

Secondary emotions in non-primate species? Behavioural reports and subjective claims by animal owners

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A defining characteristic of primary emotions is that they occur in wide variety of species. Secondary emotions are thought to be restricted to humans and other primates. We report evidence from two studies investigating claims of primary and secondary emotions in non-primate species. Study 1. We surveyed 907 owners about emotions that they had observed in their animal. Participants reported primary emotions more frequently than secondary emotions and self-conscious emotions more frequently than self-conscious evaluative emotions. Jealousy was reported at very high levels (81% of dogs and 79% of horses), which was surprising as jealousy is generally defined as a secondary emotion. Study 2. Forty dog owners were interviewed about the contexts and behaviours that led them to claim their animal was jealous. There was coherence and consistency in the behavioural descriptions of jealousy. We claim that such reports provide evidence for the existence of secondary emotions in non-primate species as predicted by theorists such as Buck (1999).

Most theorists argue that secondary emotions are restricted to humans and perhaps close relatives. Using reports from owners our studies explore the claims of the minority of psychologists who suggest that secondary emotions should be found across a range of species.

There is wide agreement that one of the defining characteristics of primary or basic emotions, e.g., anger and fear, is that they have a long evolutionary history and are found across a wide range of vertebrate species (Ekman, 1992; Gray, 1994; Izard, 1992; LeDoux, 1998; Mowrer, 1960; Panksepp, 1998; Plutchik, 1980). In contrast secondary emotions, e.g., jealousy and pride, are thought to be restricted to relatively mature humans and perhaps other primates.

There have been a number of books claiming secondary emotions in animals (Bekoff, 2000, 2002; Masson & McCarthy, 1995). However, there

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have been no peer-reviewed empirical studies that have systematically attempted to look for evidence of secondary emotions across a range of species. The only studies that have been carried out have been almost entirely restricted to monkeys and the great apes (Preston & de Waal, 2002).

The rise of cognitive ethology as a discipline has led mainstream psychology to a general re-evaluation of the cognitive capacities of non-human animals. It is now accepted that there is good empirical evidence for highly sophisticated cognitive abilities across a wide range of species (Pearce, 1987). However, despite this re-evaluation of animal intellect there are still powerful arguments posited for a qualitative divide between human and non-human animals. One such argument is the failure of almost all non-human animals, except perhaps for the great apes, to develop a “Theory of Mind” (ToM) and pass the relevant tests (Premack & Woodruff, 1978; Whiten, 1996). ToM is not a single approach but an umbrella term for a number of approaches to the understanding of other minds that have a number of common features (Leudar, Costall, & Francis, 2004). One such feature is the idea that to have a ToM implies a developed sense of self-awareness; and the absence of ToM is taken as evidence against the presence of self-consciousness. Furthermore, more direct tests of self-awareness, such as the mirror self-recognition test, are failed by almost all species (Gallup, 1982). Thus, although there is greater recognition of the sophistication of animal mentality, there are still thought to be important and unique human cognitive capacities.

The cognitive capacities identified as uniquely human are central to arguments surrounding the potential for secondary emotions in animals. Self-consciousness is thought to be key to the development of secondary emotions (Lewis, 2002). Indeed, some secondary emotions are frequently referred to as self-conscious emotions (Tangney & Fischer, 1995). A further distinction is made between “self-conscious” emotions such as jealousy and “self-conscious evaluative emotions” such as guilt or shame. The latter emotions are thought to require an evaluation of behaviour against a rule or standard that has been learned and internalised. Self-conscious emotions are thought to occur before self-conscious evaluative emotions in human ontogeny, as the evaluative component is thought to require representational capacities beyond the human infant and almost all non-human animals.

The absence of self-consciousness should preclude the development of even simple self-conscious secondary emotions in animals. So we should expect self-conscious emotions only in humans above the age of two, the great apes (Hart & Karmel, 1996; Povinelli, 1996; Premack, 1988) and perhaps dolphins (Marten & Psarakos, 1995). Our studies focus on species where there is widespread agreement that self-consciousness is not present.

