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Methods, Models, and Research Disorders

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11

Using the Hands to Study How Children Learn Language

SUSAN GOLDIN-MEADOW

Gesture provides privileged access to information that language-learning children know but do not say. For example, young children who are not yet able to produce two-word sentences ("mommy's hat") are nevertheless able to express sentence-like ideas using gesture and speech ("mommy" + point at hat). Importantly, children who produce these gesture + speech "sentences" will utter their first two-word utterance before children who have not yet produced a gesture + speech combination of this sort. Children's gestures can thus identify them as ready to take the next step on the path toward language acquisition (Iverson & Goldin-Meadow, 2005; Ozcaliskan & Goldin-Meadow, 2005). In addition, evidence is mounting that gesture can do more than identify the next cognitive step a child is about to take. Gesture can actually play a role in helping the child take that step (Goldin-Meadow & Wagner, 2005).

Moreover, gesture has the potential to provide insight into other aspects of the language-learning process—it can offer a window onto the linguistic preconceptions that children bring to language learning. Deaf children whose hearing losses prevent them from acquiring a spoken language and whose hearing parents have not exposed them to a sign language use gesture to communicate with the hearing individuals in their worlds. Despite the fact that these children have not been exposed to a conventional language model, their gestures take on many of the structures found in natural languages (Goldin-Meadow, 2003b). Gesture can thus shed light on properties of language that are robust enough to be invented by a child in the absence of linguistic input.

This chapter explores these two ways that gesture can be used within the language-learning domain:

1. As a tool to explore the predispositions children bring to language-learning before exposure to a language model
2. As a tool to track the early steps children take when learning the language of their community.

My goal is to illustrate the unique information that can be gleaned about language learning from watching how children use their hands to communicate.

GESTURE CAN TELL US ABOUT THE SKILLS CHILDREN BRING TO LANGUAGE

When deaf children are exposed to sign language from birth, they learn that language as naturally as hearing children learn spoken language (Newport & Meier, 1985). However, 90% of deaf children are not born to deaf parents who could provide early access to sign language. Instead, they are born to hearing parents who often choose to expose their children solely to speech (Hoffmeister & Wilbur, 1980). Unfortunately, it is uncommon for deaf children with profound hearing losses to acquire spoken language, even with specialized instruction (Conrad, 1979; Mayberry, 1992).

My colleagues and I have studied 10 profoundly deaf children in the United States and four in Taiwan whose hearing losses prevented them from acquiring spoken language and whose hearing parents had decided to educate them in oral schools where sign language was neither taught nor encouraged (Feldman, Goldin-Meadow, & Gleitman, 1978; Goldin-Meadow & Feldman, 1977; Goldin-Meadow & Mylander, 1984, 1998). The children had made little progress in oral language and, in addition, had not been exposed to sign language in or out of school. As a result, the children had no usable model for a conventional language, neither signed nor spoken. Nevertheless, the children spontaneously used gestures to communicate. What is particularly surprising is that the children's gestures displayed many of the structural properties characteristic of natural language. I have called the linguistic properties that deaf children introduced into their gesture systems *resilient* properties of language (Goldin-Meadow, 1982; 2003a). Table 11.1 lists properties of language identified in deaf children's gesture systems thus far.

This chapter focuses on the structural aspects of deaf children's gesture systems, specifically, on word- and sentence-level structures. However, it is important to note that the children used their gesture systems for a wide variety of linguistic functions:

- To make requests, comments, and queries about things and events happening at the moment, that is, to communicate about the here and now (Goldin-Meadow & Mylander, 1984)
- To communicate about objects and events taking place in the past, in the future, or in a hypothetical world, that is, to communicate about the nonpresent (Butcher, Mylander, & Goldin-Meadow, 1991; Morford & Goldin-Meadow, 1997)
- To make category-broad generic statements about objects, particularly about natural kinds (Goldin-Meadow, Gelman, & Mylander, 2005)

