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Do dogs get the point? A review of dog–human communication ability

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ABSTRACT

In recent years evidence has accumulated demonstrating that dogs are, to a degree, skilful in using human forms of communication, making them stand out in the animal kingdom. Neither man's closest relative, the chimpanzee, nor dog's closest living relative, the wolf, can use human communication as flexibly as the domestic dog. This has led to the hypothesis that dogs' skills in this domain may be a result of selection pressures during domestication, which have shaped dogs' skills tremendously. One hypothesis, the so-called by-product hypothesis, suggests that dogs have been selected against fear and aggression and as a by-product this paved the way for the evolution of generally more flexible social cognitive skills, which surpassed those of their ancestor, the wolf. Another hypothesis, the adaptation hypothesis, has claimed that dogs may have been specifically selected for certain tasks for which using human forms of communication was necessary. As of yet, the mechanism underlying dogs' understanding of human forms of communication is not fully understood. We argue here that understanding the mechanism involved will also shed light on possible evolutionary scenarios. We argue that the evidence to date suggests that dogs' understanding of human forms of communication may be more specialized than was predicted by some and may be best explained as the result of a special adaptation of dogs to the specific activities humans have used them for.

Dogs' use of the human pointing gesture

More than a decade ago, initial studies revealed that dogs are capable of using various forms of human communication to a degree that many other non-human species cannot (e.g., Hare, Call, & Tomasello, 1998; Kaminski, Call, & Fischer, 2004; Miklósi, Polgárdi, Topál, & Csányi, 1998; Soproni, Miklosi, Topál, & Csányi, 2001). The vast majority of these studies used the so-called object choice paradigm (see Anderson, Sallaberry, & Barbier, 1995). In this task, a human experimenter hides food under one of several containers out of the dog's view and then indicates the target location by giving a social cue, most often pointing (for a review see Miklósi & Soproni, 2006). The results show that not only are dogs very skilful in using the pointing gesture to find a reward (e.g., Agnetta, Hare, & Tomasello, 2000; Miklósi et al., 1998; Soproni et al., 2001), but their behavior can also not be explained by possibly low-level mechanisms like, e.g., pure local enhancement. Hare et al. (1998) showed that when the human stands behind and therefore enhances the empty (hence incorrect) cup but from there points to the correct cup dogs still follow the pointing gesture. In another study, although the human actively moved away from the indicated location while pointing, dogs still followed the pointing gesture (McKinley & Sambrook, 2000).

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Dogs seem also to not just rely on odor cues to find the food. Various authors have used control conditions to exclude this possibility, with food hidden as in all the other conditions but with no social cue given before the dog was allowed to make a choice (e.g., Bräuer, Kaminski, Riedel, Call, & Tomasello, 2006; Hare & Tomasello, 1999; Lakatos, Gácsi, Topál, & Miklósi, 2012; Miklósi et al., 1998). When no social cue was present, the dogs did not find the food above chance., thus indicating that odor alone was not sufficient.

Recent research has shown that other lower-level explanations can also not fully explain dogs' skills. It is unlikely for example, that dogs simply learn to follow human gestures during the course of an experiment. Different studies show that dogs' skills are present from the first trial onwards (Hare & Tomasello, 1999; Riedel, Buttelmann, Call, & Tomasello, 2006; Soproni et al., 2001) with no improvement over the course of multiple trials and therefore no evidence for any learning effect (e.g., Dorey, Udell, & Wynne, 2010; Gácsi, Kara, Belényi, Topál, & Miklósi, 2009; Wobber, Hare, Koler-Matznick, Wrangham, & Tomasello, 2009). Further, a mere associative account suggested by some, e.g., that dogs associate the humans' limbs with food (Bentosela, Barrera, Jakovcevic, Elgier, & Mustaca, 2008; Dorey et al., 2010; Elgier, Jakovcevic, Barrera, Mustaca, & Bentosela, 2009; Udell, Giglio, & Wynne, 2008; Wynne, Udell, & Lord, 2008) cannot explain dogs' behavior sufficiently. There is some evidence that dogs orient primarily to protruding body parts and generalize easily from the pointing cue to other gesture types (Lakatos, Soproni, Dóka, & Miklósi, 2009; Soproni, Miklosi, Topál, & Csányi, 2002). However, the part protruding from the body needs to be an actual part of the human's body as dogs ignore a pointing wooden stick or e.g., the "gesture" of a mechanical arm (Soproni et al., 2002; Udell, Giglio, et al., 2008).