The origins of scepticism for secondary emotions in animals should now be clear; from a theoretical perspective it is claimed that self-consciousness is

necessary for the emergence of secondary emotions, and from an empirical perspective there is thought to be little reliable evidence for self-consciousness in most animals.

However, on the basis of developments in a number of related fields in psychology, we challenge this orthodox view of the unlikelihood of secondary emotions in animals. Some major emotion theorists already challenge the idea that secondary emotions are restricted to humans. Buck (1999) makes an explicit case for the evolutionary origin of what he terms social emotions, such as pride/arrogance and envy/jealousy, and moral emotions such as contempt; these emotions are regarded as basic to all social interaction and Buck predicts would be seen across a range of species, although his work has focused on humans. We agree with Buck that it is difficult to imagine the regulation of complex social bonds and alliances in the absence of complex social emotions. Panksepp (1998), although best known for his work on the neurological basis of primary emotions, also makes the case that the more generalised higher cortical centres are likely to support more complex emotions in a range of species.

As stated, one reason for scepticism concerning the possibility of secondary emotions in non-primate species is their lack of any kind of self-consciousness, which is posited to be a prerequisite of secondary emotions. The mirror self-recognition task as the definitive measure of self-consciousness, has been criticised on a number of different levels (Schilhab, 2004) and there is increasing scepticism about its validity. Thus the failure of many animals to pass this test is no longer taken as conclusive proof that they do not have self-consciousness. Recent work by Bekoff (2003), Mitchell (2002) and others presents a coherent theoretical account supported by empirical evidence of the case for self-consciousness in a range of species. Evidence of the presence of self-consciousness in many species is another reason to predict that they may have self-conscious emotions.

Having established that we may have good reason to accept the possibility of secondary emotions in animals, there remains the problem of how we could know about the emotional states of animals. How we acquire knowledge of other minds has been a formal problem within philosophy for many centuries. The problem is that using a standard mind behaviour dualist ontology, mind is only accessible via inference from observable behaviour. Current empirical methods focus on the careful recording and manipulation of behaviour, as a means of systematically testing hypotheses regarding the inferences drawn from observations of behaviour. Thus, despite the methodological rigour of standard experimental and observational methods, they can still only provide probabilistic rather than direct knowledge of animal mind (Bavidge & Ground, 1994). We, of course, do not dismiss these methods, but merely make the point that all standard methods provide only imperfect solutions to the problem of other minds.

We wish to make a positive case for a non-standard approach to the problem of other minds. Our method focuses on asking people with particular knowledge of individual animals. Unlike many previous studies focused on the attribution of mental capacities to animals in general by the lay public (e.g., Demoulin, Leyen, Paladino, Rodriguez-Torrez, & Dovidio, 2004; Rasmussen & Rajecki, 1995), in the current study our inclusion criterion was that a person should have lived with or cared for the animal they reported on for at least two years. Thus we were asking people to ground their responses in their intimate knowledge of a particular animal. This does not of course remove the potential for ungrounded anthropomorphic attribution; however, it is an attempt to make sure that the data are based on the direct experience of participants with their animals, rather than their more global ideas about animal emotions. This is in line with approaches taken in the developmental literature where reports by mothers of their children are used as evidence for a variety of psychological abilities (Bornstein, Giusti, Leach, & Venuti, 2005).