Table 11.1 The Resilient Properties of Language

	The Resilient Property	As Instantiated in Deaf Children's Gesture Systems
Words		
	Stability	Gesture forms are stable and do not change capriciously with changing situations.
	Paradigms	Gestures consist of smaller parts that can be recombined to produce new gestures with different meanings.
	Categories	The parts of gestures are composed of a limited set of forms, each associated with a particular meaning.
	Arbitrariness	The relation between gesture form and meaning, although essentially transparent (i.e., it is easy to guess its meaning from its form), has arbitrary aspects.
	Grammatical functions	Gestures are differentiated by the noun, verb, and adjective grammatical functions they serve.
Sentences		
	Underlying frames	Frames organized around the act predicate underlie gesture sentences.
	Deletion	Consistent production and deletion of gestures within a sentence mark particular thematic roles.
	Word Order	Consistent orderings of gestures within a sentence mark particular thematic roles.
	Inflections	Consistent inflections on gestures mark particular thematic roles.
	Recursion	Complex gesture sentences are created by recursion.
	Redundancy reduction	Gestures are produced for redundant semantic elements in complex sentences less often than for nonredundant semantic elements.
Language Use		
	Here-and-now talk	Gesturing is used to make requests, comments, and queries about the present.
	Displaced talk	Gesturing is used to communicate about the past, future, and hypothetical.
	Narrative	Gesturing is used to tell stories about self and others.
	Self-talk	Gesturing is used to communicate with oneself
	Generic statements	Gesturing is used to make generic statements, particularly about animate objects
	Metalanguage	Gesturing is used to refer to one's own and others' gestures.

- To tell stories about themselves and others (Phillips, Goldin-Meadow, & Miller, 2001);
- To communicate not only with others but also with themselves
- To refer to their own or to others' gestures, that is, to communicate about communication (Goldin-Meadow, 1993)

Words

Deaf children's gesture words have a number of properties found in all natural languages. The gestures are stable in form, although they need not be. It would be easy for a child to make up a new gesture to fit every new situation. Indeed, hearing speakers appear to do just that when they gesture along with their speech (McNeill, 1992). But that's not what deaf children do; they develop a stable store of forms that they use in a range of situations (Goldin-Meadow, Butcher, Mylander, & Dodge, 1994)—they develop a lexicon, an essential component of all languages.

Moreover, the gestures deaf children develop are composed of parts that form paradigms or systems of contrasts (Goldin-Meadow, Mylander, & Butcher, 1995; Goldin-Meadow, Mylander, & Franklin, 2007). When deaf children invent a gesture form, they do so with two goals in mind: The form must not only capture the meaning they intend (a gesture-to-world relation) but must also contrast in a systematic way with other forms in their repertoire (a gesture-to-gesture relation). In addition, the parts that form these paradigms are categorical. The manual modality can easily support a system of analog representation, with hands and motions reflecting precisely the positions and trajectories used to act on objects in the real world. But, again, these children do not choose this route. They develop categories of meanings that, although essentially iconic, have hints of arbitrariness about them (they do not, for example, all share the same form–meaning pairings for handshapes).

Finally, the gestures that deaf children develop are differentiated by grammatical function (Goldin-Meadow et al., 1994). Some serve as nouns, some as verbs, some as adjectives. As in natural languages, when the same gesture is used for more than one grammatical function, that gesture is marked (morphologically and syntactically) according to the function it plays in the particular sentence.

Sentences

Deaf children's gesture sentences also have properties found in all natural languages. Underlying each sentence is a predicate frame that determines how many arguments can appear along with the verb in the surface structure of that sentence (Goldin-Meadow, 1985).[1] Moreover, the arguments of each sentence are marked according to the thematic role they play. Three types of markings have been identified as resilient (Feldman et al., 1978; Goldin-Meadow et al., 1994):

1. Deletion: The children consistently produce and delete gestures for arguments as a function of thematic role; for example, in describing a soldier beating a drum, the children are likely to produce a gesture for the patient (*drum*) but not for the actor (*soldier*).
2. Word order: The children consistently order gestures for arguments as a function of thematic role; for example, the children tend to produce gestures for patients (*drum*) before gestures for the act (*beat*).
3. Inflection: The children mark with inflections gestures for arguments as a function of thematic role; for example, the children mark the *beat* gesture by producing it near the drum, thus identifying *drum* as the patient.

