the checklist results. Pooling all words from the three different contexts, the average number of types revealed for each child was 56.7 for Mandarin and 60.2 for English. The checklist results for these same children revealed 316 types for Mandarin and 160 types for English. The Mandarin checklist vocabulary is four times greater than Tardif's (1996) report of 73.7 words based on transcript data from slightly *older* children (22 months). It appears that the transcript results seriously underestimate the children's vocabularies. In addition to revealing a larger vocabulary than the observational data, the checklist results revealed a clear noun advantage: Mandarin children showed 2.4 times as many nouns as verbs.

The Mandarin vocabularies showed a clear noun bias, consistent with the natural partitions hypothesis. However, we also note that the noun advantage was considerably less pronounced in Mandarin than in English, consistent with the claim that Mandarin is a verb-friendly language (Choi & Gopnik, 1989; Gentner, 1982; Tardif, 1996).

This research makes it clear that transcripts of observational data cannot be equated with the child's productive vocabulary. Transcripts are likely to greatly underestimate the total vocabulary size; they also are likely to provide misleading results as to noun–verb composition. In part this results from patterns of usage: People tend to use a large variety of nominal types, each fairly infrequently, and

a small number of relational types, each fairly frequently (Gentner, 1981). This means that verbs will tend to show up in a large range of contexts, but nominals will tend to be restricted to particular contexts. (For example, you may have not said the word *tiger* for weeks.) Because nouns are used in a more referentially specific manner than are verbs, transcripts are likely to underestimate nouns relative to verbs (Gentner & Boroditsky, 2001; Bates, Bretherton, & Snyder, 1988). Consistent with this suggestion, Gopnik and Meltzoff (1984) found that across several observational sessions with a group of 1- to 2-year-olds, 75% of the relational terms and only 25% of the nominals occurred in more than one session. Thus, more nouns than verbs are likely to be missing from any given transcript.

What about very early acquisition? In both Mandarin and English, mothers reported that their children's first object word had preceded their first action word (Gelman & Tardif, 1998). This accords with the first vocabularies of two Mandarin-speaking children with under 50 words, reported by Gentner (1982) using parental data collected by Mary Erbaugh (1992) in Taiwan (both parental vocabulary lists, and transcriptions of natural interaction sessions). For both children, nominals (including proper nouns) were the dominant class (.65 and .59 mean proportions). For example, at age 1.6, the child Xiao-Jing had 37 words, of which 22 were nouns, seven were relational terms (e.g., 'go,' 'come,' 'pick-up'), and two were modifiers. These results bear out the claim that even in verb-friendly languages, there are semantic-conceptual factors that favor object names as the first word-to-world mappings.

One might ask whether the use of a checklist results in overestimating vocabulary—perhaps the proud parents exaggerate, and mistakenly attribute extra words to their child's vocabulary. Although this surely must occur, Tardif et al.'s (1999) results actually showed that the opposite can occur as well. Parents omitted a small number of words that the children had in fact produced in the observational settings. That is, some words appeared in the transcript but not in the checklist. However, the degree of underestimation on the checklist was on the order of a few percent—far less severe than the 60 to 80% underestimate given by the transcript method relative to the checklist.

Another question is whether checklists overrepresent the proportion of nouns. Pine, Lieven, and Rowland (1996) suggested that there may be a noun bias in maternal reporting on checklists, based on findings that recognition is better for nouns than for verbs (e.g., Asmuth & Gentner, 2005; Gentner, 1981; Kersten & Earles, 2004).

However, they also pointed out several factors that favor checklists over observational transcripts for estimating the relative proportions of different vocabulary classes: Observational measures are generally less comprehensive and therefore less reliable than checklist reports; transcript data are highly sensitive to the context in which they are recorded; and transcript data are frequency-sensitive—words that a child knows, but rarely uses, are likely to be missed in a taped session, whereas they may appear on a checklist.

These concerns are more important than has generally been realized, because the method chosen for assessing child vocabulary has a strong effect on the outcome. For example, studies that have used checklist data have found that nouns

predominate in early vocabulary (e.g., Au et al., 1994; Caselli et al., 1995; Pae, 1993; Tardif et al, 1999), while studies using taped observational sessions or interview tasks have typically found no noun advantage (Choi & Gopnik, 1995; Tardif, 1996; but see Pae, 1993). One obvious implication is that meaningful comparisons of word acquisition across languages can only be achieved if the studies use the same methods. Taking Tardif et al.'s (1999) findings into account, we suggest that although observational transcripts are valuable for many purposes, they are not suitable for assessing total vocabulary or for assessing the relative proportions of different word classes.

