The above considerations could apply (and do apply in the case of modern humans) even in cases where the signaling currency is provided by relatively universal indicators of approval, disapproval, and so forth (Ekman 1972; Fernald 1992). What of situations where one is imagining the early construction of semi-conventional protolanguage? This brings us to our second major point.

The earliest indications of contingent, partly conventionalized signaling between mother and infant in contemporary humans can be seen in at around the age of 3 months. By the time a modern human infant is 14 weeks old, mutual gaze, shared facial expression, and prosodic vocalizations between it and its mother sustain pleasurable bouts of coordinated interaction between them. Many investigators make the mother-infant dyad their object of analysis, and focus on dyadic properties such as attunement and coordination, phenomena wherein the individual actions of either partner are best accounted for if they are seen as contingent responses to the anticipated activity of the other (e.g., Stern 1977). That is, just as caregivers effectively attuning with their offspring learn to *anticipate* and *creatively exploit* their infants' activity and responsiveness in particular expressive contexts, so infants interacting with caregivers learn to do the same. Both can learn creatively to exploit the patterns of activity and responsiveness in the other for their own interests.

Examples of non-universal signals that we have observed at this age include maternal requests for infant behaviors such as being quiet, or slightly later protorequests from the infant, for example for being lifted. (At this stage the signals are often multimodal, including vocal and gestural components.) The fact that these signals are not universal suggests that they have been constructed in interaction, either as local inventions peculiar to the dyad, or as culturally contingent patterns introduced by the mother. A conventionalized mother-to-infant command that can be obeyed (some of the time) can also be disobeyed. An infant vocalization or gesture that has come to be treated as a distinctive request not only can be granted, it can also be refused. Protoconventional signals, that is, can be seen as new tools in the ongoing battle for occasional control of the other described above. Innovations from either party in attempts to exploit or control the other lead to more sophisticated patterns, setting the stage for further innovation.

The sorts of innovation we have in mind can be described in terms of attaching more refined conditional probabilities for the success of this or that signaling strategy given an increasingly sophisticated command of relevant contextual details. Laboratory chimpanzees that point toward inaccessible but visible food only when humans are present and in a position to give it to them (Leavens & Hopkins 1998), show this sort of attention to context. So do mothers that shift from direct comforting to an attempt to distract a distressed infant when comforting seems ineffective. We are familiar with attempts at parental manipulation in modern humans by older, speaking children, who pave the way for requests they suspect would not be granted with bouts of generous cooperativeness. We suggest that these are different in degree but not in kind from the earliest forms of infant innovation in signaling, and that granting a more active role to the infant could enrich Falk's account of contemporary mother-infant interaction and perhaps her proposal regarding the evolution of motherese.

Language from gesture

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Abstract: The hypothesis that language began as a multimodal, gestural complex finds support in data from spoken languages on the connection between intonation and gesture, as well as from the process by which intonation becomes codified into grammar. Also, data from signed languages show a similar process at work, in which gestural elements become incorporated as intonation and conventionalized as grammatical markers.

Falk presents a compelling argument for the role of motherese in the evolution of language, weaving a range of scientific evidence from anthropology, linguistics, neurology, and psychology into a solid case for her "putting the baby down" hypothesis.

Two significant elements of Falk's argument are her claims that (1) mother-infant communicative interactions are massively multimodal, "encompass[ing] visual, vocal, gestural, and tactile communication" (sect. 1, para. 3) and (2) prosody and intonation formed an important substrate for the natural selection of protolanguage. In my commentary I will explore further implications of this first claim, suggesting that the multimodal nature of communicative interactions and, indeed, of human language is evidence of their gestural origins. Falk's claim that intonation played a significant role in infant-directed speech, and thereby in the evolution of language, can be further supported by studies of the conventionalization of intonation in signed as well as spoken languages.