In addition, the children form complex gesture sentences out of simple ones. They combine the predicate frames underlying each simple sentence, following systematic, and language-like, principles. When there are semantic elements that appear in both propositions of a complex sentence, the children have a systematic way of reducing redundancy, a property shared with all natural languages. Thus, recursion, which gives natural languages their generative capacity, is a resilient property of language (Goldin-Meadow, 1982).

The resilient properties of language listed in Table 11.1 are found in all natural languages and in the gesture systems spontaneously generated by deaf children. But, interestingly, they are *not* found in the communication systems of nonhumans. Even chimpanzees who have been explicitly taught a communication system by humans do not display the array of structural properties seen in Table 11.1. Moreover, a skill as simple as communicating about the nonpresent seems to be beyond the chimpanzee. For example, Kanzi, the most proficient of the language-trained chimps, uses his symbols to make requests 96% of the time (Greenfield & Savage-Rumbaugh, 1991, p. 243)—he very rarely comments on the here and now, let alone the distant past or future. Thus, the linguistic properties displayed in Table 11.1 are resilient in humans but not in any other species—indeed, there appear to be *no* conditions under which other species will develop the set of properties listed in Table 11.1.

Children Transform the Gestures They See to Create Language

The deaf children in our studies were not exposed to sign language. They were, however, exposed to the gestures that their hearing parents produced as they spoke. These gestures could have served as input to the children's gesture systems.

To explore this possibility, we looked at the gestures that the hearing mothers produced when talking to their deaf children. However, we looked at them not as they were meant to be experienced (i.e., with speech) but as a deaf child would look at them—we turned off the sound and analyzed the mothers' gestures using the same analytic tools that we used to describe the children's gestures. We found that the hearing mothers' gestures did *not* have the language-like structures found in their deaf children's gestures (e.g., Goldin-Meadow & Mylander, 1983, 1998)—indeed, they were no different from the gestures that all hearing speakers produce when they talk. The deaf children thus received as input gestures that were not language-like in form but they produced as output gestures that resembled language.

Why didn't the resilient properties of language appear in the hearing mothers' gestures? The mothers wanted their deaf children to learn to talk and, as a result, always spoke as they gestured. We hypothesized that the mothers' gestures (like the gestures of all hearing speakers; Goldin-Meadow, 2003a; Kendon, 1980; McNeill, 1992) were integrated with the words they accompanied and thus were not free to assume the language-like properties found in their children's gestures. This hypothesis leads to the following prediction: Hearing adults' gestures should look more like those of the deaf children if they are produced without talking. We tested this prediction experimentally.

We asked English speakers who had no experience with sign language to describe videotaped scenes using their hands and not their mouths. We then compared the resulting gestures with gestures these same adults produced when asked to describe the scenes using speech (Gershkoff-Stowe & Goldin-Meadow, 2002; Goldin-Meadow, McNeill, & Singleton, 1996). When using gesture with speech, the adults rarely combined gestures into strings, and when they did, those gestures were not consistently ordered. In contrast, when using gesture on its own, the adults often combined gestures into strings characterized by order, and, interestingly, this order did not follow canonical English word order—it appeared to be invented on the spot.

To summarize thus far, when gesture is called upon to fulfill all of the communicative functions of speech, it takes on word and sentence properties characteristic of speech. This "transformation" happens in deaf children not exposed to a linguistic model and also in hearing adults asked on the spot to communicate only with their hands. The appearance of these properties is particularly striking given that they are not found in the gestures that hearing adults routinely produce when they talk. I turn next to the gestures that young hearing children produce, exploring what those gestures might be able to tell us about how children go about acquiring the spoken language of their community.