The checklist method is less susceptible to problems of contextual variability and is also more likely to produce a more complete assessment of a child's total vocabulary. However, the checklist method is also not perfect. Its limitations include: (1) It can discourage proper nouns, unless parents are encouraged to provide them; (2) its success depends on having an inclusive, language-appropriate list; (3) it asks first for nouns, possibly leading to fatigue factors in reporting verbs (this could be remedied); (4) it may underestimate phrases used as wholes; (5) for heavily morphologized languages it may be difficult to decide how to count words; and (6) the context of use is not provided. Despite these flaws, in our view the CDI remains the single best method for estimating overall vocabulary when detailed longitudinal data are not available (see also Pine et al. (1996) for a comparison of transcript and checklist methods).

Another source of discrepancy between different studies lies in the criteria used to score verbs and nouns. Some studies have excluded proper names from the noun count. Such exclusion is reasonable for evaluating hypotheses that posit a noun-category linkage, but not for evaluating the natural partitions hypothesis, which encompasses names for individuals as well as classes. Indeed, to test the corollary prediction of the natural partitions hypothesis—that names for animate beings will be particularly early—*requires* that proper names be counted. Another source of variation is the criteria for relational terms; for example, whether adjectival meanings should be included if they are expressed as verbs. The checklist method will gain in utility as clear criteria are developed for classifying early words.

Learning New Verbs Another way to approach the acquisition issue is to look at children's relative ability to *learn* new nouns and verbs. When new words are taught to young English-speaking children, they acquire nouns more rapidly than verbs (Childers & Tomasello, 2006; Schwartz & Leonard, 1980). Does this noun advantage hold up crosslinguistically? Imai, Haryu, and Okada (2005; Imai et al., 2006) have found a noun advantage in word-learning among preschool children across Mandarin, English, and Japanese. They showed children a video scene of a person carrying out a novel action with a novel object, and labeled it with either a novel noun or a novel verb. Then the children were asked to generalize the new word to a new scene, which either showed the same object in a new action (correct for the noun, but not for the verb) or the same action with a new object (the reverse pattern). The results showed a noun advantage across all languages. All

three groups—Mandarin, Japanese, and English—generalized novel nouns correctly by 3 years, but did not generalize novel verbs correctly until 5 years of age. These results are consistent with there being a general noun advantage in early learning.

Interestingly, Mandarin children given the same task lagged behind the other two groups in their verb learning; even at 5 years of age, they tended to map the verb to the object rather than the action. They did not correctly generalize the verbs until 8 years of age (Imai et al., 2006). Imai and her colleagues were able to develop a version of the task such that 5-year-old Mandarin children could extend the verbs correctly, but the greater difficulty Mandarin children experience with the standard task calls for a rethinking of what makes for a verb-friendly language. Gentner's (1982) original suggestion of Mandarin as a verb-friendly language was based on the fact that it has an equal degree of added morphology on nouns and verbs (i.e., none). But Imai et al. speculate that the lack of *any* morphology on nouns and verbs in Mandarin may in fact make it more difficult for children to separate the syntactic classes of nouns and verbs (see also Kim et al., 2000). Tardif (1996) focused on another factor that might make Mandarin verb-friendly: namely, argument-dropping (the ability to omit nouns in a sentence). This permits verb-final and even verb-only sentences, which might help children attend to verbs. But here too, one must ask whether argument-dropping is always helpful. In the absence of morphological marking, a Mandarin child hearing a single word cannot know whether it is a noun or a verb. This could impede verb learning, particularly if (as seems likely) children sometimes take verbs to refer to objects. Clearly, Mandarin poses some tricky issues for child language researchers.

Conceptual and Linguistic Factors: A Rapprochement?

We have argued for the importance of semantic-conceptual factors in early word acquisition, but linguistic input factors are also important. Discovering word meanings requires both isolating the word within the speech stream and individuating the referent within the experiential stream (and connecting them). The relative difficulty of isolating the *word* in the stream of speech is influenced by linguistic factors such as word order and stress. The relative difficulty of individuating the *referent* in the stream of experience is influenced by perceptual and conceptual factors that inherently favor concrete nouns over verbs and other relational terms. Thus both input factors and conceptual factors will influence the child's acquisition rate.

