

Pointing Sets the Stage for Learning Language—and Creating Language

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Tomasello, Carpenter, and Liszkowski (2007) have argued that pointing gestures do much more than single out objects in the world. Pointing gestures function as part of a system of shared intentionality even at early stages of development. As such, pointing gestures form the platform on which linguistic communication rests, paving the way for later language learning. This commentary provides evidence that pointing gestures do establish a foundation for learning a language and, moreover, set the stage for creating a language.

Children enter language hands first. Months before they are able to produce words to refer to people, places, and things, they point. Tomasello, Carpenter, and Liszkowski (2007) argue convincingly that these early pointing gestures are used not merely to direct attention either to the self or to an object, but to influence the mental states of others. As such, pointing gestures constitute the child's first foray into establishing common ground with another person in order to affect how that person acts, feels, or thinks. According to this view, pointing gestures form the platform on which linguistic communication rests, and thus lay the groundwork for later language learning. In this commentary, I build on the argument laid out by Tomasello et al. (2007) and provide evidence that pointing gestures set the stage not only for learning language but also for creating language.

Pointing as a Stepping Stone to Learning a Language

The early gestures that children produce not only predate their words, they predict them. It is, for example, possible to predict a large proportion of the lexical items that eventually appear in a child's spoken vocabulary from looking at that child's earlier pointing gestures (Iverson & Goldin-Meadow, 2005). Moreover, one of the best predictors of the size of a child's comprehension vocabulary at 42 months is the number of different objects to which the child pointed at 14 months. Indeed, child gesture at 14

months is a better predictor of later vocabulary size than mother speech at 14 months (Rowe, Ozcaliskan, & Goldin-Meadow, 2007). Findings of this sort support Tomasello et al.'s (2007) claim that children are not merely pointing to draw attention to themselves—they are, at the least, drawing attention to the objects they find interesting enough to communicate about.

In addition to presaging the shape of children's eventual spoken vocabularies, gesture also paves the way for early sentences. Children combine pointing gestures with words to express sentence-like meanings ("eat"+point at cookie) months before they can express these same meanings in a word+word combination ("eat cookie"). Importantly, the age at which children first produce gesture+speech combinations of this sort reliably predicts the age at which they first produce two-word utterances (Goldin-Meadow & Butcher, 2003; Iverson & Goldin-Meadow, 2005; Iverson, Capirci, Volterra, & Goldin-Meadow, 2007). Gesture thus serves as a signal that a child will soon be ready to begin producing multiword sentences. Moreover, the types of gesture+speech combinations children produce change over time and presage changes in children's speech (Ozcaliskan & Goldin-Meadow, 2005). For example, children produce gesture+speech combinations conveying more than one proposition (akin to a complex sentence, e.g., "I like it"+eat gesture) several months before producing a complex sentence entirely in speech ("I like to eat it"). Gesture thus continues to be at the cutting edge of early language development, providing stepping stones to increasingly complex linguistic constructions.

Finding that gesture predicts the child's initial steps into language learning raises the possibility that gesture could be instrumental in bringing that

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learning about. Gesture has the potential to play a causal role in language learning in at least two nonmutually exclusive ways.

First, children's gestures could elicit from their parents the kinds of words and sentences that the children need to hear in order to take their next linguistic steps. For example, a child who does not yet know the word "cat" might refer to the animal by pointing at it. His mother might say in response to the point, "yes, that's a cat," thus supplying him with just the word he is looking for. Or a child in the one-word stage might point at her father while saying "cup." Her mother replies, "that's daddy's cup," thus translating the child's gesture+word combination into a simple (and relevant) sentence. It turns out that mothers often "translate" their children's gestures into words, thus providing timely models for how one- and two-word ideas can be expressed in English (Goldin-Meadow, Goodrich, Sauer, & Iverson, in press). Gesture thus offers a mechanism by which children can point out their thoughts to others, who then calibrate their speech to those thoughts and potentially facilitate language learning.

The second way in which gesture could play a causal role in language learning is through its cognitive effects (Goldin-Meadow & Wagner, 2005). Work on older school-aged children solving math problems has found that encouraging children to produce gestures conveying a correct problem-solving strategy increases the likelihood that those children will solve the problem correctly (Cook & Goldin-Meadow, 2006; see also Broaders, Cook, Mitchell, & Goldin-Meadow, in press; Cook, Mitchell, & Goldin-Meadow, in press). These findings suggest that the act of gesturing can promote learning. Similarly, when learning language, the act of pointing to an object might itself make it more likely that the pointer will learn a word for that object. Our future work will explore whether gesture can promote language learning not only by allowing children to elicit timely input from their communication partners but also by directly influencing their own cognitive state.