Further support for the idea of knowing minds through interaction comes from Parkinson (Parkinson, Fisher, & Manstead, 2005). Parkinson is part of a wider movement within the field of emotions who makes the claim that many emotions are interpersonal rather than purely intrapsychic. Thus we are not making an inferential leap to guess the mind of another being, as we are actually part of the shared emotion. Frijda (1986) in a complementary argument regards emotions as embodied and thus available in behaviour rather than inferred from behaviour. It is a controversial view, but it has been argued that the experimental method, involving the inference from behaviour to internal mental state, is a much more problematic way of knowing the mental states of other beings than interacting with them (Reddy & Morris, 2006). Psychologists may find such arguments have power with reference to human beings but do not apply with animals. However, Bekoff (2006) among others would claim that a profound level of mutual understanding and shared emotion can be observed between humans and dogs in particular. This may be the result of selective breeding for empathic traits, but nevertheless such understanding is still a phenomenon to be explained.

Within the applied context of animal welfare, Wemelsfelder (1999) has carried out a number of studies assessing the effects of various care regimens on pigs kept for slaughter. She found that the use of subjective judgements (particularly based on interaction with the pig) rather than more traditional observational techniques, led to the most reliable discrimination between pigs from industrial and open field sites. Her conclusion has been that subjective reports have more utility than more traditional observational and quantification techniques. Hebb (1946) came to a similar conclusion about chimpanzee behaviour at the Yerkes laboratory; everyday psychological description of the animals' behaviour based on subjective experience, was of

much greater utility in helping new members of staff to interact with the chimpanzees than all of the carefully recorded objective behavioural data.

Judgements by the lay public also form the basis of a number of highly quantitative research approaches within mainstream psychology. The psychometric approach to personality (Zuckerman, 2005) relies on participants' judgement of self and others as the basic source of data. Such approaches have also provided a reliable and valid approach to the study of animal personality (Gosling, 2001; Morris, Gale, & Duffy, 2002), demonstrating that lay judgements of animals are not mere anthropomorphic projections, at least in these contexts.

Furthermore, knowing about the mental states of other animals is not merely an academic problem for people who work with animals. As Midgely (1983) points out if we make a mistake about the state of mind about some large (even) domestic animals, we don't just end up wrong, we can end up injured or sometimes even dead.

Many psychologists regard any use of mentalistic terms for animals as a fundamental error. However, Fisher (1991) makes the point that just because there may be instances where we may be incorrect in attributing a mental capacity to an animal that does not make the application of mentality to animals a category mistake. We agree with Fisher and regard the accuracy or inaccuracy of reports of emotions in their animals by participants as an empirical question rather than a matter of assertion. We suggest that everybody (even the sceptic) would agree that if we took a bone from a hungry dog and the dog ran after us barking loudly, snarling and attacking our legs, that the dog was angry; the anger of the dog in this instance is not a folk belief or an anthropomorphic projection, but a reflection of the psychological reality. Thus we do not agree that reports by animal owners should in principal be regarded as no more than folk beliefs. Each claim should be carefully analysed and explored.

In our first study we asked participants which emotions they had observed in their animals from a pre-determined set derived from the theoretical literature. As a working hypothesis derived from the existing literature, we included the following emotions in our study as primary: anger, fear, surprise, joy/happiness, sadness, anxiety, disgust, interest, love/affection, and curiosity (Ortony & Turner, 1990). We also included empathy, shame, pride, grief, guilt, jealousy, and embarrassment as secondary or self-conscious emotions (Lewis, 2002; Tangney & Fischer, 1995). Owners of a range of domestic animals and pets including, dogs, cats, horses, rodents, and birds were included in the study.

There is rare unanimity among the psychological community that a wide range of species possess primary emotions, thus our first prediction was that primary emotions would be reported with great frequency across all species

included in the study. However, in agreement with Buck (1999) and Bekoff (2002) we predicted that secondary emotions would also be reported.

STUDY 1

Method

Animal sample. The inclusion criterion for use of the animal in the study, was that the owner should have lived or worked with an animal for more than two years. The mean length of contact with the animal was 6.28 years ($SD = 4.53$), see Table 1.

