


Current Trends in Dog-Human Communication: Do Dogs Inform?

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Abstract

Domestic dogs are especially skillful at understanding human forms of communication. Evidence suggests that dogs' skills in this domain might be an adaptation to life with humans and the result of selection processes during domestication. One question that has sparked a lot of research in recent years is to what extent dogs' communication is in any way comparable to that of human infants. Here, we discuss recent research that has examined the extent to which dogs communicate to inform others. Communication with the motive to inform others is, as of yet, seen as a unique feature of human communication.

Keywords

dog, informing, communication, helping

Dogs have remarkable social skills, which are considered to be to some extent functionally equivalent to those of humans (Marshall-Pescini & Kaminski, 2014). Dogs, like human infants, are very good at following visual, gestural cues provided by humans, such as pointing or gazing at a specific target (e.g., Hare & Tomasello, 1999; Soproni, Miklósi, Topál, & Csányi, 2001). Without the need of any formal training (Hare & Tomasello, 1999), and at a very young age (Riedel, Schumann, Kaminski, Call, & Tomasello, 2008), dogs' ability to use human gestures to find a hidden reward is comparable to that of young children in similar settings (Lakatos, Soproni, Doka, & Miklósi, 2009; Topál, Gergely, Erdőhegyi, Csibra, & Miklósi, 2009).

In addition, dogs tend to outperform their closest living relative, the wolf, even when both species are raised under identical conditions (Virányi et al., 2008). Unless wolves receive extensive and prolonged training (Udell, Dorey, & Wynne, 2008), they do not reach the same skills as dogs when it comes to using human communicative gestures (Miklósi et al., 2003). Finally, dogs do not seem to be as good at following cues to hidden food provided by other dogs in an experimental setting (Hare & Tomasello, 1999; Shyne, Singer, & Jameson, 2012).

Taken together, this evidence led to the so-called *domestication hypothesis*, which proposes that dogs' human-like social skills derive from dogs' unique evolutionary past with humans and are an adaptation to life with humans

(Hare, Brown, Williamson, & Tomasello, 2002). Dogs were the first species to be domesticated (Skoglund, Ersmark, Palkopoulou, & Dalén, 2015), and one possibility is that later during the domestication process humans selected dogs for activities, such as hunting and herding, that required skill at following human cues (Kaminski & Nitzschner, 2013). One hypothesis is therefore that dogs adapted to life in the human environment by developing specific social skills for interacting with humans (Hare et al., 2002; Miklósi et al., 2003). This hypothesis is further supported by the finding that dog breeds selected for work in continuous visual contact with human partners (e.g., sheepdogs, gun dogs) are more successful in following the human pointing gesture than are dogs selected for independent work (e.g., hounds, underground-hunting dogs, livestock guard dogs, sled dogs) or non-purebred dogs (Gácsi, McGreevy, Kara, & Miklósi, 2009).

Dogs also have the ability to referentially produce communicative behaviors (e.g., in order to guide a human toward a certain object; Miklósi, Polgárdi, Topál, & Csányi, 2000). These behaviors are described as *showing*

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behavior, which includes gaze alternation and attention-getting behaviors that dogs use to indicate a referent (Miklósi et al., 2000). The showing behavior fulfills the criteria for intentionality and referentiality as they have been introduced for primates (Gaunet & Deputte, 2011; Leavens, 2004). Specifically, dogs do produce this behavior in the absence of an audience; they alternate gazes between the human and the referent; they use attention-getting behaviors (e.g., vocalizations; Miklósi et al., 2000); and they take into account the attentional state of their audience (Gaunet & Deputte, 2011; Marshall-Pescini, Colombo, Passalacqua, Merola, & Prato-Previde, 2013).

Dogs' flexible use of interspecific communication with humans leads to questions about the cognitive mechanisms underlying such skills. One question is whether dogs understand the informative nature of human communication or, rather, interpret it as imperative (i.e., telling them where to go and/or what to do; Kaminski, Neumann, Bräuer, Call, & Tomasello, 2011; Kaminski & Nitzschner, 2013; Topál et al., 2009). The question is particularly relevant given that informative communication has been described as a uniquely human form of communication (Liszkowski, Carpenter, Striano, & Tomasello, 2006; Tomasello, Carpenter, & Liszkowski, 2007).

