

3 Joint Attention: Twelve Myths

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Humans have extraordinary capacities for manipulating the perceptual and conceptual foci of their social partners. Symbol users extraordinaire, by virtue of shared symbolic codes, people moot, share, and collaboratively explore the entities of the universe, both physical and abstract, transcending the present moment and the present place. Humans sharing a common language can create joint universes of ratified histories, cosmologies (shared perspectives on humanity's place in the universe), and imaginary futures. As far as we know, this kind of communicative engagement is unique to our species. The learning of these symbolic codes begins in infancy, continues over the entirety of childhood, and extends over a lifetime. However, at about the same age at which humans begin to speak, they also acquire practical, nonlinguistic skills for coordinating their attention to ever more distant entities, in the here and now. These nonverbal skills take months to develop in our species; in Western populations, children typically begin to follow pointing and to attract and redirect the attention of their social partners to increasingly distant entities between nine and eighteen months of age.

Many empirical studies support the contention that joint attention facilitates language acquisition in our species (e.g., Akhtar & Tomasello, 2000; Butterworth, 2003; Baldwin & Moses, 1996; Tomasello & Farrar, 1986). In recent decades, numerous researchers have posited that humans therefore have a species-unique adaptation for joint attention. The hypothesis of a human cognitive specialization for sharing attention is extremely popular in contemporary psychology, philosophy, and cognitive sciences. Numerous claims have been made in support of this view: (1) it has been alleged that after a year of age, human children point to change the contents of the minds of their social partners (Baron-Cohen, 1999), (2) human children allegedly point "altruistically" to inform others of the locations of objects (Lizskowski, Carpenter, Striano, & Tomasello, 2006), (3) human

children allegedly point with a manifest acknowledgment of the mutuality of joint attention (Petitto, 1988), (4) pointing with the index finger has been alleged to be a universal human gesture (Butterworth, 2003; Povinelli & Davis, 1994; Povinelli, Bering, & Giambrone, 2003). Arguments for the human uniqueness of joint attention have looked to the behavior of our nearest living relatives, the great apes, and it has been variously claimed that (5) apes do not point, (6) apes do not point with their index fingers, (7) apes do not point with each other, (8) apes do not point to share attention, (9) apes do not point “altruistically” to inform others, (10) apes do not understand the communicative intentions of others, (11) apes do not acknowledge the mutuality of joint attention, and (12) apes do not point in their natural habitats. I will refute each of these twelve claims, which suffer from either conceptual naiveté (myths 1 through 3) or neglect of the totality of the empirical record (myths 4 through 12). First, I will demonstrate that claims for uniquely human sociocognitive skills supporting joint attention suffer from experimenter bias in favor of humans. Second, I will review the empirical record, which unambiguously demonstrates that every component of joint attention that has been displayed by human infants has also been displayed by representatives of the great apes. Finally, I will suggest that joint attention is wholly explicable in apes and humans as a reflection of means–ends reasoning in all naturalistic and experimental contexts studied to date.

Myths Resulting from Prior Beliefs about Hypothetical Psychological Processes

Myths in this category are characterized by hasty, insufficiently critical commitment to particular, hypothetical models of psychological processing. The central fact that will emerge from this analysis is that the empirical, scientific record does not discriminate between mutually inconsistent interpretations of that record. The significant consequence of this fact is that virtually all contemporary claims to the effect that some experimental finding *supports* any particular hypothetical model of psychological processing must be objectively construed as a finding that is merely *consistent with* that model and, furthermore, is also consistent with a large number of other hypothetical models.

Myth 1: Human Babies Point to Change the Contents of Others’ Minds

This claim has been most forcefully put forward by Baron-Cohen (1989, 1995, 1999) in a reformulation of a theoretical scheme originally put

forward by Bates, Camaioni, and Volterra (1975). In their original treatment, Bates and her colleagues proposed that preverbal human infants' communicative bids could be characterized as *performatives*, which are similar to *utterances*, except that they lack propositional or semantic content. According to a then-popular scheme, all utterances contain both propositional and motivational (performative) content. Hence, the sentence "John hit the ball" contains the same propositional content that can be used in a variety of different performative contexts, such as an imperative, "John, hit the ball," or an interrogative, "Did John hit the ball?" (example from Bates et al., 1975, p. 206). In their analyses of the development of communication in human children, Bates et al. (1975) focused upon two of these motives (or performatives), requesting and commenting. Communicative acts in which babies use adults as means to obtain entities—for example, unreachable objects—or more generally to exert a change in the state of the environment, were termed *protoimperatives*, because these acts were interpreted as functional precursors to the babies' later developing imperative speech acts. The second mode or motivation that Bates et al. (1975) discussed was babies' use of objects to obtain infant-directed adult responses, or *protodeclaratives*, defined, in their terms, as "the use of an object (through pointing, showing, giving, etc.) as the means to obtaining adult attention" (Bates et al., 1975, p. 209). Thus, in the original use of these terms, both protoimperatives and protodeclaratives were construed as instrumental acts, the former to use adults to obtain objects (or other physical changes in the world), the latter to use objects to obtain adult attention. By adult attention, Bates et al. (1975) meant publicly available adult responses that were amenable to objective measurement: "laughter, comment, smiles and eye contact" (p. 216). Other contemporary work did not discriminate different motives for pointing (e.g., Ricks & Wing, 1975). The major significance of Bates et al.'s (1975) analysis, in their own view, was that it was consistent with a then-emerging view that "performative structures have a developmental history prior to speech itself" (p. 207).