GESTURE CAN TELL US WHEN CHILDREN ARE READY TO TAKE THEIR FIRST STEPS IN LEARNING A LANGUAGE

Young children communicate using gestures before they are able to speak. Children typically produce their first gestures between 9 and 12 months, usually points used to indicate objects in the here and now environment (Bates, 1976; Bates, Benigni, Bretherton, Camaioni, & Volterra, 1979). Even after they begin to produce words, children continue to produce gestures in combination with their words (e.g., point at cup while saying *cup*; e.g., Greenfield & Smith, 1976), and these gesture + word combinations precede production of two-word combinations. Gesture development thus predates language development. The question I focus on here is whether these gestures are fundamentally tied to language development.

The gestures that children produce early in language development provide a way for them to communicate information that they cannot yet express verbally. For example, pointing gestures (e.g., point at cup) offer children a technique for referring to objects before they have words for those objects. Moreover, gesture + word combinations offer children a technique for communicating two pieces of information within a single utterance before they can produce two-word utterances (e.g., point at cup while saying *mine*; Butcher & Goldin-Meadow, 2000; Capirci, Iverson, Pizzuto, & Volterra, 1996; Goldin-Meadow & Butcher, 2003). The fact that gesture allows children to communicate meanings that they may have difficulty expressing verbally opens up the possibility that gesture might play a role in the language-learning process. If so, changes in gesture should not only predate but should also predict changes in language at both word and sentence levels.

Words

If gesture serves a facilitating function in lexical development, we might expect an individual lexical item to enter a child's repertoire first in gesture and then, over time, to transfer to speech. Iverson and Goldin-Meadow (2005) explored this possibility in 10 children as they made the transition from one-word to two-word speech. We focused on the gestures and words that the children used to refer to objects, people, and places—that is, on deictic gestures (e.g., point at ball) and noun words (e.g., *ball*). We identified lexical items that a child used in multiple sessions and classified those items into four categories as a function of the modality in which they were produced over time: (1) the lexical item appeared initially in speech and remained in speech; (2) the lexical item appeared initially in gesture and remained in gesture; (3) the lexical item appeared initially in speech and transferred or spread to gesture; (4) the lexical item appeared initially in gesture and transferred or spread to speech. Items that appeared initially in speech and gesture were excluded from the analysis.

We found that modality had a clear impact on lexical development. Significantly more lexical items were produced initially in gesture (.75) than in speech (.25). However, over half (.59) of the lexical items did not remain in the modality in which they were initially produced but instead transferred or spread to the other modality. Importantly, the lexical items that were initially produced in gesture moved to speech (.50) significantly more often than the lexical items that were initially produced in speech moved to gesture (.09). Thus, overall, lexical items that the children produced initially in gesture were more likely to move to speech (.67) than the lexical items that the children produced initially in speech were to move to gesture (.36). On average, children produced a gesture to indicate a particular object 3.0 months (standard deviation [SD] = .54, range 2.3 to 3.9 months) before they produced the word for that object.

Thus, consistent with the gestural facilitation hypothesis, we are able to predict a large proportion of the lexical items that eventually appear in a child's verbal repertoire from looking at that child's earlier gestures. Because the relation between a deictic gesture and its referent is more transparent than the arbitrary relation between most words and their referents, gesture seems to be able to provide children with a temporary way to communicate about objects, one that allows them to circumvent difficulties related to producing speech (Acredolo & Goodwyn, 1988; Werner & Kaplan, 1963). Gesture may thus serve as a transitional device in early lexical development.