Studies of verb-friendly languages show the influence of both conceptual and input factors. We earlier discussed the findings of Tardif, Gelman, and Xu (1999), which suggest that young Mandarin children have more nouns than verbs, consistent with the natural partitions hypothesis, but also show a greater proportion of verbs than English-speaking children, consistent with the idea that input factors can accelerate verb acquisition. In her recent work, Tardif (2005) has found a similar pattern: Children learning Mandarin show clear noun dominance in their first 20 words, consistent with the natural partitions hypothesis; but their subsequent verb acquisition seems to proceed much more rapidly than in a comparable group of children learning English. Ogura et al. (2006) studied parental

interactions in Japanese and English in interactive parent–child sessions. They found that children of both languages showed noun dominance early in acquisition. This was particularly interesting in light of the fact that verbs were considerably more prominent in the Japanese input than in the English input. Further, the proportion of verbs increased over language development for both language groups. So far, the results simply follow the natural partitions hypothesis. However, consistent with the presence of input effects, the proportion of verbs increased more rapidly in Japanese children than in English children. Likewise, Kim et al. (2000) reported that both Korean and English children learned more nouns than verbs in their first 50 words; but the Korean children learned significantly more verbs than English children. In a comprehensive review of recent research, Ogura et al. concluded that early noun dominance holds for Mandarin, Korean, and Japanese, just as for English, but also that children learning the former three languages show more rapid verb acquisition than children learning English. The ease of establishing the word-to-world mapping depends both on how easy it is to individuate the word's referent in the experiential stream (the realm of the natural partitions hypothesis) and on how easy it is to pick out the word in the stream of speech.

Convergent evidence that both conceptual and linguistic factors are at play comes from the human simulation paradigm of Gleitman and her colleagues, which provides a different method of assessing the relative difficulty of picking out referents in the world. Gillette, Gleitman, Gleitman, and Lederer (1999) showed adult subjects silent videos of mothers talking to young children; beeps marked the instance of a particular noun or verb, and the subject was asked to guess the word uttered at the beeps. After six different instances of a given word, subjects guessed correctly 45% of the time for nouns, but only 15% of the time for verbs. Their accuracy at guessing verbs almost doubled (to 29%) if they were told which nouns were used in the sentence. Further, when Gillette et al. added nonsense syntactic frames (e.g., "Gorp the fendex.") as well as the nouns used, the percentage of correct verb guesses rose to 90%—evidence of the role of syntactic frames in deriving verb meanings (Fisher, 1996; Gleitman & Gleitman, 1992). Even for adult English speakers, who already know the verbs of the language, picking out the referents of highly familiar verbs cannot be reliably achieved without help from known bindings between nouns and objects. This pattern is consistent with findings from the analogy literature that, in general, people need to know the objects in a scene before they can grasp the relations between them. Thus the early learning of concrete nouns may provide the scaffolding children need to learn verb meanings (Gentner, 1982, 2006).

CONCLUSIONS

The insight that words refer to specific aspects of the external world is one of the great discoveries of early childhood. The intuition underlying the natural

partitions hypothesis is that concrete and proper nouns are the ideal starting point for making this connection, because they can act as simple referential pointers to things that the child has already individuated (or can readily discern). In contrast, as Bowerman's work has so convincingly demonstrated, it is highly unlikely that children can prelinguistically individuate the referents of verbs. Verb conceptual components don't fall into inevitable clumps ready to be named, as evidenced by the fact that different languages carve them up very differently.

These results extend the natural partitions findings to Navajo. We found that object terms predominated in early Navajo vocabulary, and that terms for animate beings were especially prominent in the early Navajo noun vocabularies. There was also evidence that the proportion of relational terms increased with vocabulary size. These findings are interesting in that some aspects of the Navajo language might be expected to make verbs more salient in the input to children. More generally, Navajo represents an Athapaskan language, a very different language type from those studied so far. Thus, these results provide evidence for the generality of the natural partitions hypothesis.

The natural partitions hypothesis, in its strongest form, predicts that noun dominance is universal in early language acquisition; and more generally, that the individuability of the referent is a major factor in early word learning. Our results for Navajo, and our review of findings from the current literature, are consistent with these claims.

The natural partitions hypothesis predicts that nouns will form the child's first referential mappings from language to the world. The mapping between nouns and concrete entities can be achieved even at the very outset of language understanding. These first connections provide an easy first case of a reference relation and perhaps give the child the idea that other more opaque words must also have referents. And once learned, nouns provide semantic and syntactic frames to aid in mapping the verb to its meaning. In this way, the early acquisition of simple nouns may pave the way for learning verbs and other relational terms.

