21   Why Verbs Are Hard to Learn

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Words do not all connect to the world in the same way. Some words basically point and refer to things in the world, while others organize the world into semantic systems and name according to the system. According to the natural partitions hypothesis, the noun class has the privilege of naming the highly cohesive bits of the world, whereas verbs and prepositions have the job of partitioning the leftovers-a diffuse set of largely relational components (Gentner, 1981, 1982; Gentner & Boroditsky, 2001). The contrast between concrete nouns and verbs is in part the contrast between local individuation and individuation as part of a semantic system. As Gentner (1982, p. 324) argued,

> There are in the experiential flow certain highly cohesive collections of percepts that are universally conceptualized as objects, and ... 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.

In other words, many concrete nouns refer to naturally individuated referents. In contrast, even fairly concrete verb meanings (such as those of motion verbs) make a selection from the available relational information, and just *which* information is selected varies across languages (Talmy, 1975, 1985). This brings us to Gentner's (1981, 1982) second theoretical claim made-namely, that verb meanings are more variable cross-linguistically than noun meanings:

> When we lexicalize the perceptual world, the assignment of relational terms is more variable crosslinguistically than that of nominal terms... . Predicates show a more variable mapping from concepts to words... . Thus, for verbs and other relational terms, children must discover how

their language combines and lexicalizes the elements of the perceptual field. (Gentner, 1982, pp. 323-325)

This claim-termed *relational relativity-was* inspired in large part by Talmy's (1975) seminal thesis research, which convincingly demonstrated that verb semantic structures vary substantially across languages. 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), and/or the shape of the moving figure (as in Atsugewi). Since this time, further research has shown more examples of cross-linguistic variability in the semantics of relational terms: for example, Casad and Langacker (1985) on the semantics of spatial terms in Cora; Bowerman and Choi (2003; Choi & Bowerman, 1991) on verbs of support and containment in Korean versus English; Levinson (1996) and his colleagues on spatial terms in Mayan languages; and Slobin (1996) on motion verbs in English and Spanish.

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 semantic of her language. My hypothesis that names for concrete objects should be learnable very early was supported by two other lines of evidence. First was the finding by Spelke (1985, 1990) and Baillargeon (1987) that prelinguistic infants can form stable object concepts even during their first year of life, suggesting that objects can be individuated and parsed out from the perceptual flow purely on the basis of experience. The second line of support was Brent Berlin's anthropological work on biological categories, which suggested considerable cross-linguistic uniformity in naming, at least for some kinds of biological categories (Berlin, Breedlove, & Raven, 1973). Berlin and his colleagues asserted that generic categories (which Rosch, Mervis, Gray, Johnson, & Boynes-Braem, 1976, later called basic *level categories)* in biology tend to "carve nature at the joints" and that these categories are remarkably stable across cultures. Extrapolating from biological terms to other concrete nouns is of course a bit of a leap, but it suggests a generalization: that some noun referents are stable across cultures and languages.

Relational relativity combines the idea that verb meanings are cross-linguistically variable with the idea that some noun meanings are relatively stable across languages. It states that verb semantics varies more across languages than does noun semantics, at least for concrete nouns. Relational relativity is an outcome of a difference in word-to-world mapping transparency, which in turn stems from a deep difference in the way in which nouns and verbs connect to the world. For concrete nouns and proper nouns that name animate beings, the referents are naturally individuated out of the stream of perception. In contrast, there is no natural individuation for the referents of verbs. Verb meanings include only part of the available relational information, and just *which* information they include varies

across languages (e.g., Bowerman & Choi, 2003; Casad & Langacker, 1985; Levinson, 1996; Slobin, 1996; Talmy, 1985). This theoretical framework implies that the mapping between word and referent is more transparent for concrete nouns than it is for verbs.

Acquisition

The assertion that concrete nouns have a more transparent mapping from language to the world than do verbs has important implications for acquisition: it implies that nouns will predominate over verbs in children's first vocabularies cross-linguistically:

> The natural partitions account has it that children learn concrete nouns early because, as object-reference terms, they have a particularly transparent semantic mapping to the perceptual-conceptual world.... Verbs and other predicate terms, however, have a less transparent relation to the perceptual world. (Gentner, 1982, p. 328)

The claim of the natural partitions hypothesis is that even a prelinguistic infant has already individuated many entities. Thus for many nouns, she or he has only to attach the noun to a referent that she or he has already isolated. This is not the case for relational terms such as verbs and prepositions; their referents are not simply "out there" in the experiential world, they are linguistically selected. To learn what a verb means, the child must discover which aspects of the situation enter into its meaning in her language (Gentner, 1982; Gentner & Boroditsky, 2001).

Of course, not all nouns are easily individuated. As Gentner (1982, p. 328) noted, these claims apply only to concrete nouns'-including proper nouns that name animate beings-and not to abstract and relational nouns (for further discussion of relational nouns, see Gentner, 2005; Gentner & Kurtz, 2005).