These original definitions have undergone an equivocation in the ensuing years. In other words, the terms are no longer used to mean the same things they meant when they were introduced into the scientific literature. For example, Mundy and his colleagues (Mundy, Sigman, Ungerer, & Sherman, 1986, 1987) discussed a tripartite division of communicative motives in infancy, including affiliative, indicating, and behavior regulation; in their scheme, what were a unitary set of motivations categorized as protodeclaratives in Bates et al.'s (1975) system were separated into distinct affiliative and indicating motives. Recently, Liszkowski

and his colleagues (Liszkowski et al., 2006) have suggested that babies' deictic gestures implicate separate motives for requesting, sharing attention, and altruistically informing. The usage of these terms has shifted inexorably toward the dogma that protodeclarative behaviors (showing objects, pointing to objects, etc.) signify attempts by even very young babies to manipulate the perceptions, even the mental contents, of others. Part of the empirical basis for this change was a series of observations on atypically developing children, especially children with autism.

During the late 1970s and 1980s, it became apparent that children with autism differed from typically developing children in their gestural behavior, and numerous researchers attempted to characterize this difference. Curcio (1978) studied, among other things, the pointing of twelve children, from four to twelve years of age, who had been diagnosed with autism. He found no instances of protodeclarative pointing in his sample, with one hour of observation per subject, although some of these children did point protoimperatively. He defined protodeclarative pointing as Bates et al. (1975) had defined it, as the use of objects to obtain adult attention, and interpreted the complete absence of protodeclarative behavior in his autistic sample as evidence for a qualitative difference in the mental development of children with autism, compared with typically developing children. Specifically, he suggested that because protodeclaratives may be functionally important in the development of spontaneous naming (citing Bates, 1976), their absence in these atypical populations might be a significant factor in these children's language delay. Mundy and his colleagues (e.g., 1987) reported that variance in the initiation of and response to joint attention, which included measures of pointing, correlated with later measures of both expressive and receptive language abilities in a sample of children with autism. They suggested that

to intentionally direct the attention of another person, or to respond to attention-directing behaviors, children presumably need to understand that (a) others have a perspective on objects which is independent of the child's perspective and (b) people can share a common interest in objects (Rheingold, Hay, & West, 1976). According to this hypothesis the association between gestural and verbal communication abilities in autistic children may have been mediated by the nonverbal social-cognitive ability to appreciate that other people have an independent point of view and by an associated affective/emphatic ability to share a common interest in objects with other people. (Mundy et al., 1987, p. 362)

Thus, by the middle to late 1980s researchers were equating protodeclarative behaviors with perspective-taking abilities. In Baron-Cohen's seminal 1989 paper, he replicated the apparent deficit in protodeclarative pointing

reported by others in autistic children, but he also redefined the terms protoimperative and protodeclarative. He declared that protoimperatives represented infants' attempts to obtain "some state of affairs in the *physical* world" (p. 137). In contrast, according to Baron-Cohen, protodeclaratives are not instrumental at all, they represent babies' attempts to remark or comment on the state of the world: "the infant's goal is to make another person recognize, attend to or understand what s/he is thinking about" (1989, p. 118). Now, protodeclaratives signified not only perspective taking in babies as young as eleven or twelve months but also the sharing of conceptual worlds—thoughts, ideas, and the like. Before too long, Baron-Cohen was defining protodeclaratives as one of a number of classes of behavior that, according to him, require a theory of mind, including even intentional communication and repairing failed communication.

It is now almost uncontroversial among developmental psychologists that babies point declaratively to influence the contents of the minds of their social partners. Why, many would ask, would babies draw the attention of their social partners to entities in the world if they did not appreciate that their social partners have perspectives and mental contents that differ from their own? According to this view, babies have abstract conceptions of mental states long before (indeed, several years before) they can articulate these abstract conceptions through speech. This theoretical position, then, is infused with an interpretative stance based on a particular assumption about mental functioning, the central assumption that human babies and adults must infer the communicative motives of their social partners to achieve a coordination of attention.

Space does not permit a full critique of this assumption (see Leavens & Racine, 2009, and references therein, e.g., Clark, 1997; De Jaegher & Di Paolo, 2007; Gallagher, 2001, 2008; Hutto, 2008; Johnson, 2001; King, 2004; Lakoff & Johnson, 1999; Leavens, Hopkins, & Bard, 2008; Leudar & Costall, 2004; Lickliter, 2008; Racine & Carpendale, 2008; Reddy & Morris, 2004). For present purposes, let me return to the original, instrumental definition of protodeclaratives. This instrumental interpretation—that babies point protodeclaratively to elicit infant-directed behavior—was elaborated in considerable detail by Moore and Corkum (1994). They argued that after months upon months of experience in the company of responsive caregivers, "the infant may understand that the point will tend to lead to an *adult head turn* and an *interesting subsequent response from the adult*" (Moore & Corkum, 1994, p. 362, emphasis added). According to Moore and Corkum (1994), no human-unique learning capacities need be employed to gain these kinds of expectations. This learning-based account

of protodeclaratives makes a clear prediction: babies who point protodeclaratively will react with dissatisfaction if their social partners do not turn their heads and display concomitant interesting responses. About ten years later, this experiment was performed by Liszkowski, Carpenter, Henning, Striano, and Tomasello (2004). Liszkowski and his colleagues manipulated experimenters' responses to babies' protodeclarative points, reasoning that if babies were dissatisfied with the experimenter's behavior, they should display that dissatisfaction through persistence in pointing (e.g., Golinkoff, 1986). The experimenters assigned twelve-month-old babies to one of four conditions: (1) the experimenter ignored the babies' points, (2) the experimenter turned to look at the targets of the babies' points but maintained a neutral emotional affect, (3) the experimenter did not turn his head to look at the indicated target but directed positive affect toward the baby, and (4) the experimenter both turned his head to look at the indicated target and expressed intensely positive emotion. Consistent with Moore and Corkum's (1994) prediction, based on a learning account of protodeclaratives, the babies in the first three groups all persisted in pointing after the experimenter's responses but appeared satisfied in the fourth condition. This experiment could have disconfirmed a social learning thesis, but it failed to do so. Liszkowski et al.'s (2004) experiment was apparently designed, in part, to refute a later claim by Moore and D'Entremont (2001) that younger babies, at around a year of age, point to enhance an interaction between themselves and their caregivers, irrespective of whether the adult had seen an interesting sight. Liszkowski et al. (2004, p. 305) interpreted their results as a refutation of the social learning account, citing both Moore and Corkum (1994) and Moore and D'Entremont (2001). In fact, their findings actually confirmed the prediction of Moore and Corkum (1994), albeit not the general conclusion of Moore and D'Entremont (2001).