Cognitive Mechanisms Underlying Informative Communication

In human communication, imperative communication has the goal of obtaining something for the self by influencing someone's behavior (e.g., a child pointing at an object that he or she wants to obtain; Camaioni, Perucchini, Bellagamba, & Colonesi, 2004). From a cognitive perspective, it requires the child to conceive of the other person as an animate "agent of action"—something like a "social tool" (Camaioni et al., 2004). By contrast, declarative communication has the goal of sharing attention and interest with others and influencing someone's attentional focus by directing it to another object (Camaioni et al., 2004) or to the self (C. Moore & D'Entremont, 2001). From a cognitive perspective, declarative pointing is thought to require some understanding of others' mental states (e.g., others' intentions; Camaioni et al., 2004). Informative pointing is defined as a subtype of declarative gestures, which specifically refers to communicative acts produced with the intent to inform others about things they want or need to know (Liszkowski et al., 2006). Several cognitive skills need to be in place for informative pointing to occur. Tomasello et al. (2007) suggested that there needs to be a mutual understanding of the signaler's intention to communicate. This is often signaled through so-called *ostensive* cues (e.g., eye contact and high-pitched voice; Csibra & Gergely, 2009). There also needs to be an understanding of referential intention, which is required for the

receiver to understand that he or she has to attend to a specific referent, and finally, there needs to be a motivation to be helpful and to provide information to the other (Tomasello et al., 2007).

Informative Communication in Dogs?

Dogs' human-like social skills make them a good candidate for exploring whether human forms of communication are indeed unique (Kaminski et al., 2011). Since dogs' social skills appear to be a specialization to communicative interactions with humans specifically, research in this area has primarily focused on dog-human communication. In order to be able to understand the informative aspect of communication, dogs would need to possess the cognitive skills required for such communication: understanding of the communicative intent (e.g., sensitivity to ostensive cues), a referential understanding of communication (Tomasello et al., 2007), and informative (helpful) motives.

There is some evidence that might suggest that dogs understand intent—more specifically, communicative intent. Dogs seem to perceive human actions as goal-directed, in that dogs differentiate human actions from the "actions" of an inanimate object (i.e., a box; Marshall-Pescini, Ceretta, & Prato-Previde, 2014)—although if a robot performs certain actions, dogs seem to accept it quickly as a "goal-directed" being, which suggests that dogs might attend to actions rather than intentions (Gergely et al., 2015). When it comes to dogs' understanding of humans' psychological states, results are not unanimous. Dogs seem to understand something about a human's current perspective, but this does not seem to lead to an understanding of humans' psychological states (Kaminski, Bräuer, Call, & Tomasello, 2009; MacLean, Krupenye, & Hare, 2014; Virányi, Topál, Miklósi, & Csanyi, 2006). Dogs do, however, seem to attend to humans' communicative intent. For example, dogs differentiate gestures made with communicative intent from random movements that resemble pointing gestures (Kaminski, Schulz, & Tomasello, 2012). Different ostensive cues such as eye contact and tone of voice seem to help dogs identify when a human has the intent to communicate (e.g., Scheider, Grassmann, Kaminski, & Tomasello, 2011; Téglás, Gergely, Kupán, Miklósi, & Topál, 2012).

