The challenge: Some properties of language can be learned without linguistic input

SUSAN GOLDIN-MEADOW

Abstract

Usage-based accounts of language-learning ought to predict that, in the absence of linguistic input, children will not communicate in language-like ways. But this prediction is not borne out by the data. Deaf children whose hearing losses prevent them from acquiring the spoken language that surrounds them, and whose hearing parents have not exposed them to a conventional sign language, invent gesture systems, called homesigns, that display many of the properties found in natural language. Children thus have biases to structure their communication in language-like ways, biases that reflect their cognitive skills. But why do the deaf children recruit this particular set of cognitive skills, and not others, to their homesign systems? In other words, what determines the biases children bring to language-learning? The answer is clearly not linguistic input.

Usage-based theories of language acquisition hold that children acquire language by applying general learning skills to patterns in their linguistic input. For example, according to Tomasello (2005: 186), "children construct from their experience with a particular language some kinds of grammatical categories, based on the function of particular words and phrases in particular utterances – followed by generalizations across these" (see also Bybee and McClelland 2005; Goldberg and Del Giudice 2005). As Jackendoff (2007) points out, this hypothesis must be correct at some level – children have to process and glean patterns from the input they receive in order to learn the language of their community. The controversial question is whether children bring biases to their input that influence the generalizations they make.

A strict usage-based account would predict that, in the absence of linguistic input, a child would not communicate in language-like ways. After all, there would be no input from which to glean linguistic patterns. But this prediction

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fails. Deaf children whose hearing losses prevent them from acquiring the spoken language of their community, and whose hearing parents have not exposed them to a conventional sign language, lack usable linguistic input. Nevertheless, these children invent gesture systems, called *homesigns*, that display many of the properties found in natural language (Goldin-Meadow 2003a, 2005). Children thus have biases to structure their communication in language-like ways. Although it is conceivable that children do not make use of these biases when they are presented with linguistic input in typical language-learning settings, it does seem unlikely.

Are the biases that children bring to language-learning specific to language-learning? Data from the deaf children's homesign systems do not bear directly on this question. All of the skills that the children display in their homesigns are, by definition, cognitive. To address the task-specificity question, we would have to determine whether the homesigners display these same skills in other non-language domains. An investigation of this sort has not yet been done.

There is, however, another side to this question that has always intrigued me. Why do the deaf children recruit this particular set of cognitive skills, and not others, to their homesign systems? When people see examples of the deaf children's homesigns,[1] they often comment that the system feels very natural. What else would you do to communicate with another person? But, in fact, there are many ways of sharing ideas with another that would not call upon the particular structures found in the deaf children's homesign systems.

For example, to ask me to share a snack, one deaf child pointed at the cookie, produced an *eat* gesture (jabbing his hand shaped like a squashed-O at his mouth several times), and then pointed at me. This order – patient, act, actor – is the gesture order this particular child routinely followed when communicating about actors acting on objects. But the child could have gotten the same point across by miming cookie-eating (pretending to take a cookie from the plate, hold it up to his mouth, and then eat it in a seamless mime) while looking questioningly at me. In other words, the child could have gotten the idea across that I was to join him in a snack without using discrete, segmented gestures that are strung together in a systematic order.

Segmentation and combination are hallmarks of linguistic systems, and these are properties that the deaf children recruited for their gesture systems. Interestingly, they are just the properties that are absent in the gestures that hearing speakers produce when they talk (Goldin-Meadow 2003b; McNeill 1992), and just the properties that are present in the gestures that hearing speakers produce when they are asked to gesture without speaking (Gerkshkoff-Stowe and Goldin-Meadow 2002; Goldin-Meadow, McNeill and Singleton 1996). It is

1. Examples of the deaf children's homesigns can be seen at http://www.psypress.com/goldinmeadow.

important to note that since the deaf children are surrounded by hearing speakers who gesture only when they talk,[2] it is these non-segmented gestures that form the input to the deaf children's homesign systems – yet their output is segmented, combinatorial, and structured in language-like ways.

Another example of a device that the deaf children could have recruited to their homesign systems but did not is the forms that the children used in their morphological systems. The gestures that comprise the children's homesigns are not unsegmented wholes. Rather, they are combinations of handshape and motion morphemes (Goldin-Meadow, Mylander and Butcher 1995; Goldin-Meadow, Mylander and Franklin in press). For example, one child used a fist handshape to represent grasping an object less than 1 inch in diameter and greater than 5 inches in length. This handshape could be combined with different motion morphemes to create gestures with systematically different meanings. When the fist handshape was combined with a move-in-circle motion, the gesture meant *move a long thin object in a circle* – stir with a spoon. When the handshape was combined with an arc-to-and-fro motion, the gesture meant *move a long thin object back and forth* – draw with a pencil.

As this example illustrates, the handshapes around which the children build their morphological systems represent the size and shape of objects. But the hand can be used to represent other types of object properties. For example, Lederman and Klatzky (1987, 1990) have isolated a variety of distinctive hand motions that people use to explore different object properties – repetitive shearing motions along a surface can be used to explore the texture of an object; applying pressure to the surface of an object can be used to explore the hardness of an object; resting the hand on an object can be used to explore the temperature of an object; and unsupported lifting can be used to explore the weight of an object. The deaf children could have recruited exploratory movements of this sort (i.e., movements which highlight the substance or material out of which an object is constructed) as the basis for their object categories, but they did not. Instead, they based their object categories on exploratory movements that extract information about the size and shape of objects. Importantly, the size and shape properties that the deaf children grammaticized in their morphological systems are routinely grammaticized in both spoken (e.g., Allan 1997) and signed (Schembri 2003) languages, unlike properties like texture, hardness, temperature, and weight which have not been found to be grammaticized in any language described thus far.

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2. One might have thought that the deaf children's hearing parents would adjust their gestures, or at the least, the rate at which they gesture, to accommodate the communicative needs of their deaf children who cannot hear their parents' talk. However, there is no evidence that the parents do make adjustments of this sort, in part because they must adhere to the cultural and linguistic norms of their communities (Goldin-Meadow and Saltzman 2000).

Many of the morphemes found in the deaf children's gestures are likely to have been derived from haptic knowledge of objects (cf., Klatzky et al. 1987). The interesting point is that the children were selective in which aspects of their haptic knowledge they drew upon as a basis for their morphological systems. Moreover, that selectivity led to a morphological system that closely resembles systems found in conventional languages, signed and spoken.

Taken together, these findings suggest that some cognitive skills (the ability to represent size and shape – but not weight, texture, temperature, for example) may play a special role in human communication (see Talmy 1988 for similar discussion of aspects of motion events that are preferentially incorporated into grammatical systems). The larger point is that the deaf children have some cognitive skills that they do *not* recruit for their homesign systems and others that they do. The question we need to address in future work is – what determines which properties do and do not find their way into the deaf children's homesign systems? More generally, what determines the biases children bring to language-learning? The answer is clearly not linguistic input.

University of Chicago

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