In conclusion, there is, to date, no empirical refutation of the hypothesis that babies might learn to point protodeclaratively based on their experiences in the first year of life, although this does not, of course, unambiguously confirm the conjecture that human babies might learn to point. Over the last forty years, babies have pointed protodeclaratively in Western, postindustrialized communities through a series of major changes in theoretical fashions in psychology, yet no new empirical findings have emerged that unambiguously disconfirm the proposal that babies could, in principle, learn from experience to point protodeclaratively. I do not know whether babies acquire these behaviors from relatively simple learning processes or by the application of human species-specific cognitive

adaptations for understanding others, and I think that any objective review of the literature on human cognitive functioning can only conclude that nobody else knows, either (see, e.g., the spirited discussions in Carruthers, 2009; Mitchell, De Houwer, & Lovibond, 2009)—cognitive science is nowhere near a consensus even on what the basic processes of mental functioning might be in adult humans with sophisticated verbal skills, who can offer explanations for their own behavior (even if those explanations are likely to range from the improbable to the absurd; Nisbett & Wilson, 1977). In a recent article on human pointing, Tomasello, Carpenter, and Liszkowski (2007) argued that human babies, as young as 12 months of age, have rich, abstract representations of the mental lives of their social partners, but commentators on this article cite the same human developmental phenomena to support arguments to the effect that babies might learn to point through experience (D'Entremont & Seamans, 2007), that some mental states are not inferred but directly perceived in the social environment (Gómez, 2007), and that babies point neither declaratively nor imperatively, but interrogatively, to probe the contingencies of their environments (Southgate, van Maanen, & Csibra, 2007). Thus, the same developmental phenomena support mutually inconsistent hypotheses about mechanisms of acquisition and about the motivational bases for pointing. Therefore, resolution of the specific question of whether human babies can represent and are motivated to alter the contents of others' minds is currently beyond the capabilities of the cognitive sciences. This conclusion admits of the possibility that this very rich interpretation of infants' behavior might be true but relegates it to the category of fervently held beliefs. To argue that human children point to alter the contents of others' minds is to make a commitment to a particular theoretical conception of mental functioning (in particular, a telementational or inferential model in which there are these entities called minds that are coextensive with brains and that can engage with others only through an inferential process—see, e.g., Leavens & Racine, 2009; Leudar & Costall, 2004), but to deny that entirely different kinds of explanations are also possible, at our present state of knowledge, is, in my view, desperately naive.

Myth 2: Human Babies Point Altruistically to Inform Others of the Locations of Objects

Liszkowski et al. (2006) claimed that one-year-old human babies pointed altruistically to inform an experimenter of the location of an object for which he was searching. They further argued that this behavior demonstrates that even very young “humans conceive of others as intentional

agents with informational states and they have the motivation to provide such information communicatively” (p. 173). In two experiments, experimenters pretended to accidentally drop a number of objects, and babies at one year and one-and-a-half years of age often pointed to the dropped objects, pointing significantly more often to the object for which the experimenter was looking, and pointing more often before than after the experimenter verbally asked for help in finding the object. In the first experiment, consisting of six trials, the babies were seated in the laps of research assistants, while the babies’ mothers were elsewhere in the room (the mothers’ locations were not specified). In the second experiment, comprising twelve trials, the babies were seated in their mothers’ laps. Liszkowski et al. (2006) concluded that the babies’ pointing to objects for which an experimenter was looking reflected a “uniquely human” (p. 186) form of cooperation.

Methodologically, it is important to note that with this study, as with virtually all experiments of this type, absolutely no experimental control was exerted over these babies’ preexperimental histories. The authors appeal to evolutionary factors within the last six million years (since our split with the other great apes) to account for behavior that emerges in human twelve-month-olds but provide no account of the life experiences of these children in the twelve months prior to these experiments. I am forced to ask, is it possible to teach (either intentionally or inadvertently) a human to point informatively in twelve months? Arguably, at least in principle, yes it is. The invocation of evolutionary history to account for this behavior in the absence of experimental control over the preexperimental lives of these organisms is neither necessary nor convincing. Now, sometimes people get angry with me for pointing this out because there is no way anybody can ethically control the preexperimental histories of human babies, so the criticism is perceived as being unfair. However, my criticism stands: if an organism (of any species) displays a behavioral innovation at some age (any age) and the experimenter lacks control over its preexperimental experiences, then it is logically ambiguous whether evolutionary factors, ontogenetic factors, or gene–environment interactions account for the behavioral innovation. This is a rudimentary principle of the experimental method and is the major rationale for carefully matching comparison groups on as many social, economic, and other experiential variables as possible.¹ The consequence of these methodological problems is that the “human uniqueness” of the behavior is entirely conjectural—this study provides no empirical foundation for this aspect of their claim, that informative pointing indexes a uniquely human motivation.