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APPENDIX 1.A Examples of Checklist Items, Showing MCDI Category and Our Classification as to Noun, Verb, or Other

Navajo word	English gloss	Word type	Noun/ verb/ other	Animate
k'iVniVtiViVh	You break it [stick-shaped object].	MCDI: action words	verb	
k'iV'eVltvo'	It [slender stiff object, or mechanism] broke.	MCDI: action words	verb	
sits'il	It shattered/bloated.	MCDI: action words	verb	
niV'aah	You bring/carry it [round, compact object].	MCDI: action words	verb	
nich'iish	You brush [e.g., teeth].	MCDI: action words	verb	
nishoVoVh	You brush [e.g., dirt off your dress].	MCDI: action words	verb	
yishtiViVf	I carry it along [e.g., rifle/spear/pole].	MCDI: action words	verb	
naVniVfjid	I carried it on my back.	MCDI: action words	verb	
daVdi' nishtvivih	I am closing it [stick-shaped object, e.g., door].	MCDI: action words	verb	
daV' niV'aah	You close it [compact object e.g., a box].	MCDI: action words	verb	
da'deelkaal	It is closed.	MCDI: action words	verb	
yisbvas	I am driving/rolling it along.	MCDI: action words	verb	
da'iViVniVilbvavas	We [severally] drive.	MCDI: action words	verb	
hoV'vaVvaVfdaVaVz	It splashed over the rim.	MCDI: action words	verb	
vavadiVziViVd	You spread it out [e.g., sand, coals].	MCDI: action words	verb	
niVdii'aah	You get it [roundish, compact object].	MCDI: action words	verb	
yoVoV'ahiVfhan	You throw it away.	MCDI: action words	verb	
shiVf hozh	You tickle me.	MCDI: action words	verb	
wvivivavo	meow	MCDI: animal sounds	other	
pbpbpbpbpbp	vroom	MCDI: animal sounds	other	
wuVh wuVh	woof woof	MCDI: animal sounds	other	
tsiVdii	bird	MCDI: animals	noun	yes
ch'osh	bug	MCDI: animals	noun	yes
gah	bunny	MCDI: animals	noun	yes

APPENDIX 1.A (continued) Examples of Checklist Items, Showing MCDI Category and Our Classification as to Noun, Verb, or Other

Navajo word	English gloss	Word type	Noun/ verb/ other	Animate
k'aaloVgi	butterfly	MCDI: animals	noun	yes
moVsiV	cat	MCDI: animals	noun	yes
gaVagii	crow	MCDI: animals	noun	yes
dlvoVvoV'	prairie dog	MCDI: animals	noun	yes
Shigaan	my arm	MCDI: body parts	noun	
shits'eVeV	my belly button	MCDI: body parts	noun	
tf'eestsooz	diaper	MCDI: clothing	noun	
biil	traditional dress	MCDI: clothing	noun	
ch'ah	hat	MCDI: clothing	noun	
yiVftseViV	It is dried up.	MCDI: descriptive words	verb	
bii aVdin	It's empty/There is nothing inside.	MCDI: descriptive words	verb	
tsxviVviVf	fast	MCDI: descriptive words	other	
biVighah	That's fine (It works/fits).	MCDI: descriptive words	verb	
toV	water	MCDI: food	noun	
toVdilchxoVshiV	soda	MCDI: food	noun	
naadvaVvaV'	corn	MCDI: food	noun	
ayaV	ouch	MCDI: games and routines	other	
waV	uh oh	MCDI: games and routines	other	
aVammmm	yum yum	MCDI: games and routines	other	
t'aVaVshvovodiV	please.	MCDI: games and routines	other	
bee nahalzhohiV	broom/brush	MCDI: household items	noun	
bvavaha'iVizhahiV	cup (with handle)	MCDI: household items	noun	
feits'aat'vaVhiV	dish/plate	MCDI: household items	noun	
bilataVaV'iV	fork	MCDI: household items	noun	
toVzis bii adlaVniV	glass	MCDI: household items	noun	

(*continued*)

APPENDIX 1.A (continued) Examples of Checklist Items, Showing MCDI Category and Our Classification as to Noun, Verb, or Other

Navajo word	English gloss	Word type	Noun/ verb/ other	Animate
naak'ei siniliV	eyeglasses	MCDI: household items	noun	
bee atsidiV	hammer	MCDI: household items	noun	
bee aVndiVtviVviVhviVviV	keys	MCDI: household items	noun	
t'ahkvo'	iil lamp	MCDI: household items	noun	
beVeVsh	fnife	MCDI: household items	noun	
adee'	ladle	MCDI: household items	noun	
ts'aa'	basket	MCDI: household items	noun	
yiVftseViV	It is dried up.	MCDI: modifiers	verb	
bii aVdin	It's empty./There is nothing inside.	MCDI: modifiers	verb	
tsxviVviVf	fast	MCDI: modifiers	other	
biVighah	That's fine (It Works/fits).	MCDI: modifiers	verb	
shiVnaaiV	my older brother	MCDI: people	noun	yes
shizheV'eV	my father	MCDI: people	noun	yes
at'eed	girl	MCDI: people	noun	yes
shimaVsaVniV,	my maternal grandmother	MCDI: people	noun	yes
shinaVliV	my paternal grandparent	MCDI: people	noun	yes
shicheii	my maternal grandfather	MCDI: people	noun	yes
shimaV	my mother	MCDI: people	noun	yes
baV'oVfta'iV	teacher	MCDI: people	noun	yes
ooljeVeV'	moon	MCDI: places/things in nature	noun	
joVhonaa'eViV	sun	MCDI: places/things in nature	noun	
chaha'oh	shade/ramada	MCDI: places/things in nature	noun	
chizh	firewood	MCDI: places/things in nature	noun	
hooghaniVmaVziV	hogan	MCDI: places/things in nature	noun	