This view suggests that noun referential bindings are the natural starting point for language acquisition, and that these early-learned bindings may facilitate other aspects of language learning:

> 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)

Noun-object bindings thus could provide a basis for working out the more variable aspects of language, including the binding of semantic relations to verb structures (see Fisher, 1996; Gleitman, 1990, for similar proposals).

The natural partitions/relational relativity (NP/RR) hypotheses makes two key predictions for acquisition: (1) there will be a universal early noun advantage in acquisition, and (2) possessing a stock of nouns will help children learn less transparent relational terms-notably verbs and prepositions. There is considerable support for the first prediction. Nouns predominate over verbs in early production and comprehension in English (Gentner, 1982; Goldin-Meadow, Seligman, & Gelman, 1976; Huttenlocher, 1974; Huttenlocher & Smiley, 1987; Macnamara, 1972; Nelson, 1973) and other languages (Au, Dapretto, & Song, 1994; Bornstein et al., 2004; Caselli et al., 1995; Gentner & Boroditsky, 2005; Kim, McGregor, & Thompson, 2000; Pae, 1993). Further, children appear to take novel words as names for objects (Landau, Smith, & Jones, 1998; Markman, 1989, 1990; Waxman, 1991; Waxman & Hall, 1993), even as early as 13 months of age (Waxman & Markow, 1995). Woodward and Markman's (1998) review of the evidence confirmed an early predominance of names for objects and individuals in early vocabulary and a later increase in the proportion of relational terms, consistent with the second prediction.

Further Predictions

Beyond these first two central predictions, four other predictions follow from the NP/RR hypothesis. Prediction 3 is that novel nouns should be learned more readily than novel verbs by young children. This prediction has been borne out in studies that controlled frequency and position in sentence (Schwartz & Leonard, 1980) as well as in studies that controlled phonology (Camarata & Leonard, 1986). A particularly relevant study was done by Childers and Tomasello (2002). They taught 2-year-olds new words-either nouns or verbs-or new actions to imitate. The children learned nouns far more rapidly than verbs, and actions more rapidly than either word class. This order belies the view that verbs should be learned early because children attend to dynamic events. An interest in dynamic events is not enough to learn verbs; the child must learn what to attend to. Another interesting finding was that the children learned better when presentation was distributed over several days than when an equal number of exposures was given on the same day. Childers and Tomasello (2002) note that this advantage of distributed over massed presentation has been found across a wide variety of learning studies, suggesting the operation of a general learning process.

Prediction 4 is that within the noun class, words for highly individuable entities, such as concrete objects and animate beings, will be learned especially early. I return to this prediction later. Prediction 5 is that even after verbs enter the vocabulary, children may take some time to fully learn their meanings. Indeed, Melissa Bowerman (1982) has found that children make semantic errors on verbs and other relational terms even quite late in language learning: for example, "I come it closer so it won't fall" (at 2 years, 9 months, while bringing the bowl closer to herself); "Want me to come it out?" (at 3 years, 9 months, referring to the broken end of a marker); "Don't dead him" (at 4 years, 10 months, as mother picks up a spider). Such errors suggest that children are still in the process of learning the semantic systems for verbs in their language.

Prediction 6 of the NP/RR hypothesis is that once the system of verb semantics has been mastered, it will influence the way in which new verbs are learned. That is, speakers of a given language should learn new verbs according to the semantic system in that language. Nagy and Gentner (1990) tested this claim by giving adults passages containing novel nouns or verb embedded in passages containing many rich contextual details that could have entered into the word's meaning. Later in the passage, the word was used again in a more neutral passage. After reading the passage, participants were given questions designed to reveal what they thought the words meant. The results showed that people were highly selective: they retained those features from the first context that were appropriate to whichever form class they had received.

Prediction 7 is that there should also be a noun advantage in second-language learning; this follows from the assumption that the lag in verb acquisition stems from lack of knowledge, not maturational factors. This prediction has been borne out in studies of second-language learning in English and other languages (Dietrich, 1985; Kallkvist, 1999). Further, second-language learners verbs make more errors for verbs than for nouns (Kallkvist, 1999; Lennon, 1996).

Input-Level Explanations

Summarizing so far, the natural partitions (NP) hypothesis states that the mapping between word and referent is highly transparent for some concrete nouns-those whose referents are readily individuated. The relational relativity claim implies further that there is no such preindividuated class of verbs. Their joint prediction, that nouns should predominate over verbs in children's first vocabularies across languages, has received considerable support in English and other languages.

However, before drawing the conclusion that the early noun advantage is a acquisitional universal, it is necessary to rule out the possibility that the noun advantage results solely from specific characteristics of the input language. Gentner (1982) considered this possibility and presented cross-linguistic data that tested specific input factors, including word order, relative morphological transparency, and patterns of language teaching. Table 21.1 shows the "verb-friendliness" score for each of the six languages considered, along with the proportion of nouns in the early vocabulary. She concluded that, while linguistic input factors do influence the degree of the noun advantage, they do not outweigh the semantic-conceptual advantage of nouns mapping to objects. However, the cross-linguistic vocabulary data in Gentner (1982) were admittedly rather spotty. They were mostly collected on the side by researchers whose main purpose was to collect other cross-linguistic data.