Pointing as a Building Block in Creating a Language

Children make use of pointing gestures even if they are not learning language from their elders but are, instead, forced to create their own language. Deaf children whose hearing losses are so severe that they cannot learn a spoken language and whose hearing parents have not exposed them to a sign language nevertheless communicate with the hearing individuals in their worlds and use gesture (including

pointing gestures) to do so (Lenneberg, 1964; Moores, 1974; Tervoort, 1961). These gestures are structured in language-like ways despite the fact that the children do not have a usable model for language to guide their gesture creation (Goldin-Meadow, 2003). In fact, the gestures are structured enough like language to have earned the label "homesigns." Importantly from the point of view of Tomasello et al. (2007), the children use their homesigns not only to get others to do things for them (i.e., to make requests) but also to share ideas and request information (i.e., to make comments and ask questions). The children even use their gestures to serve some of the more sophisticated functions of language—to tell stories, to comment on their own and others' gestures, and to talk to themselves. In this sense, the children's communications are qualitatively different from those produced by nonhuman primates, even language-trained apes who use whatever language they are able to develop only to change people's behavior and not to change their ideas (see, e.g., Greenfield & Savage-Rumbaugh, 1991).

As one example, the homesigning deaf children use pointing gestures to refer not only to visible objects but also to objects that are not present in the room. For example, one child pointed at the chair at the head of the table in his dining room and then produced a "sleep" gesture. No one was sleeping in the chair, nor did anyone appear to be planning a nap in that location. However, the head dining room chair is where the child's father typically sits, and his father was, at that moment, asleep in his bedroom down the hall. The child was, through his gestures, telling us that his father (denoted by the chair) was sleeping, and he fully expected us to understand his message. This interchange is a striking example of the kind of "mindreading" that, according to Tomasello et al. (2007), must take place in order to recover the intended meaning of a pointing gesture.

Hearing children learning a spoken language use pointing gestures to refer to objects, people, and places, and so do deaf children inventing their own homesign systems. Moreover, the homesigners use their pointing gestures to refer to the same range of objects that young hearing children refer to using, first, pointing gestures and, later, words—and in the same distribution (Feldman, Goldin-Meadow, & Gleitman, 1978). Both groups of children refer most often to inanimate objects, followed by people and animals. They also both refer to body parts, food, clothing, vehicles, furniture, and places, but less frequently.

However, whereas hearing children rarely combine their pointing gestures with other gestures, the

homesigning deaf children frequently combine their pointing gestures with both pointing and iconic gestures. We consider a string of gestures to be a single unit if the child does not pause or relax his hand between gestures (Goldin-Meadow & Mylander, 1984). The homesigners use their gesture strings to convey the same kinds of semantic relations as hearing children acquiring spoken language from their hearing parents (Brown, 1973) and as deaf children acquiring sign language from their deaf parents (Newport & Meier, 1985). Moreover, even though they do not have an explicit model to guide them in constructing their gesture systems, the homesigners produce gesture strings that are structured in sentence-like ways (Goldin-Meadow, 2003). For example, their gesture sentences are organized around predicate frames (e.g., *x sleeps*, *x goes to z*, *x beats y*, *x gives y to z*) and thus are structured at an underlying level. The gesture sentences are also structured at the surface level—they are characterized by the consistent production and deletion of gestures playing particular thematic roles (e.g., a sentence with an *x_y* frame is more likely to contain a gesture for the patient *drum* than for the actor *soldier*), and also by consistent orderings of gestures playing particular thematic roles (e.g., the gesture for the patient *drum* will tend to precede the gesture for the act *beat*). Finally, the gesture sentences can be complex, containing more than one proposition (e.g., *drum beat straw sip*, produced to describe a scene in which a soldier is beating a drum and a cowboy is sipping a straw).