The deep psychological connections between speech, gesture, and thought are well documented (Duncan 2002; Kendon 1972; 1980; McNeill 1992; 2000). In spite of this massive evidence for the contemporary linking of speech and gesture, the two are often severed in evolutionary accounts of the origins of language. This is the position favored by Chomsky (1972), who suggested that, although human gesture and animal communication do share properties, human language and animal communication (and therefore human language and gesture) are based on "entirely different principles" (p. 70).

An alternative account begins with a multimodal, gestural complex. This view regards communication as essentially gestural in nature: Articulatory gestures of various kinds produce acoustic, optical, or tactile signals that are perceived by others.[1]

Critics mistakenly assume that a gestural theory of language evolution requires that a purely optical (e.g., manual or facial) gesture language preceded speech. The gestural-complex scenario does not require such a gesture-first hypothesis. Components of the gestural complex, such as acoustic versus optical gestures or segmental versus suprasegmental aspects of each, possess different properties and come to serve different functions. Thus, unlike the first scenario, which requires an evolutionary mechanism responsible for the integration of distinct systems, the gestural-complex scenario predicts functional differentiation. I regard this as a more plausible evolutionary account.

Falk brings to light several facts suggesting the early ancestry of the gestural complex, such as noting that infant crying increases the strength of the grasping reflex, that maternal speech is tied to facial expression, and that mothers' communications with infants are overwhelmingly multimodal. Also, because her data suggest a way in which mothers' ability to modify their vocal and gestural repertoires in interaction with infants could have led to a selective advantage, Falk's study demonstrates how evolutionary differentiation could have taken place.

One of the most appealing aspects of Falk's argument is her suggestion that intonation was an important substrate for the natural selection of protolanguage. Linguistic studies investigating the conventionalization of intonation support Falk's claims and also provide further evidence of the gestural complex. Bolinger (1986) regarded intonation as a master thread running through the fabric of speech and proposed that intonation is intimately linked to

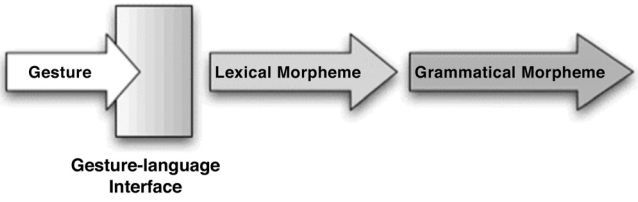


Figure 1 (Wilcox). First route from gesture to language.

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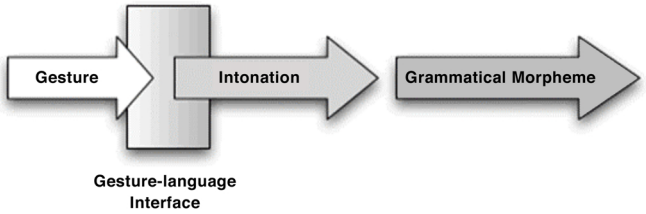


Figure 2 (Wilcox). Second route from gesture to language.

gesture: "Intonation is part of a gestural complex whose primitive and still surviving function is the signaling of emotion" (p. 195). Both intonation and gesture, according to Bolinger, are specialized, biologically built-in adaptations that allow us to read the visible and audible signals that are symptomatic of emotion.

As Falk points out, these instrumental signals may become incorporated into the linguistic system through a process of conventionalization. Intonation is an especially telling case. Haiman (1998a) noted that intonation lies on the border between paralinguistic and linguistic behavior, and that the stereotyping of intonation – motherese being an example – provides a glimpse into the genesis of language. Both Haiman and Bolinger regard ritualization as the driving force in language genesis, a process that transforms "actions into gestures, gestures into words" (Haiman 1998b, p. 132).

Data from signed languages reveal how intonational aspects of the gestural complex take on grammatical function. My colleagues and I have identified two routes by which gesture is incorporated in signed languages. In the first route (see Fig. 1), a quotable gesture becomes a lexical item; these lexical items then acquire grammatical function (Janzen & Shaffer 2002; Wilcox 2002).