That dogs might have some understanding of the referential nature of human communication was suggested by a study showing that dogs followed a human's gaze toward a certain target only when it was preceded by ostensive cues (Téglás et al., 2012). Dogs are also sensitive to the order in which ostensive and referential signals (gestures) are given during a communicative interaction with humans. When the ostensive cues are given before the gesture, dogs attend to the gesture more than when it is the other way around. This may indicate that during the

presentation of the ostensive cues, dogs are already forming referential expectations (Tauzin, Csík, Kis, Kovács, & Topál, 2015). Finally, dogs also use gaze alternation in a referential way during situations that require social referencing (i.e., seeking information from another individual regarding a target; Marshall-Pescini et al., 2013). However, when they see a human pointing and the referent of the gesture is later moved, dogs reach the location that the human indicated rather than the actual object. This suggests that they may understand pointing as a general indication of where to go rather than what to do (Tauzin, Csík, Kis, & Topál, 2015; see also Kaminski & Nitzschner, 2013, for a discussion of this point).

Finally, the central question is whether dogs act based on cooperative/helpful motives. Dogs' ability to follow human pointing might be partly based on their ability to understand the cooperative element of human communication in a way that other nonhuman animals do not (Kirchhofer, Zimmermann, Kaminski, & Tomasello, 2012). For example, a direct comparison of dogs' performance in an object-choice task to that of chimpanzees, humans' closest relative, showed that dogs were especially skilled at finding hidden food when they could follow human social cues (i.e., the pointing gesture), whereas chimpanzees performed better when they could use physical, nonsocial cues (i.e., the noise made when a cup holding the food was shaken; Bräuer, Kaminski, Riedel, Call, & Tomasello, 2006). Furthermore, dogs are outstandingly good at following a point specifically when the gesture is used in cooperative contexts (i.e., when the human partner points to help the dog find a food reward; Hare & Tomasello, 1999) or is used to request a dog's help in retrieving an object (Kirchhofer et al., 2012). Dogs have also evolved the predisposition to use gaze to communicate with humans when facing unsolvable problems, suggesting that they expect humans' help (Miklósi et al., 2003). Moreover, dogs do not outperform chimpanzees in noncommunicative social contexts, meaning that dogs' skills do not seem to extend to all social interactions but may be limited to cooperative, communicative contexts (Wobber & Hare, 2009). This suggests that dogs' social skills possibly rely on a special receptiveness to human cooperative communication (Kirchhofer et al., 2012), which seems to depend on a sensitivity to humans' ostensive referential signals (Topál et al., 2009).

In a study conducted by Bräuer, Schönefeld, and Call (2013), dogs were trained to open a door by pushing a button. Dogs needed to be prompted to push the button by human communication and would not push it spontaneously. Moreover, there is evidence that in communicative contexts, dogs differentiate between objects based on their owners' preference for one over the other, rather than their own selfish interest (Turcsán, Szánthó, Miklósi, & Kubinyi, 2015). Additionally, dogs have the general

motivation to act cooperatively in response to humans' requests. When asked to indicate the location of a hidden object, dogs indicated things that a person, but not they themselves, had an interest in; however, they then did not differentiate between an object the person was interested in versus an object the person was not interested in (Kaminski et al., 2011). There is evidence that dogs interpret human communications as directives (Kaminski et al., 2011; Scheider, Kaminski, Call, & Tomasello, 2013), such as a command to fetch irrespective of the object (Kaminski et al., 2011). This suggests that dogs' helpful indications may partly depend on the effect of social facilitation, which can suppress the dog's own preferences—for example, when following human pointing, dogs chose a less preferred food reward indicated by a human over a reward that they preferred but that was not indicated (Pongrácz, Hegedüs, Sanjurjo, Kővári, & Miklósi, 2013).