APPENDIX 1.A (continued) Examples of Checklist Items, Showing MCDI Category and Our Classification as to Noun, Verb, or Other

Navajo word	English gloss	Word type	Noun/ verb/ other	Animate
ni	[used for emphasis, singular] you/your/yours	MCDI: possessives	other	
daanihiV	[used for emphasis, plural] (severally)	MCDI: possessives	other	
nVlaVaVhdi	at a remote and invisible location	MCDI: prepositions	other	
naVt'vaVvaV'	back (in the direction from whence one came)	MCDI: prepositions	other	
yaago	downward	MCDI: prepositions	other	
woVne'	in/inside [e.g., a hogan]	MCDI: prepositions	other	
bik'i	on it [e.g., put the saddle "on" the horse]	MCDI: prepositions	other	
bikaVaV	on it [e.g., the snow], against a horizontal plane	MCDI: prepositions	other	
deigo	upwards	MCDI: prepositions	other	
nViVleVidi	over there/yonder/at a remote but visible location	MCDI: prepositions	other	
naVaVnaV	again	MCDI: quantifiers	other	
bilaVahgo	being beyond it in quality or quantity	MCDI: quantifiers	other	
dooda	no	MCDI: quantifiers	other	
hait'eVego	how (in what manner)	MCDI: question words	other	
haV'aVt'iViV	what	MCDI: question words	other	
hahgo	when (at what future time)	MCDI: question words	other	
ch'iiyaVaVn	kitchen	MCDI: rooms and furniture	noun	
bii' naV'aVkaVhiV	oven	MCDI: rooms and furniture	noun	
biij'eVheVdaVhiV	outhouse (place you go out to)	MCDI: rooms and furniture	noun	
bii' azk'aVziV	refrigerator	MCDI: rooms and furniture	noun	

(*continued*)

APPENDIX 1.A (continued) Examples of Checklist Items, Showing MCDI Category and Our Classification as to Noun, Verb, or Other

Navajo word	English gloss	Word type	Noun/ verb/ other	Animate
niVfch'ih naalkidiV	tv	MCDI: rooms and furniture	noun	
abiVniV	morning	MCDI: temporal words	other	
tf'veVveV'	night	MCDI: temporal words	other	
k'ad	now	MCDI: temporal words	other	
diViVjviV	today	MCDI: temporal words	other	
yiskvaVvago	tomorrow	MCDI: temporal words	other	
diViVtf'veVveV'	tonight	MCDI: temporal words	other	
joof	ball	MCDI: toys	noun	
naaltsoos woVlta'iV	book	MCDI: toys	noun	
aweVeVshchiViVn	doll	MCDI: toys	noun	
aVazdaa	you're lying	added—Navajo	verb	
ch'il	weed/shrub	added—Navajo	noun	
aVniVleVeVh	you make it	added—Navajo	verb	
Zha Zha	Zandria (cousin)	added—Navajo	noun	yes
duck duck goose	duck duck goose	added— English	other	
excuse me	excuse me	added—English	other	
hurt	hurt	added—English	other	
outside	outside	added—English	other	
see you	see you	added—English	other	
pretty	pretty	added—English	other	
bye	bye	added—English	other	
airplane	airplane	added—English	noun	
banana	banana	added—English	noun	
blanket	blanket	added—English	noun	
chili	chili	added—English	noun	
corn	corn	added—English	noun	
dad	dad	added—English	noun	yes
diesel	diesel	added—English	noun	
orange	orange	added— English	noun	

APPENDIX 1.A (continued) Examples of Checklist Items, Showing MCDI Category and Our Classification as to Noun, Verb, or Other

Navajo word	English gloss	Word type	Noun/ verb/ other	Animate
pamper	pamper	added—English	noun	
look at	look at	added—English	verb	
love	love	added—English	verb	
move over	move over	added—English	verb	
open	open	added—English	verb	
play	play	added—English	verb	

REFERENCES

Au, T. K., Dapretto, M., & Song Y. K. (1994). Input vs. constraints: Early word acquisition in Korean and English. *Journal of Memory and Language, 33,* 567–582.