Fortunately, other researchers took up the issue, inspired (or infuriated) by this claim of a universal noun advantage in acquisition. These investigations focused on languages whose input properties seemed to favor verbs and which therefore

Table 21.1 Combined estimate of verb-friendly input factors

Language	Word Order	Verb-Final	Relative Morphological Complexity	Object-Reference Not Taught	Verb-Friendly Score	Proper Verbs
English	SVO		X		1	.17
German	SOV (some)	X		X	2	.14
Japanese	SOV	XX			2	.19
Mandarin	SVO		XX		2	.27
Turkish	SOV	XX		X	3	.21
Kaluli	SOV OSV	XX		XX	4	.26

X, Favors verbs.
The entries represent rough estimates of the degree of support for verb learning offered by the factor in question in the particular language verb.

Data from Gentner (1982).

seemed likely to show a verb advantage. On the basis of these studies, some researchers argued against the NP claim of a universal noun advantage. For example, Gopnik and Choi (1995) investigated early language use in Korean, which is verb-final and allows pro-drop, making the verb highly salient in speech to children (see also Choi & Gopnik, 1995). Based on the results of a questionnaire for parents concerning the language used by their young children, they concluded that the noun advantage does not appear in Korean.

Tardif (1996) investigated acquisition in Mandarin. Gentner (1982) had suggested that Mandarin might be more verb-friendly than English. This speculation was based on the fact that in Mandarin comes the closest of any language to having equal morphological complexity for verbs and nouns. In languages that use affixes and other morphological devices, the complexity and variability of the morphological system is greater for verbs than for nouns. For example, a child learning the verb *jump will* hear the forms *jump, jumps, jumped,* and *jumping,* whereas a child learning a noun such as *dog will* hear only *dog* and *dogs.* Thus, the difficulty in learning verb meanings in English could stem from having to trace the same verb root across different surface morphological forms. However, Mandarin has no morphology on *either* nouns or verbs, resulting in a level playing field, morphologically speaking. Gentner reasoned that if differential morphological complexity contributes to the noun advantage, then the noun advantage should be attenuated in Mandarin. This was not the case for the two Mandarin children included in Gentner's (1982) study. For both children, nominals (including proper nouns) were the dominant class (.65 and .59 mean proportions). This led Gentner to conclude that differences in morphological complexity could not by itself account for the noun advantage (see table 21.1).

Tardif (1996) found a very different result; she reported that Mandarin children at 2 years, 8 months had as many or more verbs as nouns. However, her later studies, using checklists,[2] have shown an early noun advantage in Mandarin (Tardif, 2002; Tardif, Gelman, & Xu, 1999). Other recent evidence also favors the claim of a universal noun advantage (Bornstein et al., 2004; Caselli et al., 1995). This evidence has shown early noun dominance even in verb-friendly languages such as Korean (Au et al., 1994; Kim et al., 2002; Pae, 1993) and Mandarin (Gelman & Tardif, 1998; Tardif et al., 1999; but see Tardif, Shatz, & Naigles, 1997).

In Korean, a comprehensive study was done by Pae (1993). She used a checklist adapted for Korean (as well as observational methods) to assess the vocabularies of 90 children of monolingual families living in Seoul between the ages of 12 and 23 months. She found a strong noun advantage throughout. At 51–100 words, the children's productive vocabularies contained 50–60% nouns and about 5% verbs. Indeed, as shown in figure 21.1, Pae found that the proportions of nouns and verbs in the productive vocabularies of Korean children were comparable to those found in English (though see Kim et al., 2000).

Imai et al.'s findings (chapter 17, this volume) that Mandarin-speaking children learn new nouns much more readily than new verbs—and even more strikingly, that Mandarin-speaking children learn new verbs less readily than Japanese- and English-speaking children—further undermine the suggestion of rapid verb learning in Mandarin. We discuss these findings further below.