Sentences

Iverson and Goldin-Meadow (2005) examined the role of gesture in the acquisition of two-word sentences in the same 10 children. All of the children combined single gestures with single words and did so several months before producing their first two-word utterances. Moreover, all 10 children produced two kinds of gesture + speech combinations before the onset of two-word utterances (*bird nap*): (1) supplementary combination in which gesture adds information to the information conveyed in speech (e.g., point at bird while saying "nap"); and (2) complementary combinations in which the information conveyed in gesture is redundant with the information conveyed in speech (e.g., point at bird while saying "bird"). The mean interval between the onset of supplementary gesture + word combinations and the onset of two-word utterances was 2.3 months (*SD* = 1.66); the corresponding interval for complementary gesture + word combinations and the onset of two-word combinations was 4.7 months (*SD* = 2.2).

Note that like two-word combinations, supplementary gesture + word combinations communicate two semantic elements within a single communicative

act. If gesture facilitates the emergence of early speech combinations, we might expect children who produce supplementary gesture + word combinations to be the first to make the transition to two-word speech. And, indeed, we found a significant correlation between age of onset of supplementary gesture + word combinations and age of onset of two-word combinations (Figure 11.1, left graph; Spearman $r_s = .94, p < .001$).

Unlike supplementary gesture + word combinations, complementary combinations convey a single semantic element. We therefore would not expect the onset of this type of gesture + word combination to predict the onset of two-word utterances, and, indeed, it did not. The correlation between age of onset of complementary gesture +word combinations and age of onset of two-word combinations was low and not reliable (Figure 11.1, right graph; Spearman $r_s = .24$, *ns*). Thus, it is the ability to combine two different semantic elements within a single communicative act, one in gesture and the other in speech—not simply the ability to produce gesture and speech together—that reliably predicts the onset of two-word speech.

Gesture May Play an Active Role in the Early Stages of Language Learning

We now know that gesture reflects skills that are involved in language learning. But gesture has the potential to do more—it could be part of the learning mechanism itself. In other words, gesture might not only signal that a child is ready to build his or her vocabulary or sentences; it might also play a role in the

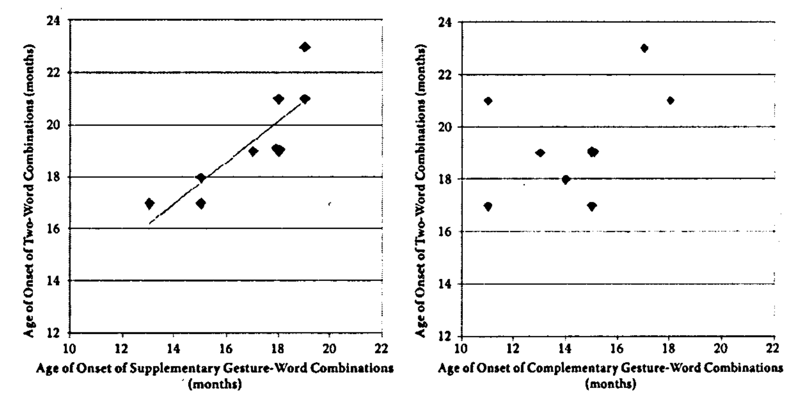

Figure 11.1 Scatterplots displaying the relation between age of onset of supplementary gesture + word combinations and age of onset of two-word combinations (left graph), and age of onset of complementary gesture + word combinations and age of onset of two-word combinations (right graph).

actual building. Gesture could play a causal role in language learning in two nonmutually exclusive ways, outlined in the next two sections.

Gesture Can Play a Role in Language Learning through Its Communicative Effects

The gestures children produce in the early stages of language learning reflect their readiness to progress to the next linguistic level. This insight into a child's cognitive state is accessible to researchers armed with video cameras and instant replay. But the insight is also accessible to adults interacting with their children on a daily basis. Perhaps adults respond in a targeted way to the gestures that their children produce, providing children with just the right input to take the next step on the road to learning to speak English.