Baillargeon, R. (1987). Object permanence in 3.5- and 4.5-month-old infants. *Developmental Psychology, 23*, 655–664.

Bates, E., Bretherton, I., & Snyder, L. (1988). *From first words to grammar: Individual differences and dissociable mechanisms.* Cambridge, UK: Cambridge University Press.

Bohnemeyer, J. (1997). Yucatec Mayan lexicalization patterns in time and space. In M. Biemans & J. v.d. Weijer (Eds.), *Proceedings of the CLS opening academic year 1997–1998* (pp. 73–106). Tilburg, Netherlands: Center for Language Studies.

Bornstein, M. H., & Cote, L. R., with Maital, S., Painter, K., Park, S.-Y., Pascual, L. et al. (2004). Crosslinguistic analysis of vocabulary in young children: Spanish, Dutch, French, Hebrew, Italian, Korean, and American English. *Child Development, 75*(4), 1115–1139.

Bowerman, M. (1974). Learning the structure of causative verbs: A study in the relationship of cognitive, semantic, and syntactic development. *Papers and Reports on Child Language Development 8*, 142–178.

Bowerman, M. (1976). Semantic factors in the acquisition of rules for word use and sentence construction. In D. M. Morehead & A. E. Morehead (Eds.), *Normal and deficient child language* (pp. 99–179). Baltimore, MD: University Park Press,.

Bowerman, M. (1982). Reorganizational processes in lexical and syntactic development. In E. Wanner & L. R. Gleitman (Eds.), *Language acquisition: The state of the art* (pp. 319–346). New York: Cambridge University Press.

Bowerman, M. (1985). What shapes children's grammars? In D. I. Slobin (Ed.), *The cross-linguistic study of language acquisition: Vol. 2. Theoretical issues.* Mahwah, NJ: Erlbaum.

Bowerman, M., & Choi, S. (2003). Space under construction: Language-specific spatial categorization in first language acquisition. In D. Gentner & S. Goldin-Meadow (Eds.), *Language in mind: Advances in the study of language and cognition* (pp. 387–428). Cambridge, MA: MIT Press.

Brown, P. (1994). The ins and ons of Tzeltal locative expressions: The semantics of static descriptions of location. *Linguistics, 32,* 743–790.

Brown, P. (1998). Children's first verbs in Tzeltal: Evidence for an early verb category. *Linguistics, 36*(4), 713–753.

Camarata, S., & Leonard, L. B. (1986). Young children pronounce object words more accurately than action words. *Journal of Child Language, 13*, 51–65.

Casad, E. H., & Langacker, R. W. (1985). "Inside" and "outside" in Cora grammar, *International Journal of American Linguistics, 51*, 247–281.

Caselli, M. C., Bates, E., Casadio, P., Fenson, J., Fenson, L., Sanderl, L. et al. (1995). A crosslinguistic study of early lexical development. *Cognitive Development, 10*, 159–199.

Childers, J. B., & Tomasello, M. (2002). Two-year-olds learn novel nouns, verbs, and conventional actions from massed or distributed exposures. *Developmental Psychology, 38*(6), 967–978.

Childers, J. B., & Tomasello, M. (2006). Are nouns easier to learn than verbs? Three experimental studies. In K. Hirsh-Pasek & R. Golinkoff (Eds.), *Action meets word: How children learn verbs*. Oxford: Oxford University Press.

Choi, S., & Bowerman, M. (1991). Learning to express motion events in English and Korean: The influence of language-specific lexicalization patterns. *Cognition, 41*, 83–121.

Choi, S., & Gopnik, A. (1995). Early acquisition of verbs in Korean: A crosslinguistic study. *Journal of Child Language, 22*(3), 497–529.

Clark, E. V. (1993). *The lexicon in acquisition*. Cambridge, UK: Cambridge University Press.

Croft, W. A. (1990). *Typology and universals*. Cambridge, UK: Cambridge University Press.

de Leon, L. (2001). Finding the richest path: Language and cognition in the acquisition of verticality in Tzotzil (Mayan). In M. Bowerman & S. C. Levinson (Eds.), *Language acquisition and conceptual development* (pp. 544–565). Cambridge, UK: Cambridge University Press.

Dromi, E. (1987). *Early lexical development*. Cambridge, UK: Cambridge University Press.

Erbaugh, M. S. (1992). The acquisition of Mandarin. In D. I. Slobin (Ed.), *The crosslinguistic study of language acquisition* (Vol. 3, pp. 373–455). Hillsdale, NJ: Erlbaum.

Fisher, C. (1996). Structural limits on verb mapping: The role of analogy in children's interpretations of sentences. *Cognitive Psychology, 31*, 41–81.