Recent Findings Exploring Different Typologies

Our recent studies have explored a new typological arena, that of the richly morphologized American Indian languages. Our checklist studies have shown a noun advantage for both Navajo (Gentner & Boroditsky, 2001; 2005) and Tzeltal (Brown, Gentner, & Braun, 2005). The findings for Tzeltal are particularly interesting, as there is reason to believe that verb acquisition might be particularly rapid in Tzeltal (Brown, 1998; see de Leon, 1999, for similar claims concerning Tzotzil, a close neighbor). Tzeltal has rich morphology on both nouns and verbs, although (as is generally true), verbs take more inflections than nouns. It is a verb-object-subject language, and thus places the verb in the first position, a more salient position than in the English subject-verb-object order. Further, it allows noun-dropping, so that the child often hears a verb as the first or only element of a sentence. Further, many Tzeltal verbs—including those learned by children—are what Brown (1998) called *heavy verbs*—semantically specific verbs with rich, contextually specific meanings, incorporating many object properties. There are many different verbs for eating, carrying, and so on, depending on the shape, substance, position or orientation of the objects acted on. For example, instead of a general verb *to eat* as in English, Tzeltal has several different eat-verbs for eating different kinds of things: *we'*, eat tortilla or bread; *k'ux*, eat crunchy things; *lo'*, eat soft
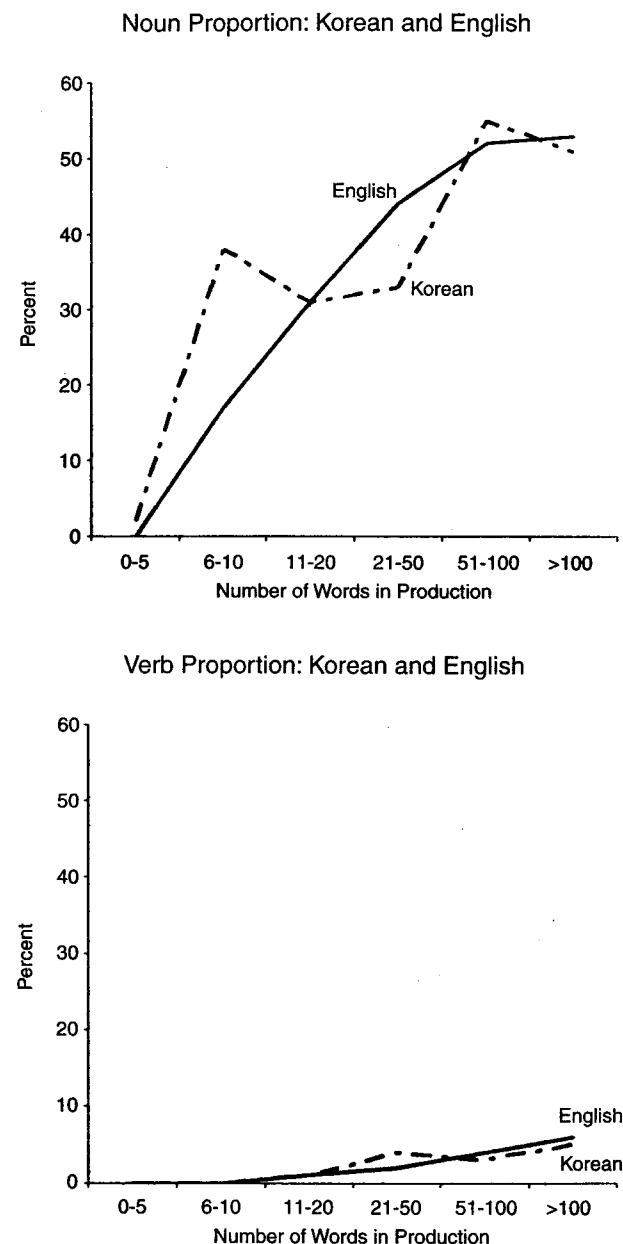

Figure 21.1. Proportions of nouns and verbs in early acquisition in Korean and English productive vocabularies (adapted from Pae, 1993).

things like bananas; and *ti,* eat meat, or bite. Because these verbs incorporate properties of their objects, acquiring their meaning does not require the same degree of abstraction from the situation as with more general verbs, such as English *eat.* Brown (1998) thus suggested that children could find them easier to acquire than English verbs, which require a greater degree of decontextualization. Consistent with this conjecture, de Leon (1999) reported rapid acquisition of verbs in a Tzotzil child, based on analyzing recorded transcripts.

To test this, we constructed a checklist for Tzeltal (see Brown et al., 2005). On the principle that it is better for a checklist to include too many words than too few, we began with an extremely broad list that included words from an English checklist (the MCDI for English toddlers; Fenson et al., 1993), a Korean checklist (Au et al., 1994), and a Navajo checklist (Gentner & Boroditsky, 2005). This extended list (in English gloss) was translated into Tzeltal by P. Brown. Brown also augmented and filtered the list, adding words that might possibly be heard by a Tzeltal child, and removing words that had no Tzeltal equivalent. This initial Tzeltal checklist was then read to women in the village, who were asked to say for each word whether a young child might know the word (either to say or to understand). The women also provided any other words that they thought a child might know instead of, or in addition to, the words on the initial list. This included child versions of words (the equivalent of "doggy" and "kitty cat").

We next administered the preliminary checklist to the grandmother of a Tzeltal child, eliciting comments such as "She doesn't say X, but she does say Y and Z." We added all such words Y and Z to the list (usually also retaining word X). Our goal was to create a maximally inclusive list. We tried to give the children every opportunity to display understanding of verbs; to this end we included more than one inflected form of the same verb when our informants considered both forms likely to be said by young children. This way a child who knew the verb in (for example) only the first-person form would not be mistakenly scored as not knowing the verb (as might occur if the verbs were only tested in one standard form). (Of course, it must be noted that this technique could result in overestimating the number of verbs children know, because different forms of the same verb are counted as separate verbs.)