Goldin-Meadow, Goodrich, Sauer, and Iverson (2007) explored this hypothesis in the same 10 children as the previously mentioned studies. We identified all of the times the children produced gestures, either without speech (e.g., point at bird) or with speech but conveying different information from that speech (e.g., point at bird + *nap*), and calculated the proportion of times the mothers translated those gestures into words. We found that mothers translated a third of their children's gestures into speech (e.g., producing the word *bird* after the child pointed at a bird). The more important result, however, is that the mothers translated gestures whose verbal equivalents *became* part of the child's spoken vocabulary during our observation sessions (.36) significantly more often than they translated gestures whose verbal equivalents *did not become* part of the child's vocabulary (.20). In other words, when mother translated her child's gestures into words, those words tended to become part of the child's spoken vocabulary. Thus, when mothers produced words in response to the gestures that their children produced without speech, the children added those words to their vocabularies. The children's gestures thus provided a signal to the mothers, who responded accordingly.

We asked next whether mothers were similarly responsive to their children's gesture + word combinations. If mothers understand both the gestural and verbal elements in a child's supplementary gesture + word combination, they might be expected to reproduce both elements in their response, thus producing a relatively long sentence. To explore this possibility, we calculated mean length of utterances (MLUs) for sentences that mother produced in response to her child's supplementary combinations and compared them with MLUs for sentences produced in response to the child's complementary combinations. We found that mothers' MLUs were significantly higher in their responses to children's supplementary combinations (3.7) than in their responses to children's complementary combinations (3.0; Goldin-Meadow, Goodrich, et al., 2007).

This effect is even more striking if we look at the kinds of sentences the mothers produced in response to their children's supplementary combinations. The mothers' MLUs differed as a function of the type of response they gave to the child's supplementary combinations. MLU was significantly longer when mothers incorporated *both* the child's word and a translation of the child's gestures into their utterances (5.7, e.g., saying, "the *bird* is taking a *nap*" after the child says *nap* and points at a bird) than when they reproduced the information found only in the child's gesture (3.8, "it's just like grandma's *bird*") or only in the child's word (2.5, "it's time for your *nap*"), and than when they reproduced none of the information conveyed by the child (2.6, "let's read the other book"). Sentences identified as containing semantic elements conveyed in the child's word *and* gesture must, of course, have a minimum MLU of 2.0. Note, however, that the mothers embellished the two-element information they gleaned from their children, producing their most complex sentences (with MLUs of 5.7, which were much larger than 2.0) at just those moments when they appeared to grasp the sentence-like nature of their children's thoughts.

Importantly, mothers' increased MLUs were targeted to particular utterances that their child produced and not to the child's state overall. Mothers might have begun producing longer utterances when they sensed that their child was ready to hear them—that is, around the time that the child first produced supplementary gesture + word combinations. But, in fact, mothers' MLUs overall were no higher after their children began producing supplementary combinations than they were before. Mothers increased the length of their sentences selectively in response to particular gesture + speech combinations that their children produced.

But do these translations play a role in the child's transition to two-word speech? A multiple linear regression analysis of the data from the 10 mothers provides tentative evidence that mothers' translations of child gesture might contribute to the onset of two-word utterances. We used two factors—(1) the proportion of supplementary combinations to which mother responded with a gesture translation and (2) the age at which each child first produced supplementary combinations—to try to predict the age at which the child first produced two-word utterances. As the findings reported earlier would lead us to expect, the onset of children's supplementary combinations (i.e., child gesture) accounted for a significant proportion of the variance in the onset of two-word utterances ($r^2 = .68$). But the proportion of gesture translations that the mothers produced (i.e., adult responses to child gesture) also contributed, accounting for an additional 11% of the variance in the age at which children produced their first two-word utterance.

Mothers thus translate their child's gestures into words, providing timely input for the child's acquisition of both object names and multiword sentences.