However, there is a graver epistemological problem with any claim about the state of mind of any organism, including human babies: no scientist in the 13.7-billion-year history of the universe has ever directly measured a “state of mind” or a motivational state (e.g., Bergmann, 1962; Leavens et al., 2008). These alleged motivations are nothing more than hypothetical constructs that scientists invent to account for the behavior that is directly measured. Therefore, like the claims we discussed, above, this specific claim that the babies in these experiments were pointing with the particular ambition to provide information to social partners that the babies recognized as “persons who can retain and attend to new information” (p. 185) is naive and misleadingly myopic. It is simply one of a very large number of mutually incompatible interpretations of these babies’ behavior. This will become particularly clear, I think, when we discuss the numerous observations of informative pointing by great apes, below. In short, Liszkowski and his colleagues have no special apparatus or unique talent to perceive the invisible mental processes of nonverbal organisms of any species—the claim for a human-unique motivation for sharing information that is manifest as early as twelve months of age is nothing more than a currently fashionable interpretation. We do not know whether this proclivity to point to dropped objects is cued by aspects of the experimental contexts. We do not know that human babies are incapable of learning (either operantly or observationally) an informative response given twelve full months of life experience in a cultural context characterized by numerous episodes of joint attention. To be clear, I do not think that it is irresponsible to posit these kinds of hypothetical psychological processes—what I think is irresponsible is the strident insistence that only one interpretation is plausible when the truth is that these data are consistent with an immensely large number of alternative and plausible explanations.

Myth 3: Human Babies Point with Manifest Acknowledgment of the Mutuality of Joint Attention

One of the keystones of several strands of philosophical thought in the contemporary cognitive sciences is that humans communicate with the mutual awareness that they are communicating, sharing a large set of presumptions about the motivations with which specific information is imparted from one person to the next (e.g., Grice, 1975). Open almost any textbook on human communication, and you will find claims to the effect that this theoretical mutuality of engagement during communication is unique to our species. Therefore, developmental psychologists have worked

to identify the onset of this mutual awareness, and the preponderance of opinion in contemporary psychology is that it emerges with the preverbal, intentional gestural communication of human babies near the end of the first year or early in the second year of life (e.g., Bates et al., 1975; Petitto, 1988; Tomasello, 1995). How do researchers know that these young babies have developed this explicit appreciation of the mutuality of joint attention? The babies look at their caregivers while pointing (Bates, Benigni, Bretherton, Camaioni, & Volterra, 1977; Desrochers, Morissette, & Ricard, 1995; Franco & Butterworth, 1996; Lempers, 1979). Sometimes, they also smile (Jones & Hong, 2001, 2005; Messinger & Fogel, 1998).

Franco and Butterworth (1996) documented a developmental transition from (1) pointing followed by looking toward a social partner to (2) pointing after a look toward the social partner, which they interpreted as evidence for babies' increasing awareness of the circumstances in which their pointing is effective (i.e., only if the social partner is attending to them). Tomasello (1995) argued that this visual orienting toward adult caregivers signifies that "the child understands that the adult is a separate person who has intentions and attention that may differ from its own" (p. 109). Tomasello (1995) highlighted the affective concomitants of these looks, arguing that the smooth coordination of these emotional expressions with ongoing social activities implicates a dawning awareness of others as mental beings. Tomasello (1995) contrasted his mentalistically rich explanation with the conditioning models of Moore and Corkum (1994) and noted, in passing, that "conditioning explanations can never be ruled out completely" (p. 109). In other words, these rich interpretations of babies' looks toward their caregivers are not uniquely specified by the behavior of looking. I agree.

As for the earlier myths we discussed, the ideas (1) that babies understand their interactions with other people as engagements between people who have separate perspectives and (2) that this sophisticated social understanding is indexed by the babies' looking behavior or the babies' increasingly smooth integration of looking into social interactions are simply two of a very large number of possible interpretations of these developmental elaborations. Empirically, babies' visual monitoring of their caregivers during social interaction does change with age in timing and affective quality, but these developmental innovations are entirely mute regarding the babies' understandings of their social partners as mental beings. If there was some reason that human babies could not, in principle, become more skilled at negotiating communication in triadic contexts with increased experience in these contexts (i.e., if human babies were—unique among

mammals—incapable of learning from experience), then their developmental changes in the coordination of looking with gesturing would require some kind of non-learning-based theoretical explanation. However, there is no evidence that human babies are uniquely incapable of learning from experience; therefore, there is no rational case for dismissing learning models in accounting for humans' communicative development. It is currently fashionable to read sophisticated reasoning in the patterns of visual engagement of human babies with their social partners, and it seems to me that it is reasonable to posit different psychological processes to account for these patterns, but it is neither reasonable nor responsible, in my opinion, to pretend that babies' visual orienting can, in principle, distinguish between a host of hypothetical psychological processes, none of which are available for public scrutiny.

Myths Resulting from Weak or Selective Scholarship

Myths in this category arise from a variety of scholastic infelicities. Three of the most rampant contemporary scholarly weaknesses are (a) overgeneralization from one population to an entire ape or human species, (b) arguments from ignorance (in which a lack of empirical data is taken to signify evidence of, variously, absence or universality), and (c) omission of published findings without adequate justification or explanation. All of these factors constitute confirmation bias, the tendencies to ignore evidence contrary to one's beliefs or to accept evidence consistent with one's beliefs, without adequate critical scrutiny. In my reading of the contemporary literature on joint attention in apes and humans, the field is rotten with confirmation biases, and I hope this critique will contribute to better standards of scholarship than are currently evident.