The completed list contained 594 words-283 nouns, 207 verbs, and 104 other words. When we administered this list to five Tzeltal caretakers of young children, the results showed a uniform noun advantage across all the children. This can be seen in both the noun-verb ratio *(M=* 1.34:1, range 1.17:1-1.63:1) and the proportion of nouns over the total productive vocabulary (M = .57, range .54-.62). All five children were reported to produce more nouns than verbs *(M* = 174.6, range 67-225 for nouns; *M* = 132.6, range 47-190 for verbs).

Words for animate beings (including relatives' names) are prominent in the early vocabularies, comprising about one third of children's nouns (M = .30, range .28-33). This is consistent with Gentner and Boroditsky's (2002) claim that highly individuable entities will be lexicalized early (discussed further below).

Although the results show a clear noun advantage, they also reveal a comparatively large number of verbs; most studies have reported 10 or fewer verbs at the 50-word vocabulary level.[3] Assuming that our counts do not greatly overestimate the number of verbs acquired (as discussed above), these findings suggest that verb learning progresses relatively rapidly in Tzeltal. In this connection, it is reassuring that the noun-verb proportions are roughly consistent with those in Brown's (1998, table 1) report of a diary study of the vocabulary of a girl, Xan.[4] At 2 years 1 month years of age, she had 52 words: 20 verbs and 31 nouns (including proper nouns). This rapid verb learning may stem in part from the favorable word order. It is also consistent with Brown's (1998) conjecture that heavy verbs-with contextually rich semantics such as object incorporation-might be easier to acquire than semantically sparse (or more abstract) verbs. In summary, our findings suggest that Tzeltal children do indeed acquire verbs more rapidly than English children. However, even in this highly verb-friendly language, there is still a clear noun advantage. These findings strengthen the case for a universal early noun bias, and for individuability as a key factor in early word learning.

Studies of Teaching New Words

As Imai and colleagues point out (chapter 17, this volume), many of the methods used in assessing children's existing vocabularies have some difficulties (see also Gentner & Boroditsky, 2001; Pine, Lieven, & Rowland, 1996). Even if the obvious problems with using a few hours of transcript are avoided by adopting a checklist or journal method, it can be difficult to set up clear, objective criteria for classifying a given produced word into its appropriate form; and the fact that the child uses a given word in one context does not guarantee that she understands the full meaning of the word. This brings us to the second prediction of the NP hypothesis, namely, that early in learning, children should learn new nouns more readily than new verbs.

Childers and Tomasello (2002) investigated this question for English by teaching 2-year-olds either six novel nouns, six novel verbs, or six novel actions over a 2-week period. Children produced the nouns well before they produced the verbs (although comprehension was rapidly achieved for all three kinds of materials). Further, as noted above, (1) children learned the novel actions better than they learned either of the two word types, and (2) children learned both types of words better when exposures were distributed over four days than when they were massed in one day-a pattern typical of general learning processes.

The key question, of course, is whether this noun-dominance pattern in word learning will show up in languages whose input patterns are arguably more verb-friendly, such as Mandarin. Imai, Haryu, and Okada (2005) investigated this by showing a dynamic video scene of a person carrying out a novel action with a

novel object and labeling 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 (which would be correct for the noun, but not for the, verb) or the same action with a new object (which had the reverse pattern). Japanese-speaking children correctly generalized the novel nouns by the age of 3 years. Verbs were more difficult. Japanese-speaking children correctly generalized verbs only at 5 years of age. Among Mandarin-speaking children, verbs were not correctly extended until 8 years of age (Imai et al., chapter 17, this volume). Chinese children, even as old as 3-5 years, tended to map the verb to the object rather than the action. It is striking that Mandarin-speaking children had more difficulty in mapping a novel verb to its meaning than did Japanese- or English-speaking children. Imai et al.'s results bear out the NP prediction of a universal noun advantage, even for a language that (at least on grounds of differential morphological complexity) could be classified as verb-friendly.'

Why Are Verbs Harder Than Nouns?

My conclusion from the above discussion is that there is a semantic-conceptual basis for the early noun bias (though other factors in the input also influence the degree of bias). It is now time to delve more deeply into the nature and causes of this advantage. At least four possible semantic-conceptual explanations have been proposed for why verbs lag behind nouns in early acquisition: (1) maturational limitations, (2) difficulty in detecting the conceptual components of verbs, (3) difficulty in learning which semantic components enter into verbs and how they combine, and (4) order of information. I consider each of these in turn.

Maturation

Perhaps some level of a maturationally linked cognitive capacity is required to learn verbs. Such a view would be consistent with Halford, Wilson, and Phillips's (1998) position that the ability to carry out relational processing is limited by maturational increases in processing capacity. Two lines of evidence argue against this view. First, as discussed above, second-language learners show the same pattern of rapid learning of nouns together with slow and errorful learning of verbs and prepositions (Dietrich, 1985; Kallkvist, 1999; Lennon, 1996).