We consider pointing gestures to be object-referring terms, akin to nouns or pronouns. Is this a legitimate analytic decision, or have we pushed Tomasello et al.'s (2007) faith in the pointing gesture too far? We attribute lexical status to the pointing gesture for several reasons. First, if we consider pointing gestures to be lexical items, the homesigning deaf children turn out to have vocabularies identical to hearing children (Feldman et al., 1978). If we exclude pointing gestures from our analyses, the homesigners end up looking as though they have remarkably impoverished vocabularies, with no way to refer to just those objects that hearing children talk about most often. Second, if we treat pointing gestures like object-referring terms, the homesigners' gesture combinations turn out to be structured as are hearing children's early sentences (Goldin-Meadow, 2003, chaps. 10 and 11). If pointing gestures are excluded from our analyses, the homesigners' gesture systems appear to be incomplete and less structured. Finally, the fact that hearing children's pointing gestures seem to serve as stepping stones on the path

to acquiring spoken vocabulary items suggests that pointing gestures can, for young children, function as object-referring terms. And, as it turns out, including pointing gestures as object-referring terms in homesigners' gesture systems is not an unprecedented analytic step—when researchers describe the early sign systems of deaf children who are learning conventional sign languages from their deaf parents, they too consider pointing to be object-referring terms in children's (and adults') linguistic systems (Hoffmeister, 1978; Kantor, 1982).

The pointing gesture thus seems to function as a lexical item in the sign languages developed by deaf children learning a conventional sign language, in the early gestures developed by hearing children learning a spoken language, and in the gesture systems developed by deaf children exposed to no language model whatsoever. However, as we will see in the next section, the pointing gesture may not have word-like status in the gestures that hearing adults produce when they talk.

The Development of Gesture With and Without Speech

We have seen that children at the earliest stages of learning a spoken language use gestures to stand in for words—a pointing gesture can take the place of a word that a child does not yet have in her spoken vocabulary, and combining pointing gestures with words gives the child a way to express sentence-like meanings before she is able to express those meanings entirely in speech. Importantly, these early uses of gesture predict the entry of particular lexical items into the child's spoken vocabulary and predict the onset of the child's earliest sentences. At the least, early child gesture reflects the child's readiness for learning language. At most, gesture plays a role in the learning process itself, either by eliciting targeted responses from the child's communication partner or by altering the child's own cognitive state.

We have also seen that gesture can function like words for deaf children who have not been exposed to a usable model for language and must invent their own. Pointing gestures serve as object-referring lexical items in the homesign systems these deaf children create, and pointing gestures are combined with each other and with other gestures to convey sentence-like meanings in structured ways. But because their gestures must carry the full burden of communication, the homesigning deaf children need to continue to develop their gesture systems—and they do, building more and more linguistic proper-

ties into their gesture systems over time (Goldin-Meadow, 2003, 2005, chap. 12).

Hearing children, in contrast, are learning the spoken language that surrounds them. Eventually, they will become proficient language users and will no longer need to substitute gestures for words. But they will continue to gesture. The question is—What form will those gestures take?

Speakers of all ages gesture when they speak and those gestures are integrated both temporally and semantically with the speech they accompany (McNeill, 1992). The gestures that proficient language users produce are comparable to the gestures used by early language learners in that, at times, they convey information that is different from the information conveyed in speech. Proficient language users, like children on the cusp of language learning, produce gestures conveying different information from speech most often when describing tasks that they are on the verge of learning (Goldin-Meadow, 2003).

Note, however, that the task facing the young language learner is language itself. Thus, when gesture is used in these early stages, it is used as an assist into the linguistic system, substituting for words that the child has not yet acquired. But once the basics of language have been mastered, gesture is free to be used for other purposes, for example, to frame the discourse (McNeill, 1992) or to help speakers grapple with ideas that they are having difficulty expressing in speech, ideas that rarely translate into a single lexical item (but see Krauss, Chen, & Gottesman, 2000).

As a result, although gesture conveys ideas that do not fit neatly into speech throughout the life span, we might expect to see a transition in the kinds of ideas that gesture expresses as children become proficient language users. Initially, gesture is used as a substitute for the words children cannot yet express. Later, once language is mastered and other learning tasks present themselves, gesture is used to express more global ideas that do not fit neatly into word-like units. At every stage, however, the gestures that accompany speech serve to enrich the ideas that speakers express.

To summarize, when young children do not have a model for language, they use gesture to fill the void. However, when children do have a model for language, they use gesture to take steps into language that they cannot yet take in speech. Indeed, gesture may even facilitate children's transition to language. As Tomasello et al. (2007) have persuasively argued, when young children use the pointing gesture, they do so with a deep understanding of the social implications of the act. Early pointing is thus a

significant communicative act that sets the stage for language, be it learned or created.