Myth 4: Pointing with the Index Finger Is a Human Universal

It has been widely believed that pointing with the index finger is a human universal (e.g., Butterworth, 2003; Eibl-Eibesfeldt, 1989; Degos, 2001; Povinelli & Davis, 1994; Povinelli et al., 2003). However, Wilkins (2003) has garnered a broad range of ethnographic data in support of his thesis that pointing is not a universal human pointing gesture, chiefly on the basis of its different prominence in different human cultures, ranging from complete absence (the Barai of Papua New Guinea) to very high incidence (e.g., many Western cultures). For many millions of people, worldwide, pointing with the index finger is certainly not the canonical form of pointing—many people point, preferentially, with their lips, for example

(Enfield, 2001; Wilkins, 2003). Moreover, pointing with the whole hand is a widespread deictic gesture in both Western and non-Western cultures (Kendon & Versante, 2003; Wilkins, 2003). Pointing with the index finger is certainly very widespread among humans, but it is by no means the preferred manner of pointing in all cultures in all communicative contexts, including Western cultures (Iverson & Goldin-Meadow, 1997; Kendon & Versante, 2003; Leavens & Naylor, in preparation). This cultural and contextual variation in the posture of the pointing hand and even the preference for pointing with a limb rather than the lips argues against earlier ideas of "The Human Pointing Gesture" (Leavens, 2004; Leavens & Bard, 2011; Leavens & Racine, 2009).

In accordance with the older view of index-finger pointing as something decidedly special and unique, the early literature on the development of pointing in humans strictly separated pointing with the index finger from other apparently deictic gestures, including pointing with the whole hand (Leung & Rheingold, 1981; Masur, 1983); however, little evidence has been garnered to support the view that pointing with the index finger has significant functional or psychological differences compared with pointing with the whole hand during early human development. Both kinds of pointing are increasingly accompanied by high rates of vocal production and visual orienting toward caregivers (reviewed by Leavens & Hopkins, 1999).² Recent studies with human babies have largely abandoned this rigid distinction between index-finger pointing and whole-hand pointing, in numerous experimental contexts, and contemporary researchers now include whole-hand points as exemplars of protoimperative pointing (O'Neill, 1996), protodeclarative pointing (Brooks & Meltzoff, 2002), and so-called "informative" pointing (Liszkowski et al., 2006).

Myth 5: Apes Do Not or Cannot Point

Because apes are our nearest living relatives, most claims for human behavioral and cognitive uniqueness have cited the absence of various capabilities in the great apes in support of these generally very hasty sorts of assertions. With respect to pointing, for example, until recently, there were numerous claims to the effect that apes either did not or could not point (e.g., Butterworth & Grover, 1988; Degos, 2001; Povinelli et al., 2003), and I have reviewed the empirical data refuting these incorrect assertions several times in recent years (Leavens, 2004; Leavens & Bard, forthcoming; Leavens & Hopkins, 1999; Leavens & Racine, 2009; Leavens, Racine, & Hopkins, 2009; Leavens, Bard, & Hopkins, 2010); therefore, I will not repeat the same material, here. In short, since 1909, there are at least forty-

five scientific publications in which pointing has been reported in all four species of great ape, including orangutans (*Pongo* spp.), gorillas (*Gorilla gorilla* spp.), bonobos (*Pan paniscus*), and chimpanzees (*Pan troglodytes* spp.; e.g., Boysen & Berntson, 1989; Call & Tomasello, 1994; Carpenter, Tomasello, & Savage-Rumbaugh, 1995; Finch, 1942; Furness, 1916; Krause & Fouts, 1997; Leavens & Hopkins, 1998, 2005; Leavens, Hopkins, & Bard, 1996; Leavens, Hopkins, & Thomas, 2004; Leavens, Russell, & Hopkins, 2005a; Menzel, 1999; Povinelli, Nelson, & Boysen, 1990, 1992; Savage-Rumbaugh, 1986; Savage-Rumbaugh, Rumbaugh, & MacDonald, 1985; Savage-Rumbaugh, MacDonald, Sevcik, Hopkins, & Rubert, 1986; Tanner, Patterson, & Byrne, 2006; Veà & Sabater-Pi, 1998; Whiten, 2000; Witmer, 1909; Woodruff & Premack, 1979; Yerkes, 1943). Thus, apes can and do point. The central significance of this pointing is that apes point without evolutionary adaptations for bipedal locomotion, for speech, or for extraordinarily large brains; therefore, either (1) these adaptations are largely irrelevant to the development of pointing (this is my position, e.g., Leavens, 2004; Leavens et al., 2005b, 2008, 2009) or (2) human pointing is predicated upon entirely different evolutionary and psychological foundations than is the pointing of our nearest living relatives, the great apes (this is the position of just about everybody else: e.g., Butterworth, 2003; Povinelli et al., 2003; Tomasello et al., 2007). Of course, I should point out that both (1) and (2) could be true, in principle, but in practice, most theorists attribute uniquely human cognitive adaptations either to one of these three adaptations or to epiphenomenal consequences of these adaptations. Gómez (e.g., 2007) advocates a unique position that he described as “a balanced interpretation” (p. 729); in his view, pointing is an adaptation in humans but an exaptation (see Gould & Lewontin, 1979) in apes (i.e., apes are evolutionary “newcomers” to pointing), and therefore, according to Gómez, there are both psychological similarities and differences in the pointing of apes and humans.

Myth 6: Apes Do Not Point with Their Index Fingers

Consistent with earlier interpretations of pointing with the index finger as a biologically based human species-specific manual gesture (e.g., Butterworth, 2003; Eibl-Eibesfeldt, 1989; Povinelli et al., 2003), numerous claims exist in the literature either that apes do not point with their index fingers (Masataka, 2003), or do not point very often with their index fingers (Butterworth, 2003; Povinelli et al., 2003), or that cage mesh forces independent extension of index fingers while apes “reach” for food (Povinelli et al., 2003; Tomasello, personal communication, March 29,