In previous work, experimenters have tried to target responses to child utterances, responding to a child's utterance with an expansion of that utterance (Nelson, 1989). Expansions of this sort have sometimes led to learning (Nelson, 1977; Nelson, Carskaddan, & Bonvillian, 1973) but not always (Cazden, 1965), perhaps because it is often difficult to know what a child has in mind when he or she produces an incomplete utterance. By using a child's gestures to narrow down the range of possible expansions for a given utterance, both experimenters and mothers may be better able to target input to the child, thus making that input particularly effective.[2]

Gesture Can Play a Role in Language Learning through Its Cognitive Effects

The results described in the previous section suggest that gesture can play a role in learning through its communicative effects—learners signal through their gestures that they are in a particular cognitive state, and listeners adjust their responses accordingly. But gesture also has the potential to play a role in learning through its cognitive effects (cf. Goldin-Meadow & Wagner, 2005). Take as an example children learning how to solve a mathematical equivalence problem. Encouraging children to produce gestures that convey a correct strategy for solving the problem increases the likelihood that those children will learn to solve the problem correctly. Findings such as these suggest that the act of gesturing may itself play a role in learning (Broaders, Cook, Mitchell, & Goldin-Meadow, 2007; Cook & Goldin-Meadow, 2006; Cook, Mitchell, & Goldin-Meadow, 2008).

There is indeed evidence within the language-learning domain that children's own gestures might be setting the stage for their subsequent vocabulary learning. We observed 54 English-learning children at home once every four months interacting naturally with their caregivers during the period from 14 to 30 months (Rowe, Ozcaliskan, & Goldin-Meadow, 2006; see also Rowe & Goldin-Meadow, in press; Rowe, Ozcaliskan, & Goldin-Meadow, 2008). As expected, children showed substantial growth in their productive vocabularies over this time period. On average, children produced 14 different spoken words at 14 months and 207 at 30 months, an increase of more than 190 words in a 16-month period. There was, moreover, large variation in the rate at which children increased their spoken vocabularies during this period. The interesting result from the point of view of the discussion here is that the children's own gesture production explained some of this variability—controlling for the number of different spoken words that the children and their mothers produced at 14 months, we found that the number of gestures the children produced at 14 months accounted for 28% of the variance in vocabulary growth. As a specific example of this relation, children who produced more gestures at 14 months used an estimated 38 more spoken words at 26 months than children who produced fewer gestures at 14 months.

There is thus growing evidence that gesture can promote language learning not only by allowing children to elicit timely input from their language-learning environments but also by influencing their own cognitive state.

GESTURE AS A TOOL FOR CHILDREN AND RESEARCHERS

When gesture assumes the full burden of communication, acting on its own without speech (as in the deaf children described here), it takes on language-like form; for example, structure at both word and sentence levels (see Table 11.1). Gesture can thus provide the raw materials out of which a child who has not been exposed to a language model can construct language.

However, when children are exposed to input from a language model (as are all young hearing children), gesture can serve as a stepping stone to language, particularly at the earliest stages of the learning process. Although not language-like in structure when it accompanies speech, gesture nevertheless forms an important part of language, providing young language learners with the means to convey word-like and sentence-like thoughts that they are not yet able to express entirely within speech.

Gesture is thus a useful tool for children when they are forced to invent their own communication system and when they are attempting to learn the communication system of their elders. But precisely because gesture taps into important aspects of the language-learning process, it can also serve as a useful tool for language researchers. Gesture offers researchers two unique perspectives on language learning—a window into the linguistic properties that a young language creator deems essential to communication and a window into the earliest steps that a young language learner takes en route to language (it may even provide insight into the mechanism responsible for those steps). For these reasons, gesture belongs in every language researcher's tool kit.

ENDNOTES

1. According to Bickerton (1998), having predicate frames is what distinguishes language from its evolutionary precursor, protolanguage.
2. Note that child gaze can also tell mothers what to focus on. If mother is attentive to where her child is looking, she can follow her child's gaze and establish joint attention with the child—a situation that turns out to be good for word learning (Tomasello & Farrar, 1986). The advantage gesture has over gaze is that, by gesturing, the child makes it clear that she is interested in communicating; mother can thus calibrate her words to a child who is ready to hear them.

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IV

MODELS AND METHODS TO STUDY INFANT LANGUAGE