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Social dog — emotional dog?

Commentary on [Kujala](#) on *Canine Emotions*

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Abstract: Based on their high sociability and their capabilities in social cognition, we should consider that dogs experience rich emotions in the social domain. I discuss the importance of dog-human attachment and some of the controversial evidence for so-called secondary emotions, which leaves many questions to answer.

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Kujala's (2017) comprehensive review provides an excellent summary of convergent evidence from physiology, neuroscience, behaviour and cognition regarding the existence of emotions in domestic dogs — but *which* emotions they experience remains an open question. On the basis of the high level of their sociability and capacity for social cognition (e.g., perspective-taking in the guesser-knower paradigm, Catala et al., 2017), the existence of basic emotional states in dogs such as fear and anger is perhaps the most widely accepted. However, we also need to consider the fact that dogs experience rich emotions in the social domain.

1. Social attachment and canine emotions. Given the strong attachment of dogs to humans and the high prevalence of separation-related problems (14% up to 56%, reviewed in Karagiannis et al., 2015), the PANIC emotion (after Panksepp's, 2011, classification) appears to be commonly activated in dogs, although it needs to be borne in mind that separation problems in dogs can be multifactorial and may reflect different emotions besides PANIC, such as frustration and fear (e.g., Lund and Jørgensen, 1999).

Evidence for the high value of human contact to dogs has been reported in a recent fMRI study. Cook et al. (2016) trained dogs to lie completely motionless in the fMRI scanner and presented different stimuli previously associated with either (1) a piece of food, (2) their out-of-view owner coming forward to praise them, or (3) a control condition (nothing happening). Thirteen of the 15 subjects showed equal or greater activation in the ventral caudate (which is known to be correlated with the degree of expected reward, Cook et al., 2016) in response to the stimulus predicting the appearance of the owner and praise compared to the stimulus predicting food. These results were interpreted as demonstrating that most dogs like praise at least as much as food.

Given that the food was associated with the absence of the owner, however, whereas the praise was associated with the presence of the owner – can we really draw this conclusion, which contrasts with some previous findings (e.g., Feuerbacher and Wynne, 2014, 2012; Fukuzawa and Hayashi, 2013)? As Cook et al. (2016) mention in their discussion, their data are consistent with attachment theory. Dogs are highly social animals and it is suggested that their attachment to their human caretakers resembles that of human children towards their parents (Nagasawa et al., 2009b; Topál et al., 1998). Hence the study primarily confirms that most dogs value contact with their owner at least as much as they would value food received when their owner is absent. A comparison of responses to either food or praise with the owner present in both conditions warrants further investigation.

2. Aversion to inequity. In using rewards in dog training, we have to be conscious not only of their relative value to the dogs, but – in situations where more than one dog is present – also in comparison to rewards offered to other individuals. Thus, two studies to date indicate that dogs may experience inequity aversion when a conspecific is rewarded for a specific action and they themselves are not – and even to some extent when they receive a reward of lower value (Brucks et al., 2016; Range et al., 2009). In the first of these studies, Range et al. (2009) pre-empted the question by Zentall (2017) as to what would happen if a reward were visible in the non-social control condition: Even though the experimenter handled the reward and mimicked the procedure of giving food to an invisible conspecific in this control condition, dogs cooperated for longer than they did when another dog was given the reward for the same action (Range et al., 2009).

Brucks et al. (2016) recently demonstrated that dogs not only show inequity aversion during the trial itself, but that the unequal treatment also affects subsequent behaviour, with dogs co-feeding less in a subsequent tolerance test and spending less time near their canine partner. That is, dogs show carryover effects from (1) having received unequal treatment, which can be interpreted as reflecting an associated aversive emotion and what may be (2) a ‘secondary’ emotion – with performance in the non-social control condition indicating that mechanisms other than mere frustration may have been at play in the inequity treatment.

3. Secondary emotions. There is as yet only patchy evidence for the existence of ‘secondary’ emotions (Damasio, 1995), for example, components of empathy, guilt, and jealousy. Perhaps the best-researched topic is that of empathy, via tests of emotional contagion and perspective taking. Some studies show evidence of empathy in dogs (e.g., Custance and Mayer, 2012; Huber et al., 2017; Quervel-Chaumette et al., 2016), whereas others are more inconsistent (e.g., yawning contagion in dogs, reviewed in Romero et al., 2013). Most studies on empathic-like responding in dogs used either acting out of emotions (e.g., pretending to cry) or playbacks, thus presenting incongruent information (e.g., behavioural signs/sounds but not the olfactory components of sadness). It has recently been shown, however, that dogs are able to differentiate the smells of human fear from happiness or no odour: they show enhanced heart rate responses and stress signals when exposed to the former (D’Aniello et al., 2017). Perhaps a multimodal demonstration of distress signals to the subjects would activate different emotional and behavioural responses and provide still clearer evidence.

Dogs were long believed to demonstrate guilt (and could thus be blamed) for “misdeeds,” when they most likely only react to their owner’s behaviour or to learned unpleasant experiences associated with certain environmental stimuli (e.g., shredded paper) and the owner’s return (Hecht et al., 2012; Horowitz, 2009; Vollmer, 1977). These studies have

made an important contribution to dog welfare by highlighting that behaviour perceived as 'guilty' is simply a behavioural response in order to avoid further harm, independent of whether the dog has broken a rule.

Nonetheless, what these studies show is not the absence of guilt in this species, but that what humans interpret as guilty behaviour is a behavioural strategy of appeasement. In a group-living species, to maintain cooperation within the group, there may be a function for the emotion of guilt (or remorse), which, by definition, "motivates reparative action—confessions, apologies, and attempts to undo the harm done" (Tangney et al., 1996). Dogs do perform reconciliation following conflicts (Cools et al., 2008), but whether emotions may be underlying this behaviour, and which ones, is not known.

To conclude: despite the growing evidence for positive and negative affective states in dogs, the study of emotions in dogs leaves us with many open questions. Given our own emotional involvement with pet dogs (e.g., reciprocal oxytocin surge produced by dog-human interactions, Nagasawa et al., 2009a; Odendaal and Meintjes, 2003), we also need to be careful of overinterpretation.

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