Gelman, S. A., & Tardif, T. (1998). Acquisition of nouns and verbs in Mandarin and English. In E. Clark (Ed.), *Proceedings of the 29th Annual Stanford Child Language Research Forum*. Stanford: Center for the Study of Language and Information.

Gentner, D. (1981). Some interesting differences between verbs and nouns. *Cognition and Brain Theory, 4*(2), 161–178.

Gentner, D. (1982). Why nouns are learned before verbs: Linguistic relativity versus natural partitioning. In S. Kuczaj (Ed.), *Language development: Language, cognition, and culture* (pp. 301–334). Hillsdale, NJ: Erlbaum.

Gentner, D. (2006). Why verbs are hard to learn. In K. Hirsh-Pasek & R. Golinkoff (Eds.), *Action meets word: How children learn verbs* (pp. 544–564). Oxford, U.K.: Oxford University Press.

Gentner, D., & Boroditsky, L. (2001). Individuation, relativity and early word learning. In M. Bowerman & S. Levinson (Eds.), *Language acquisition and conceptual development*. New York: Cambridge University Press.

Gentner, D., & Rattermann, M. J. (1991). Language and the career of similarity. In S. A. Gelman & J. P. Byrnes (Eds.), *Perspectives on thought and language: Interrelations in development* (pp. 225–277). London: Cambridge University Press.

Gillette, J., Gleitman, H., Gleitman, L., & Lederer, A. (1999). Human simulations of vocabulary learning. *Cognition*, *73*(2), 135–176.

Gleitman, L. R., & Gleitman, H. (1992). A picture is worth a thousand words, but that's the problem: The role of syntax in vocabulary acquisition. *Current Directions in Psychological Science, 1,* 31–35.

Gleitman, L. R., Cassidy, K., Papafragou, A., Nappa, R., & Trueswell, J. T. (2005). Hard words. *Journal of Language Learning and Development*, *1*, 23–64

Goldin-Meadow, S., Seligman, M., & Gelman, R. (1976). Language in the two-year-old. *Cognition, 4,* 189–202.

Gopnik, A., & Choi, S. (1995). Names, relational words, and cognitive development in English and Korean speakers: 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: Erlbaum.

Gopnik, A., & Meltzoff, A. N. (1984). Semantic and cognitive development in 15-to-21-month-old children. *Journal of Child Language, 11,* 495–513.

Gopnik, A., & Meltzoff, A. (1993). Words and thoughts in infancy: The specificity hypothesis and the development of categorization and naming. In C. Rovee-Collier & L.P. Lipsitt (Eds.), *Advances in infancy research* (pp. 217–249). Norwood, NJ: Ablex.

Halford, G.S. (1992). Analogical reasoning and conceptual complexity in cognitive development. *Human Development*, *35*(4), 193–218.

Haugen, E. (1950). The analysis of linguistic borrowing. *Language, 26,* 210–231.

Huttenlocher, J. (1974). The origins of language comprehension. In R. L. Solso (Ed.), *Theories in cognitive psychology: The Loyola Symposium.* Potomac, MD: Erlbaum.

Imai, M., & Gentner, D. (1997). A crosslinguistic study of early word meaning: Universal ontology and linguistic influence. *Cognition, 62,* 169–200.

Imai, M., Haryu, E., & Okada, H. (2005). Mapping novel nouns and verbs onto dynamic action events: Are verb meanings easier to learn than noun meanings for Japanese children? *Child Development, 76,* 340–355.

Imai, M, Haryu, E, Okada, H., Li, L. & Shigematsu, J. (2006). Revisiting the noun-verb debate: A crosslinguistic comparison of novel noun and verb learning in English, Japanese- and Chinese-speaking children. In K. Hirsh-Pasek & R. Golinkoff (Eds.), *Action meets word: How children learn verbs* (pp. 450–476). Oxford: Oxford University Press.

Kako, E. T. (2004). Information sources for noun learning. *Cognitive Science, 29,* 223–260.

Kersten, A.W., & Earles, J.L. (2004). Semantic context influences memory for verbs more than memory for nouns. *Memory & Cognition 32*(2), 198–211.

Kim, M., McGregor, K. K. & Thompson, C. (2000). Early lexical development in English and Korean-speaking children: Language-general and language-specific patterns. *Journal of Child Language 27*, 225–254.

Levinson, S. C. (1996). Frames of reference and Molyneux's question: Crosslinguistic evidence. In P. Bloom, M. A. Peterson, L. Nadel, & M. F. Garrett (Eds.), *Language and space* (pp. 109–169). Cambridge, MA: MIT Press.

Lucy, J. A. (1992). *Language diversity and thought: A reformation of the linguistic relativity hypothesis.* Cambridge, MA: Cambridge University Press.