2004). Again, this is a topic that my colleagues and I have reviewed in numerous places in the last fifteen years, including Leavens (2004), Leavens and Bard (2011), Leavens and Hopkins (1999), Leavens and Racine (2009), and Leavens et al. (2008, 2009, 2010), so I will limit my remarks to the basic facts, here, referring the interested reader to those other sources. Language-trained apes usually point with their index fingers (Call & Tomasello, 1994; Krause & Fouts, 1997; Miles, 1990; Tanner, Patterson, & Byrne, 2006), and this does not usually involve intervening cage mesh (although, in some experimental contexts, it does). Among sign-language-trained apes, pointing with the index finger has pronominal and locative linguistic functions, and there are hundreds of published observations of apes extending their index fingers to refer to entities in these symbolic contexts in the absence of cage mesh (e.g., Gardner, Gardner, & van Cantfort, 1989; Miles, 1990). In my view, given that it is not sensible to assign completely different cognitive capabilities to humans as a function of whether they point with their index fingers, their whole hands, or their lips, this concern with the form of pointing by apes is misplaced—it is a red herring. If no population of apes displayed a preference for pointing with the index fingers, then perhaps the idea that hand shape reflects something deeper than learned convention or immediate contextual exigencies would be worthy of discussion, but this is not the case.

Myth 7: Apes Do Not Point with Each Other

Numerous researchers have claimed that apes do not point with each other (e.g., Povinelli et al., 2003; Tomasello et al., 2007). Moll and Tomasello (2007) emphatically stated that “there has not been a single reliable documentation of any scientist in any part of the world of one ape pointing for another” (p. 643—the same claim was made by Tomasello, 2006). Apparently, Moll and Tomasello find the following scientists’ documentations of these behaviors to be unreliable: de Waal (1982), Savage-Rumbaugh (1986), and Veà and Sabater-Pi (1998). Savage-Rumbaugh (1986), for example, reported thirty-seven instances of pointing between Sherman and Austin, two language-trained chimpanzees. Pointing between non-language-trained chimpanzees was reported by de Waal (1982), who only saw this gesture on a few occasions. Here is one example:

On a hot day two mothers, Jimmie and Tepel, are sitting in the shadow of an oak tree while their two children play in the sand at their feet. Between the two mothers the oldest female, Mama, lies asleep. Suddenly the children start screaming, hitting, and pulling each other’s hair. Jimmie admonishes them with a soft, threatening grunt, and Tepel anxiously shifts her position. The children go on quarrelling, and

eventually Tepel wakes Mama by poking her in the ribs several times. As Mama gets up Tepel points to the two quarrelling children. As soon as Mama takes one threatening step forward, waves her arm in the air, and barks loudly the children stop quarrelling. Mama then lies down again and continues her siesta. (de Waal, 1982, p. 34)

Pointing between wild bonobos was reported by Veà and Sabater-Pi (1998). As far as I can tell from the literature, pointing between apes is infrequent, but it happens on occasion, and when it does, it is similar in function to pointing by humans.

Tied up with these false claims that apes do not point between themselves is the idea that apes do not point “naturally.” It does seem to be true that apes only rarely display manual pointing in their natural habitats (see myth 12, below), but the significance of this empirical fact is widely misunderstood. Because we have discussed this specific point at length, elsewhere (Bard & Leavens, 2009; Leavens & Bard, 2011; Leavens, Hopkins, & Bard, 2005b, 2008), I will simply state our position, here, and direct the interested reader to those sources. Everything that we think we know about the development and use of pointing in humans derives from human populations raised in patently unnatural circumstances; that is, pointing emerges in humans in artificial environments to which we are clearly not adapted by natural selection. Therefore, I believe that it is specious to argue that because apes mostly point when raised in artificial environments, pointing is therefore not representative of the species. Instead, I note that both apes and humans develop pointing in artificial environments—it is as “natural” for an ape to point in man-made³ social and physical environments as it for a human to point in man-made social and physical environments.

Myth 8: Apes Do Not Point to Share Attention

This is one of the most frequent claims in the contemporary literature (e.g., Povinelli et al., 2003; Tomasello et al., 2007). Tomasello and his colleagues stated the following with conviction:

apes do not produce, either for humans or for other apes, points that serve functions other than the imperative/requestive function. That is, they do not point declaratively to simply share interest and attention in something with another individual, and they do not point informatively to inform others of things they want or need to know. (2007, p. 717)

With the proviso that we are as blind to the inner psychological processes of great apes as we are to human infants' internal processing, in fact, like humans, apes do point and otherwise use objects in apparent attempts to

redirect the attention of their social partners, and this has been documented numerous times over the last 100 years (e.g., Kellogg & Kellogg, 1933; Miles, 1990; Plooi, 1978; Russell, Bard, & Adamson, 1997; Savage-Rumbaugh et al., 1986; Savage-Rumbaugh, Shanker, & Taylor, 1998; Veà & Sabater-Pi, 1998; Witmer, 1909). The state of the empirical record is so sparse that it is difficult to know how often this sort of thing happens, and the situation is further complicated by the fact, as discussed at some length above, that there is a widespread belief that protodeclarative pointing signifies psychological processes that are substantially different from the psychological processes underpinning protoimperative pointing. Here I will simply repeat that I think the evidence is decidedly equivocal on this specific point, that the empirical record seems to me to be consistent with the idea that both protoimperative and protodeclarative pointing are instrumental acts, and direct the reader to our previous reviews on this topic (Leavens, 2004; Leavens & Racine, 2009; Leavens et al., 2005b, 2009).