Second, research by Gillette, Gleitman, Gleitman, and Lederer (1999) demonstrates that maturation cannot be the whole explanation, for even adults show a noun advantage in mapping from language to the world. They showed adults silent videos of mothers talking to young children, with beeps marking the instances of a particular noun or verb, and asked them to guess the word uttered at the beeps. The participants identified about three times as many nouns as verbs. The fact that observational mapping was far more effective for nouns than for verbs, even for

adults, shows that the noun advantage cannot be due to a maturational limitation that impedes the learning of verbs.

These findings are especially striking because unlike children acquiring language, the adults in these studies already knew the semantics of their verbs. Also, unlike children, they were told the form class-noun or verb of the word they were seeking. These findings bear out the NP claim that there is greater difficulty in individuating verb referents than in individuating noun referents. Further, they demonstrate that maturational change is unlikely to be the explanation for the noun advantage.

Knowledge of Conceptual Components

Another possible reason that verbs might be slow in acquisition is that young children might lack knowledge of the conceptual and semantic components that enter into verbs. If children lack an understanding of the basic components of verb meanings, this could account for their slowness in learning verbs. This kind of explanation surely has a role to play; for example, a verb like *confiscate* or *divorce* can hardly be grasped without some understanding of the complex social relations they presuppose. And to take a more realistic example, Gentner (1975) investigated children's acquisition of verbs of possession and found that while semantically simple verbs *give* and *take* were enacted correctly by 3-year-olds, the verbs *buy* and *sell* were not correctly enacted until about 8 years of age. These verbs require some understanding of monetary transactions.

However, this kind of conceptual gap cannot explain the fact that children's understanding of motion verbs also lags behind their understanding of nouns (including many nouns that occur with considerable lower frequency). By a year of age, infants show considerable insight into simple events involving change of location or physical causation, yet motion verbs and causal verbs still lag behind nouns in their vocabulary acquisition. This underlines the point that there is more to verb learning than simply understanding conceptual relations in the world. As Gentner (1982, p. 326) put it:

> It is important to note that the Natural Partitions hypothesis does not assume that relations themselves are perceived later than objects ... even those sparse relations that act as predicates over objects are, I suspect, *perceived* quite early. Movement, change, directionality, and so on, seem quite interesting to infants.... It is not perceiving relations but packaging and lexicalizing them that is difficult.

In other words, the problem is *mapping*: figuring out which constellations of the semantic components a given verb refers to (Gentner, 1982). Recent evidence bears out the supposition that understanding of the individual semantic components of motion verbs is present well before the knowledge of how to assemble those components into verbs. Event cognition appears to be highly developed even in infants (e.g., Baillargeon &Wang, 2002; Golinkoff & Kerr, 1978; Gordon, 2004).

Even some early insight into intentions and goals has been demonstrated (Baldwin et al., 1996; Tomasello & Barton, 1994; Woodward, 1999).

Hirsh-Pasek and Golinkoff and their students (Pruden, Hirsh-Pasek, Maguire, & Meyer, 2004) carried out studies that directly address whether and when infants can learn the semantic components that enter into motion verbs. They showed 7- to 9-, 10- to 12-, and 13- to 15-month-old infants a series of dynamic events that all had the same actor ("Starry," an animated character) and the same path, but had four different manners. Both groups of infants were able to align these events and abstract the common path. When subsequently given two test events in which Starry moved in a new manner, in a preferential looking task, the infants could differentiate a new path from the old (invariant) path by 10-12 months. By 13-15 months, the infants could also extract an invariant manner across four different paths.

Adding words to the preferential looking task appears to increase the likelihood that 7- to 9-month-olds will extract the invariant path across the four exemplars with varying manner. The repeated word may invite aligning and abstracting the path across the set of exemplars, consistent with Gentner and Namy's "words as invitations to compare" and with Brown's (1958) "words as invitations to form categories." Interestingly, even at this early stage there may be an influence of the language children are learning, at least among children with higher maternal reported vocabularies. In a set of studies that asked children to discriminate between manner and path changes in events with Starry as the protagonist, English-reared children more readily detected manner changes (Pulverman, Scotsman, Golinkoff, & Hirsh-Pasek, 2001, 2003; Maguire, Hirsh-Pasek, Golinkoff, & Imai, 2005). Thus it appears that infants can extract some of the separate manner and path components that enter into motion verbs.