References

- Broaders, S. C., Cook, S. W., Mitchell, Z., & Goldin-Meadow, S. (in press). Making children gesture reveals implicit knowledge and leads to learning. *Journal of Experimental Psychology: General*.
- Brown, R. (1973). *A first language*. Cambridge, MA: Harvard University Press.
- Cook, S. W., & Goldin-Meadow, S. (2006). The role of gesture in learning: Do children use their hands to change their minds? *Journal of Cognition and Development*, 7, 211–232.
- Cook, S. W., Mitchell, Z., & Goldin-Meadow, S. (in press). Gesturing makes learning last. *Cognition*.
- Feldman, H., Goldin-Meadow, S., & Gleitman, L. (1978). Beyond Herodotus: The creation of language by linguistically deprived deaf children. In A. Lock (Ed.), *Action, symbol, and gesture: The emergence of language* (pp. 351–414). New York: Academic Press.
- Goldin-Meadow, S. (2003). *Hearing gesture: How our hands help us think*. Cambridge, MA: Harvard University Press.
- Goldin-Meadow, S. (2005). What language creation in the manual modality tells us about the foundations of language. *Linguistic Review*, 22, 199–225.
- Goldin-Meadow, S., & Butcher, C. (2003). Pointing toward two-word speech in young children. In S. Kita (Ed.), *Pointing: Where language, culture, and cognition meet* (pp. 85–107). Hillsdale, NJ: Erlbaum Associates.
- Goldin-Meadow, S., Goodrich, W., Sauer, E., & Iverson, J. (in press) Young children use their hands to tell their mothers what to say. *Developmental Science*.
- Goldin-Meadow, S., & Mylander, C. (1984). Gestural communication in deaf children: The effects and non-effects of parental input on early language development. *Monographs of the Society for Research in Child Development*, 49, 1–121.
- Goldin-Meadow, S., & Wagner, S. M. (2005). How our hands help us learn. *Trends in Cognitive Science*, 9, 230–241.
- Greenfield, P. M., & Savage-Rumbaugh, E. S. (1991). Imitation, grammatical development, and the invention of protogrammar by an ape. In N. A. Krasnegor, D. M. Rumbaugh, R. L. Schiefelbusch, & M. Studdert-Kennedy (Eds.), *Biological and behavioral determinants of language development* (pp. 235–262). Hillsdale, NJ: Erlbaum Associates.
- Hoffmeister, R. (1978). *The development of demonstrative pronouns, locatives and personal pronouns in the acquisition of American Sign Language by deaf children of deaf parents*. Unpublished PhD dissertation, University of Minnesota.
- Iverson, J. M., Capirci, O., Volterra, V., & Goldin-Meadow, S. (2007). *Learning to talk in a gesture-rich world: Early Communication in Italian US. American Children*. Manuscript submitted for publication.

- Iverson, J. M., & Goldin-Meadow, S. (2005). Gesture paves the way for language development. *Psychological Science, 16*, 368–371.
- Kantor, R. (1982). Communicative interaction: Mother modification and child acquisition of American Sign Language. *Sign Language Studies, 36*, 233–282.
- Krauss, R. M., Chen, Y., & Gottesman, R. F. (2000). Lexical gestures and lexical access: A process model. In D. McNeill (Ed.), *Language and gesture* (pp. 261–283). New York: Cambridge University Press.
- Lenneberg, E. H. (1964). Capacity for language acquisition. In J. A. Fodor & J. J. Katz (Eds.), *The structure of language: Readings in the philosophy of language* (pp. 579–603). Englewood Cliffs, NJ: Prentice-Hall.
- McNeill, D. (1992). *Hand and mind*. Chicago: University of Chicago Press.
- Moore, D. F. (1974). Nonvocal systems of verbal behavior. In R. L. Schiefelbusch & L. L. Lloyd (Eds.), *Language perspectives: Acquisition, retardation, and intervention* (pp. 372–417). Baltimore: University Park Press.
- Newport, E. L., & Meier, R. P. (1985). The acquisition of American Sign Language. In D. I. Slobin (Ed.), *The cross-linguistic study of language acquisition, Vol. 1: The data* (pp. 881–938). Hillsdale, NJ: Erlbaum.
- Ozcaliskan, S., & Goldin-Meadow, S. (2005). Gesture is at the cutting edge of early language development. *Cognition, 96*, B101–B113.
- Rowe, M. L., Ozcaliskan, S., & Goldin-Meadow, S. (2007). *Learning words by hand: Gesture's role in predicting vocabulary growth*. Manuscript submitted for publication.
- Tervoort, B. T. (1961). Esoteric symbolism in the communication behavior of young deaf children. *American Annals of the Deaf, 106*, 436–480.
- Tomasello, M., Carpenter, M., & Liszkowski, U. (2007). A new look at infant pointing. *Child Development, 78*, 705–722.