Myth 9: Apes Do Not Point “Altruistically” to Inform Others

In 1909, Witmer published his observations on the language comprehension of a performing chimpanzee named Peter. He asked Peter where “Mrs. McArdle” (one of his trainers) was, and Peter pointed to Mrs. McArdle, informing Witmer altruistically (i.e., without reward) of something that Witmer wanted to know. Therefore, Tomasello et al.’s (2007) claim to the contrary (see quote in myth 8), was refuted ninety-eight years prior to its initial publication. Kellogg and Kellogg (1933) published a photograph of Gua pointing to her own nose in response to the query, “Where is your nose?” The seminal paper by Premack and Woodruff (1978) introduced a chimpanzee named Sarah to videotapes of a series of human activities, each of which required a key element for successful completion, and she indicated the correct solution out of a pair choices by selecting a photograph depicting an appropriate solution (e.g., a photograph of a key when a human is trying to enter a locked cage). To the best of my knowledge, every language-trained ape in history has responded appropriately to queries of the form, “Where is X?” by either pointing to the entity “X” or selecting a symbol representing “X,” including many hundreds of such episodes performed under extinction (i.e., without reinforcement; see, e.g., Leavens & Racine, 2009). Tomasello and his colleagues (2007) clearly know about this research, so I am forced to speculate that they believe there must be some kind of psychological difference between informative pointing when apes do it (and which informative pointing has been empirically

demonstrated numerous times) and informative pointing when human babies do it. As noted above, however, the evidence for “altruistic” pointing in human babies is equivocal, at best—there is no dispute that babies will point to dropped objects after many months of life experience in urban, German environments, but there is no compelling evidence that this is truly “altruistic,” and, to date, there has not been adequate control for inadvertent cuing. When it comes to informative pointing, the empirical record demonstrating this behavior is far stronger in great apes than it is in humans because in great apes it has been documented in conditions of extinction (contrary to the differential reinforcement used in Liszkowski et al., 2006; see, e.g., Gardner, 2008; also see Call 2011 for an independent analysis of communicative motivations in pointing apes: his conclusion is that great apes do display “informative,” but not protodeclarative pointing).

Myth 10: Apes Do Not Understand the Communicative Intentions of Others

It has been widely stated that great apes are oblivious to the communicative intentions of others, especially in cooperative contexts, where, for example, a human might point to a baited container (e.g., Povinelli, Reaux, Bierschwale, Allain, & Simon, 1997; Tomasello et al., 2007). Thus, failures to follow pointing are taken to signify a lack of appreciation of cooperative intentions in others. It is true that sometimes some apes perform poorly in this kind of task (e.g., Hare & Tomasello, 2004; Itakura, Agnetta, Hare, & Tomasello, 1999), but because other apes have no difficulty whatsoever in following pointing, therefore, the general conclusion that a given species cannot understand communicative intentions has been repeatedly falsified under controlled experimental conditions (e.g., Itakura, Agnetta, Hare, & Tomasello, 1999; Lyn, Russell, & Hopkins, 2010; Peignot & Anderson, 1999; Povinelli et al., 1990, 1992). According to the analyses presented in Leavens and Bard (2011) and Leavens et al. (2010), institutionalized apes sometimes fail to follow pointing gestures, but language-trained or home-raised apes, considered as a group, display no such difficulty. Therefore, according to the empirical record, those apes with the greatest familiarity with conventions of human signaling tend to perform better in following pointing and other nonverbal cues. This is not surprising to anyone except those who may have an undue emotional commitment to theoretical models built on notions of uniquely human sociocognitive skills in joint attention contexts.

Myth 11: Apes Do Not Acknowledge the Mutuality of Joint Attention

Recall from the discussion of myth 3 that for many contemporary researchers, the state of mutual knowing of engagement is signified in human babies by visual orienting toward their social partners at certain times in development, and that I am skeptical that this visual orienting behavior, with or without accompanying emotional signals, can unambiguously implicate any concept so abstract. However, irrespective of the diagnostic value of the visual checking behavior, it has been claimed that only humans point with gaze alternation between distant objects and social partners (e.g., Petitto, 1988). In fact, in my studies of chimpanzee communication with William D. Hopkins and our collaborators at the Yerkes National Primate Research Center, in Atlanta, Georgia, we find that gaze alternation (looking between unreachable food and a human experimenter) is a very frequent accompaniment to manual gestures in these triadic contexts: between 85% and 100% of the chimpanzees who display manual gestures in the presence of unreachable food—and including many manual points as well as experimenter-directed begging gestures—also look toward the experimenter (see figure 3.1). In our studies, sample sizes ranged from 29 to 115 chimpanzees, who received only one trial in each of the eight experimental conditions depicted in figure 3.1. Human babies in similar experimental contexts do not display this same high level of visual monitoring until near the end of their second year of life (Bates et al., 1977; Desrochers et al., 1995; Lempers, 1979—see Leavens et al., 2008, for discussion). Thus, again, we find that a key defining behavioral variable that is widely interpreted to index sophisticated cognitive reasoning in human babies—namely, looking at a social partner while gesturing—is also characteristic of chimpanzees in triadic contexts.

It has to be said that there are substantial qualitative differences in the emotional tone of the triadic contexts in which we have studied chimpanzee gestures, involving unreachable food, and the experimental contexts in which pointing is typically elicited from human babies, often using unreachable nonfood items. In these latter contexts, human babies often display obvious joy, and these joint attention episodes are punctuated by looks from baby to mother and vice versa with intense bursts of apparently shared positive emotion (Carpenter & Liebal, 2009; Leavens & Todd, 2009). Although chimpanzees in the presence of unreachable food might be described as earnest or enthusiastic, it would be not be accurate to describe the quality of their looking as joyful. These patterns of emotional signaling in triadic contexts are not well studied at present (but see, e.g., Jones & Hong, 2001, 2005).