However, a different story emerged when the semantic components were combined into words, as in a real verb-learning situation. Infants and toddlers were presented with scenes of several women, all performing the same action. When given this task nonverbally, 9- to 12-month-olds subsequently differentiated a new action from the familiar action (both performed by a new woman; Salkind, Sootsman, Golinkoff, Hirsh-Pasek, & Maguire, 2002). Yet, when the action was described by a novel verb, and the children were asked, "Where's she blicking? Find blicking," they failed to find the woman who was blicking. In fact, even 3-year-olds failed at this task (Maguire et al., 2001). When a set of relational components occurred across different actors, the presence of words no longer improved performance; instead, the reverse occurred. These results point up the gap between detecting particular facets of dynamic events and learning how to combine them into verb meanings.

This is a very instructive set of studies. It underscores the gap is between the ability to extract particular components of a verb's meaning in a focused task and the ability to select the right set of semantic components from the vast amount of potential relational information in the world. It also dramatizes an important methodological point. As Gentner and Namy (2004) point out, habituation and familiarization studies in which a series of highly alignable exemplars are presented represent an ideal learning situation. The ability to align the exemplars across such a series and abstract the common element does not entitle the researcher to conclude that the infant possesses that category. To draw such a conclusion, it must be shown that the infant can use the category in other situations. This kind of sequence of perfectly alignable exemplars should be seen as a boundary condition: it represents an existence proof that under ideal learning conditions the infant can derive the abstraction.

Golinkoff and Hirsh-Pasek's findings suggest that the ability to extract individual semantic components does not by itself solve the problem of verb learning. Childers and Tomasello's (2002) findings also argue against the idea that children's lag in learning verbs stems simply from a lack of knowledge of the semantic components. As discussed above, they found that when 2-year-olds were taught new nouns, new verbs, or new actions to imitate, they learned the action-imitation very quickly but learned the verbs slowly. Finally, Bauer and Dow (1994) have found that infants from 16 months to can remember and reproduce sequences of actions quite accurately after a delay. These findings suggest that children's difficulty with verbs does not stem solely from lack of understanding of events. They can readily grasp, retain, and correctly enact many events. Rather, what children lack is an understanding of how verbs map onto events and relations in the world.

Information Order

The "nouns before verbs" pattern in acquisition may be one instance of a very general pattern of order of learning. Learners of a new domain commonly show a *relational shift:* They focus on object properties before they are able to focus on relations-Gentner (1988; Gentner & Rattermann, 1991; Rattermann & Gentner, 1998). For example, 3-year-olds asked to choose the solution to an analogy task tend to choose an (incorrect) object match instead of the correct relational match. Gentner and Rattermann (1991) reviewed evidence that this shift is based on gains in knowledge, not simply on maturation; it occurs at different ages across different domains.

Early in their understanding of a given domain, children tend to focus on object matches, such as the match between a round red ball and a round red apple. With increasing knowledge, children come to make relational similarity matches (e.g., a ball rolling on a counter and a toy car rolling on the floor). For example, Gentner and Rattermann (1991) gave children a relational mapping task in which the object matches conflicted with the best relational match. The relation was a simple perceptual relation-same relative size and position. Even though children were shown the correct answer on each trial, 3-year-olds were at chance on this task; they had a strong tendency to make the (incorrect) object matches instead of

the (correct) relational match. By 5 years of age, children succeeded at the relational mapping.

A relational shift was found at a later age in a more challenging causal picture mapping task. Gentner and Flusberg (2005) showed children two pictures-(1) a cat chasing a mouse and (2) a dog chasing a cat. The experimenter pointed to the cat in picture (1) and asked what it best matched in picture (2). Children aged 5-7 years strongly preferred the object match (cat to cat). When the experimenter emphasized the relation in the instructions (e.g., "Do you see this one that's chasing? What does it go with?"), the 7-year-olds, but not the 5-year-olds, chose the relational match (cat to dog).

These general learning patterns predict exactly the pattern found in children's word learning: earlier learning of object nouns than of relational terms such as verbs. Noun-object bindings can be learned locally, whereas learning a relation requires attending to the objects bound by the relation as well. A further parallel is that once a store of initial object matches are learned, they can facilitate the learning of verbs; a relation can more easily be inferred if its objects are clear.

Nouns and Names

Learning object nouns is relatively easy for children, but as noted above, it paves the way for learning less transparent relational words. But what exactly characterizes the easy object mappings? According to NP, it is ease of individuation that distinguishes the early easy mappings from word to world. This means that nouns with dearly individuable referents, such as concrete nouns and proper names of animate beings, are the privileged set. Recently, Gleitman and her colleagues have proposed an account of early word learning similar to the NP hypothesis, but differing in its characterization of the privileged, early-learned class of nouns (Gleitman, Cassidy, Nappa, Papafragou, & Trueswell, 2005; Kako, 2005). They suggest that the privileged referent class is basic level concrete categories, rather than highly individuable entities and categories as in the NP hypothesis.

These two positions overlap considerably. The members of concrete basic level categories are typically easily individuated. Also, basic-level category terms are highly likely to be used with children (Rosch et al., 1976). Thus basic level concrete object nouns should be acquired early on either account. However, one salient difference is that the NP hypothesis (but not the basic level categories hypothesis) extends to proper names for animate beings (see Kako, 2005). Animate beings are maximally individuable. Accordingly, the NP hypothesis predicts that in addition to basic-level terms like *dog,* proper names like *Mommy, Rover,* and *Auntie* should be highly frequent in early vocabularies.s Proper names for animate beings should be charter members of the privileged, easy-to-acquire class.'