In addition, dogs are able to use more subtle cues like head turning, bowing and nodding, with some individuals even able to use glancing towards the target location as a communicative cue (McKinley & Sambrook, 2000; Miklósi et al., 1998; Soproni et al., 2001; Udell, Giglio, et al., 2008). More importantly, recent research suggests that dogs seem to attend to the referential nature of the human's gaze during the communicative interactions (Kaminski, Schulz, & Tomasello, 2012; Soproni et al., 2001; Teglas, Gergely, Kupan, Miklosi, & Topal, 2012) and the communicative intent of the human (Kaminski et al., 2012). Kaminski et al. (2012) set up a situation during which the human either gestured intentionally or produced certain unintended movements, directed at the target location, which mirrored to some extent the communicative gesture (e.g., the human held her arm in an outstretched position to check the time on her watch and protruded her finger while doing so). While the dogs followed the intended gesture, they basically ignored the unintended movements even though they looked very similar. The key differences between both conditions was the eye contact between the human and the dog which, for the dogs, seemed to determine whether the gesture was intentional or not (Kaminski et al., 2012). In another study, Scheider, Grassmann, Kaminski, and Tomasello (2011) showed that dogs also take contextual information into account rather than blindly following a pointing gesture. In this study, dogs were led into an empty room and got the chance to investigate this room without the human interfering. During their search half of the dogs found a piece of food without the human having gestured towards it in any way while the other half did not find anything. After both left the room and then re-entered, the human pointed towards an empty spot within the room. The dogs which had previously found food followed the pointing gesture, while the dogs which had not found anything, did not. This indicates that certain contextual information was necessary for the dogs to take pointing as a relevant gesture.

Taken together these findings suggest that dogs are very skilful in using pointing as a communicative gesture to find food. Interestingly, research further suggests that selection pressures during domestication had an effect on dogs' skills in this domain.

The domestication hypothesis

The domestication hypothesis claims that dogs' ability to use human gesture (and other forms of communication) may be influenced by selection pressures during domestication (Hare, Brown, Williamson, & Tomasello, 2002; Hare & Tomasello, 2005; Miklósi et al., 2003). Support for this hypothesis comes from several facts. First, wolves, as dogs' closest living relatives, are not as skilful with human communication as are dogs (Hare et al., 2002; Miklósi et al., 2003). Even if raised under very similar conditions from birth on (in a human household) and tested at a young age, dogs outperform wolves (Gácsi, Gyoöri, et al., 2009; Miklósi et al., 2003; Virányi et al., 2008). Intensively socialized wolves can learn to use human gestures (Gácsi, Gyoöri, et al., 2009; Miklosi & Topal, 2011; Udell, Dorey, & Wynne, 2008) but they need to be more exposed to human social interactions than dogs to reach similar performance levels (Gácsi, Gyoöri, et al., 2009; Miklosi & Topal, 2011). Recently Udell, Dorey, et al. (2008) suggested that, if socialized intensively, adult wolves outperform dogs in how successfully they use human pointing. In their study this was especially true for dogs which had been housed in shelters and with little human contact, suggesting that ontogeny alone may account for dogs' skills in this domain (Udell, Dorey, et al., 2008). However, there are significant differences in methodology as well as in how data were analysed in comparison with most other studies using the object choice design, making it difficult to put these data in the context of the debate. Unlike all previous studies, Udell, Dorey, et al. (2008) used a procedure during which food was not hidden under the target cup but only dropped into the cup as a reward after the subject had walked towards the target location. In addition, subjects were presented with a 'clicker' sound-stimulus upon making the correct choice. Recently, Pongracz, Gacsi, Hegedus, Peter, and Miklosi (2013) showed that this difference in the method causes significant differences in the performance of pet dogs. The authors showed that subjects' performance increased significantly when a clicker was used, proving that a supposedly small modification in method can lead to a substantial difference in the results. A more substantial problem, however, results from the difference between the data analysis of Udell, Dorey, et al. (2008) and most other studies using the object choice paradigm. While most