A Non-Mentalistic Approach to Communication

Overall, the evidence suggests that dogs may possess some of the skills necessary for the understanding of communication as information. There is, however, not enough evidence suggesting that dogs act with helpful motives when interacting with others, and, in addition, there is not much evidence for dogs' understanding of humans' mental state (i.e., human perspective and state of knowledge; Kaminski et al., 2009; MacLean et al., 2014). According to a "mentalistic" approach, this is necessary for declarative communication to be possible (Tomasello et al., 2007). Some authors, however, have challenged this mentalistic view, arguing for a non-mentalistic basis of human preverbal communication (Csibra & Gergely, 2009; Leavens, 2004; R. Moore, 2013). The hypothesis here is that infants' early pointing may be aimed at gaining positive emotional reactions rather than directing the attention of others to external objects, and therefore the understanding of others' attention is not necessary (C. Moore & Corkum, 1994). Also, Gergely and Csibra (2009) suggested that human communication may rely on "natural pedagogy" (i.e., it is characterized by a series of elements that allow and facilitate the transfer of knowledge). Specifically, even very young children are sensitive to ostensive cues indicating to others that they are addressed in the communication (Csibra & Gergely, 2009). Such cues create referential expectations in the receiver (Csibra & Volein, 2008), which allow him or her to interpret the communication as conveying information that is relevant and generalizable (Csibra & Gergely, 2009). This way, the understanding of others' states of mind is not required for successful declarative communication. Thus, the authors suggested that nonhuman animal communication might

be more comparable to human communication than is thought by others (Csibra & Gergely, 2009).

Directions for Future Research

The currently available evidence on dog communication suggests that dogs possess some of the cognitive building blocks that need to be in place for an individual to communicate informatively: Dogs seem to have some understanding of humans' communicative intent (Kaminski et al., 2012; Scheider et al., 2011; Téglás et al., 2012) and, in some situations, seem to show helpful motives and have an expectation for humans to act helpfully (Bräuer et al., 2013; Hare & Tomasello, 1999; Kaminski et al., 2011; Kirchhofer et al., 2012; Miklósi et al., 2003). Findings on dogs' understanding of humans' mental states (Kaminski et al., 2009; MacLean et al., 2014; Virányi et al., 2006) and their understanding of referentiality (Tauzin, Csík, Kis, & Topál, 2015; Téglás et al., 2012) are still controversial, however, and as of yet there is no convincing evidence that dogs show the tendency to communicate with a motive to inform (Kaminski et al., 2011).

Future research on dogs' understanding of human communication should focus on some of the aspects that remain unclear, such as dogs' understanding of the referential nature of communication (Kaminski et al., 2011; Kaminski & Nitzschner, 2013; Tauzin, Csík, Kis, & Topál, 2015; Topál et al., 2009)—that is, understanding the relevance of the referent for the receiver—and should further investigate to what extent helpful motives drive dogs' communication with humans (Kaminski et al., 2011).

Recommended Reading

- Csibra, G. (2010). Recognizing communicative intentions in infancy. *Mind & Language*, 25, 141–168. A review summarizing the key elements of the concept of natural pedagogy in children's communication.
- Gergely, G., & Csibra, G. (2003). Teleological reasoning in infancy: The naive theory of rational action. *Trends in Cognitive Sciences*, 7, 287–292. An easy-to-read, complete summary of Gergely and Csibra's non-mentalistic view of communication.
- Kaminski, J., & Nitzschner, M. (2013). (See References). A complete summary for readers who wish to expand their knowledge on canine communication.
- Miklósi, Á., Topál, J., & Csányi, V. (2004). Comparative social cognition: What can dogs teach us? *Animal Behaviour*, 67, 995–1004. A comprehensive review for readers who wish to expand their knowledge on the “domestication hypothesis” for dogs' human-like social skills.
- Miklósi, Á., & Szabó, D. (2012). Modelling behavioural evolution and cognition in canines: Some problematic issues. *The Japanese Journal of Animal Psychology*, 62, 69–89. A critical overview of comparative research on dogs' cognition.
- Pettersson, H., Kaminski, J., Herrmann, E., & Tomasello, M. (2011). Understanding of human communicative motives in domestic dogs. *Applied Animal Behaviour Science*, 133, 235–245.

- doi:10.1016/j.applanim.2011.05.008. An overview focusing on research on dogs' understanding of human communication.
- Kaminski, J., & Marshall-Pescini, S. (2014). *The social dog: Behavior and cognition*. Amsterdam, The Netherlands: Elsevier. A book providing an updated and approachable review of the literature on the subject of social behavior and cognitive skills in dogs.

Declaration of Conflicting Interests

The authors declared that they had no conflicts of interest with respect to their authorship or the publication of this article.

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