What is the evidence on this point? Are names (including proper names) for animate beings learned especially early, as predicted by the NP hypothesis? Caselli et al. (1995) used the MacArthur checklist to assess the early vocabularies of 659 English-speaking and 195 Italian-speaking infants. Proper names for animate beings constituted two of the first five words produced on average in English *(Daddy* and *Mommy)* and three of the first five in Italian *(Mamma, Papa,* and *Nonna* [grandmother]). A fourth word, *bau-bau* (for dogs), also refers to animate beings. For the six children of six different languages whose early vocabularies are given in Gentner's (1982, table 5) corpus, names for animate beings (including both proper and common nouns) accounted for 33-100% of the first nominals.

There is some evidence that the proportion of animate nouns to total nouns drops as vocabulary size increases, as would be expected if animate beings are particularly easy to individuate. For example, a Kaluli girl at 1 year 8 months (with 16 recorded words) had as her first eight nominals seven names for people and one animal term. Thus, names for animate beings constituted 100% of her early nominals, with person names dominating. For Xiao-Jing, a Mandarin girl aged 1 year, 6 months with 37 recorded words, names for animate entities constituted 50% of the early nominals and 30% of her total vocabulary, and most of these were person names. An English girl (age 1 year, 2 months, vocabulary 39) and a German boy (age 1 year, 8 months, vocabulary 33) had 36% animates. But these children contrast with the Kaluli and Mandarin child: For these children, with their smaller extended families, animal names were as prominent as person names. The makeup of the early animates may differ cross-culturally. Children whose cultures emphasize extended sets of relatives, like the Kaluli and Mandarin child just discussed, tend to have large numbers of person names (proper names and kin terms); children who grow up in smaller families may learn a higher proportion of animal names. However, overall, proper names appear quite common in early vocabularies, consistent with the individuability account.

In sum, I have argued that words connect to the world in very different ways, that (concrete) nouns do so more transparently than verbs, and that verb meanings are more linguistically shaped than (concrete) noun meanings. Although many factors at all levels contribute to determining what is learned early by children, these semantic-conceptual factors are certainly among the core influences on how words connect to the world.

Notes

1. However, for brevity, I will use the term *noun* to refer to concrete nouns (and to proper nouns that refer to animate beings). I will use terms such as *abstract noun* and *relational noun* for other kinds of nouns.

2. Tardif (1996) initially reported that Mandarin at 2 years, 8 months had as many or more verbs than nouns. However, her vocabulary assessment was based on a transcription of the words spoken in 1 hour; vocabulary size was estimated at under 80 for children of this age, an improbably low estimate. In an extremely interesting study, Tardif, Gelman, and Xu (1999) showed that estimates from observational transcripts of both absolute and relative numbers of nouns and verbs are highly variable with

context, casting doubt on their value as vocabulary assessments. Further, using a checklist, they showed that Mandarin children aged 2 years, 2 months have twice as many nouns as verbs. The checklist also revealed a much higher (and more plausible) vocabulary count (over 300 words) than had been found using her earlier observational method. Thus it appeared that Mandarin children when tested with a checklist show a noun preponderance. Recently Tardif (2002) has reported corroborating findings: early Mandarin vocabularies show noun dominance, although subsequent verb learning is more rapid than in English.

3. For example, in Pae's (1993) detailed study of Korean acquisition, the results showed a mean of 2 verbs (and 17 nouns) at 21-50 words and a mean of 4 verbs (and 49 nouns) at 51-100 words, comparable to English.

4. Xan's vocabulary was assessed with a combination of transcripts and parental lists.

5. Of course, these results also call into question whether Mandarin is indeed a verb-friendly language. Gentner's (1982) original suggestion that Mandarin might be verb friendly was based on the fact that Mandarin has equal morphological complexity in nouns and verbs (i.e., none). But Imai et al.'s data call for a rethinking of this issue. Imai et al. suggest that the lack of *any* morphology on nouns and verbs in Mandarin may in fact make it more difficult for children to form separate syntactic classes of nouns and verbs. Of course, both ideas could be correct; it may be that (1) equal morphological complexity benefits verbs, but (2) having a morphological distinction between nouns and verbs also aids in verb learning. Unfortunately, to my knowledge there is no test language in which the number of inflections that can appear on nouns and verbs is equal but nonzero.

6. One implication of this point is that inclusion of proper names is essential in tests of the NP hypothesis. Many such studies have failed to include proper nouns (e.g., Tardif, 1996).

7. Comrie (1981, p. 179) notes that some languages treat proper names as being "higher in animacy" than common noun phrases: for example, "William Shakespeare" versus "the author of Hamlet."

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Author Index