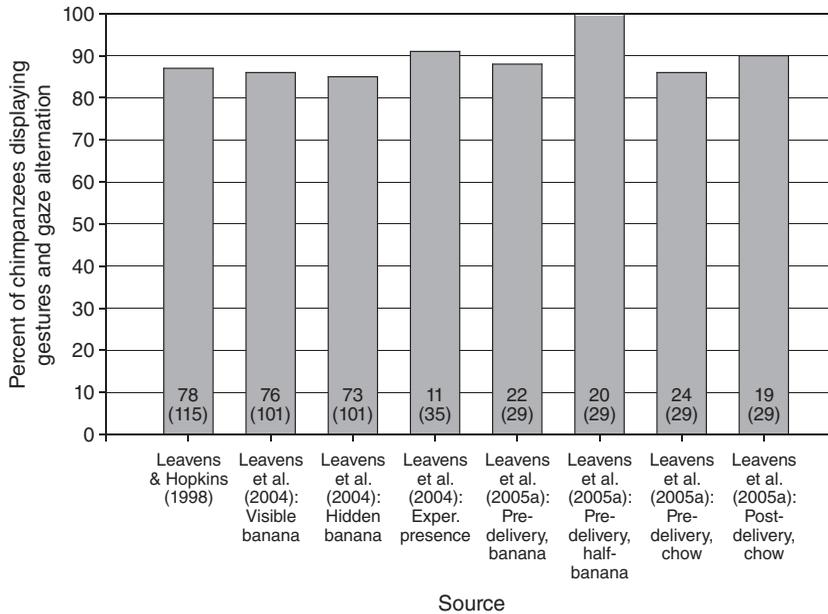


Figure 3.1

Percentage of chimpanzees who displayed both manual gestures and gaze alternation between unreachable food and an experimenter in eight experimental conditions. Arabic numerals denote the number of chimpanzees who displayed manual gestures (numbers in parentheses denote the total sample size for each experimental condition). Each condition involved a triangular arrangement of (1) desirable, but unreachable food, (2) a chimpanzee, and (3) a human experimenter. Each bar represents only the first trial in which the subjects were exposed to each of these experimental conditions. These chimpanzees ranged from three to fifty-six years in age and were housed at the Yerkes National Primate Research Center, in Atlanta, Georgia, between 1996 and 2003. Exper., experimenter.

Myth 12: Apes Do Not Point in Their Natural Habitats

Related to the fallacious idea that apes do not point “naturally” is the oft-repeated claim that apes do not point in their natural habitats (Povinelli et al., 2003; Tomasello et al., 2007). In fact, as noted earlier, manual pointing by apes in wild habitats seems to be exceedingly rare. Nissen (1931) reported pointing by a wild female chimpanzee but then questioned whether she was actually pointing or merely flicking her hand at flying insects. Inoue-Nakamura and Matsuzawa (1997) described several instances of index-finger pointing in wild chimpanzees in the context of using stone tools to crack palm nuts; however, it is unclear from this

report whether the animals were actually communicating with this gesture or simply using their index fingers to probe various items associated with the nut-cracking, for example, to reposition a nut on an anvil stone. These authors have not responded to my query about the specific circumstances of this apparent pointing, so this remains a fairly ambiguous report of pointing. Veà and Sabater-Pi (1998) reported two clear instances of pointing by a bonobo to the location of several human observers attempting to hide behind some shrubbery. This pointing was accompanied by looks back toward the remainder of the bonobo's troop. As far as manual pointing goes, this is the extent of the published record, to the best of my knowledge (I would be grateful for any further such observations from fieldworkers). Thus, it is a myth to state categorically that apes do not point in the wild, but the behavior does seem to be exceedingly rare. However, apes in the wild do display plenty of deictic behaviors, including the showing of objects (e.g., Plooi, 1978), display of self (Plooi, 1978), and the recently reported "directed scratching" described by Pika and Mitani (2006). In this latter activity, one chimpanzee directs the grooming of another chimpanzee to a particular part of its body with an exaggerated scratching gesture.

The scientific significance of the distribution of pointing among great apes is, according to my reading of the contemporary literature, widely underappreciated. Most researchers who have a theoretical interest in the matter report that apes either never or almost never point in their natural habitats, trumpet pointing as a uniquely human biological adaptation, and leave it at that (e.g., Povinelli et al., 2003). The situation is as follows: wild apes almost never point, about half of institutionalized apes will point in triadic contexts, and as far as I know, there is no such thing as a language-trained ape who does not frequently point. This means that pointing in great apes cannot be attributed to nucleotide sequence differences between, for example, wild and captive apes. Therefore, the display of pointing in great apes is subject to profound environmental plasticity, ranging from almost complete absence to ubiquity, depending on their specific environmental circumstances. Thus, it is fairly clear that apes learn to point when they are raised in some man-made environments—the central claim of this chapter is that the data permit the speculation that perhaps humans also learn to point when they are raised in some man-made environments (Leavens, 2004; Leavens & Bard, 2011; Leavens & Racine, 2009; Leavens et al., 2005b, 2008, 2009, 2010).

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Notes

1. Another methodological criticism of this study is that no analysis was presented to control for the possibility that the experiments, themselves, were eliciting this behavior—no relevant analysis was presented for either experiment. Thus, it is ambiguous the degree to which the babies responded on later trials based on events that happened in the earlier trials. This is a particularly important consideration because the researchers only reinforced correct pointing to the dropped object (exclaiming, “Ah! There it is!”). There was, furthermore, no control against inadvertent cuing from the adults present (experimenters and mothers—see Boesch, 2008, for a particularly exasperated critique of related studies on infant behavior).
2. However, see, for example, Butterworth (2003), Masataka (2003), and Franco and Butterworth (1996) for data and arguments for the functional differentiation of pointing with the index finger versus the whole hand; specifically, the claim is that pointing with the whole hand may be more associated with protoimperatives than protodeclaratives in some human populations (Blake, O’Rourke, & Borzellino, 1994; Leavens & Hopkins, 1999; Liszkowski, Schafer, Carpenter, & Tomasello, 2009).
3. I usually try to avoid androcentric terms for human activities or for humans, generally, but I prefer “man-made” to its more gender-neutral but less mellifluous synonym, “anthropogenic.”

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