Macnamara, J. (1972). Cognitive basis of language learning in infants. *Psychological Review, 79,* 1–13.

Maratsos, M. P., & Chalkley, M. A. (1980). The internal language of children's syntax: The ontogenesis and representation of syntactic categories. In K. Nelson (Ed.), *Children's language* (Vol. 2, pp.). New York: Gardner Press.

Markman, E. M. (1989). *Categorization and naming in children: Problems of induction.* Cambridge, MA: MIT Press.

Markman, E. M., & Hutchinson, J. E. (1984). Children's sensitivity to constraints on word meaning: Taxonomic versus thematic relations. *Cognitive Psychology, 16,* 1–27.

Nelson, K. (1973). Structure and strategy in learning to talk. *Monographs of the Society for Research in Child Development, 38* (Serial Nos. 1–2), 1–136.

Ogura, T., Dale, P., Yamashita, Y., Murase, T., & Mahieu, A. (2006). The use of nouns and verbs by Japanese children and their caregivers in book-reading and toy-playing contexts. *Journal of Child Language, 33,* 1–29.

Pae, S. (1993). *Early vocabulary in Korean: Are nouns easier to learn than verbs?* Unpublished doctoral dissertation, University of Kansas, Lawrence.

Pine, J. M., Lieven, E. V. M., & Rowland, C. (1996). Observational and checklist measures of vocabulary composition: what do they mean? *Journal of Child Language, 23,* 573–589.

Rattermann, M. J., & Gentner, D. (1998). The effect of language on similarity: The use of relational labels improves young children's performance in a mapping task. In K. Holyoak, D. Gentner, & B. Kokinov (Eds.), *Advances in analogy research: Integration of theory & data from the cognitive, computational, and neural sciences* (pp. 274–282). Sophia: New Bulgarian University.

Schieffelin, B. B. (1985). The acquisition of Kaluli. In D. I. Slobin (Ed.), *The crosslinguistic study of language acquisition* (Vol. 1). Mahwah, NJ: Erlbaum.

Schwartz, R. G., & Leonard, L. B. (1980). Words, objects, and actions in early lexical acquisition. *Papers and Reports in Child Language Development, 19,* 29–36.

Slobin, D. I. (1973). Cognitive prerequisites for the development of grammar. In C. Ferguson & D.I. Slobin (Eds.), *Studies of child language and development*. New York: Holt, Rinehart & Winston.

Slobin, D. I. (1996). Two ways to travel: Verbs of motion in English and Spanish. In M. Shibatani & S. A. Thompson (Eds.) *Essays in syntax and semantics* (pp. 195–220). Oxford: Oxford University Press.

Sloutsky, V. M., & Yarlas, A. S. (submitted). Processing of information structure: Mental representations of elements and relations.

Spelke, E. S. (1990). Principles of object perception. *Cognitive Science, 14,* 29–56.

Talmy, L. (1975). Semantics and syntax of motion. In J. Kimball (Ed.), *Syntax and semantics* (Vol. 4, pp. 181–238). New York: Academic Press.

Tardif, T. (1996). Nouns are not always learned before verbs: Evidence from Mandarin speakers' early vocabularies. *Developmental Psychology, 32*(3), 492–504.

Tardif, T., (2005, April). *But are they really verbs?* Paper presented at the meeting of the Society for Child Development, Atlanta, Georgia.

Tardif, T., Gelman, S. A., & Xu, F. (1999). Putting the noun bias in context: A comparison of English and Mandarin. *Child Development, 70*(3), 620–635.

Tomasello, M. (2000). Do young children have adult syntactic competence? *Cognition, 74*(3), 209–253.

Watson, C. S. (1976). Factors in the discrimination of word-length auditory patterns. In S. K. Hirsh, D. H. Eldredge, I. J. Hirsh, & S. R. Silverman (Eds.), *Hearing and Davis: Essays honoring Hallowell Davis* (pp. 175–189). St. Louis, MO: Washington University Press.

Waxman, S. R. (1990). Linguistic biases and the establishment of conceptual hierarchies: Evidence from preschool children. *Cognitive Development, 5*,123–150.

Waxman, S. R., & Markow, D. B. (1995). Words as invitations to form categories: Evidence from 12- to 13-month-old infants. *Cognitive Psychology, 29,* 257–302.

Young, R. W., & Morgan, W. Sr. (1987). *The Navajo language: A grammar and colloquial dictionary*. Albuquerque, NM: University of New Mexico Press.

Young, R. W., & Morgan, W., Sr., with Midgette, S. (1992). *Analytical lexicon of Navajo*. Albuquerque, NM: University of New Mexico Press.