The second route is more relevant for this discussion. Here, a gestural element first exhibits primarily intonational function; it then acquires grammatical function, and the language eventually exhibits morphological patterns marked entirely by the erstwhile gestural element. One example is modification to the manner of articulating a sign's movement. In data from several signed languages, we find that manner of movement serves functions ranging from strictly expressive to purely grammatical. Other gestural elements that follow this second route include facial and eye gestures, which again range from signaling speaker expressivity or emotional state to marking grammatical functions such as speaker's commitment to the truth of a proposition. In this second route the path of development is from gesture to paralinguistic to grammatical (see Fig. 2). It is intriguing to note that because this route bypasses a lexical stage, it suggests a more direct path from intonation to grammar, at least in signed languages.

These data are significant for several reasons. First, the developmental path from gesture to intonation to grammar provides further evidence for Falk's proposal that prosodic elements of prelinguistic vocalizations may have played a vital role in the evolution of language and for her adoption of a continuity model. Second, since the data come from nonvocal languages, they demonstrate cross-modal linguistic evidence for the gestural-complex hypothesis. Finally, they suggest that the remarkable human ability to acquire and use language regardless of modality does not depend on an abstract system of disembodied rules; rather, human language is the highly specialized, evolutionary manifestation of a multimodal gestural complex.

NOTE

1. I regard the issue of whether the signals are intentionally communicative to be a separate issue because unintentional signals may acquire communicative import.

Author's Response

The "putting the baby down" hypothesis: Bipedalism, babbling, and baby slings

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Abstract: My responses to the observations and criticisms of 26 commentaries focus on the coregulated and affective nature of initial mother/infant interactions, the relationship between motherese and emergent linguistic skills and its implication for hominin evolution, the plausibility of the "putting the baby down" hypothesis, and details about specific neurological substrates that may have formed the basis for the evolution of prelinguistic behaviors and, eventually, protolanguage.

Put a baby in my arms and I cannot refrain from producing singsong streams of baby talk, punctuated by attention-getting clicks and breathy intakes of air, all of which are accompanied by a barrage of gentle bouncing. From reading the literature on language acquisition, I began to realize that motherese occurs all over the world, that babies like it, and that it is important for (among other things) their eventual acquisition of language. As a physical anthropologist who had long explored the relationship between brain size and the external morphology of the cerebral cortex reflected on hominin endocasts for clues about cognitive evolution, including language origins, I realized that here was an avenue by which one could approach similar questions from a totally different perspective. I began to think about the evolution of motherese. Where did it come from? Why don't chimpanzee mothers do it? More important, when and why did hominins begin to engage in motherese?

The last thing to click into place (an epiphany of sorts) was the "putting the baby down" part of my hypothesis, which followed only after I realized the potential importance of ongoing selection for bipedalism, reduction of body hair, and loss of infants' ability for sustained clinging to their mothers' bodies. Confident that I was on the right track, I presented my ideas at a seminar for anthropologists. To my surprise, the linguists in the group actually became visibly angry (in an unintended spontaneous display of multimodal communication, one fellow flung his pencil onto the floor). "You haven't proven that motherese has anything to do with language acquisition," he insisted. "Sure, mommies are emoting affection, and that's nice – but there's no evidence that it has anything to do with their infants' eventual grasp of syntax, grammar, semantics, et cetera." "But I'm not claiming to address the details of language origins per se," I protested. "I'm going earlier and trying to formulate hypotheses about the evolution of the prelinguistic substrates that preceded language." They would have none of it. By the time I submitted the first draft of the present target article, I'd researched the linguistics literature and incorporated a good deal of evidence (sect 2.2 of the target article) that motherese does, indeed, act as a scaffold for language acquisition (although a few of these commentaries continue to express some of the same reservations raised earlier by the linguists).

I've worked on this project for about two years, and it's

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