The questionnaire. A written questionnaire was used to ask questions regarding the occurrence, and confidence about seventeen different emotions (anger, fear, surprise, joy/happiness, sadness, disgust, guilt, jealousy, embarrassment, interest, love/affection, empathy, curiosity, shame, pride, anxiety and grief). The format of the questions was as follows. “Is your animal ever surprised? Yes/No. If yes, how confident are you about your decision?” (answer given on a 5-point Likert scale from 1 “*not at all confident*” to 5 “*very confident*”).

Ethics. The protocols of both studies received ethical approval and followed standard ethical guidelines.

Results

Frequency of reporting of primary emotions and secondary emotions

Figure 1 illustrates the percentage of owners that answered yes to the presence of each emotion. Almost all owners reported all primary emotions (i.e., interest, curiosity, fear, joy, affection, surprise, anxiety, sadness and

TABLE 1
Demographic data

<i>Species</i>	<i>Number of owners</i>	<i>Mean length of contact</i>	<i>Mean age of animal</i>
Dog	337	6.34	6.84
Cat	272	7.84	8.33
Horse	69	6.54	14.25
Rabbit	51	3.68	3.99
Guinea Pig	37	3.49	3.70
Hamster	34	1.94	2.12
Rat	32	2.21	2.31
Bird	75	6.20	6.92

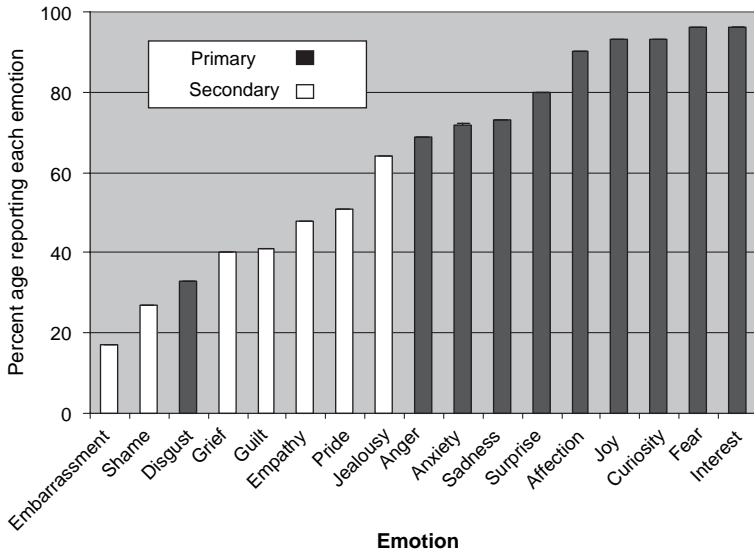


Figure 1. Percentage of animals reported to have a particular emotion ($N=907$) arranged in ascending order.

anger) in their animal with the exception of disgust. Disgust was reported to occur in only 33% of animals. Reporting of the remaining primary emotions ranged from 70% for anger to 98% for interest.

All secondary emotions were reported as occurring less frequently than all primary emotions with the exception of disgust. Only embarrassment and shame were reported less frequently than disgust. Furthermore, participants were, with the exceptions of disgust and jealousy, more confident in their reporting of primary emotions (see Figure 2.) than secondary emotions.

We compared the frequency of reporting of primary emotions taken together with secondary emotions taken together. Primary emotions were reported on average much more frequently ($M = 81.79\%$) than secondary emotions ($M = 43.10\%$), $\chi^2 = 2318.66$, $df = 1$, $p < .0001$; Cramér's $V = .39$. Owners were also significantly more confident about the presence of primary emotions ($M = 3.06$, $SD = 0.52$) than secondary emotions ($M = 2.13$, $SD = 0.39$), $t(15) = 3.97$, $p < .01$, $d = 2.02$.

Reporting of self-conscious and self-conscious evaluative emotions

Self-conscious emotions (empathy 52%, jealousy 64%) were reported more frequently than the self-conscious evaluative emotions (shame 26%, guilt 40%, pride 51%). We compared the frequency of occurrence of empathy and jealousy with the occurrence of shame, guilt and pride. Statistical

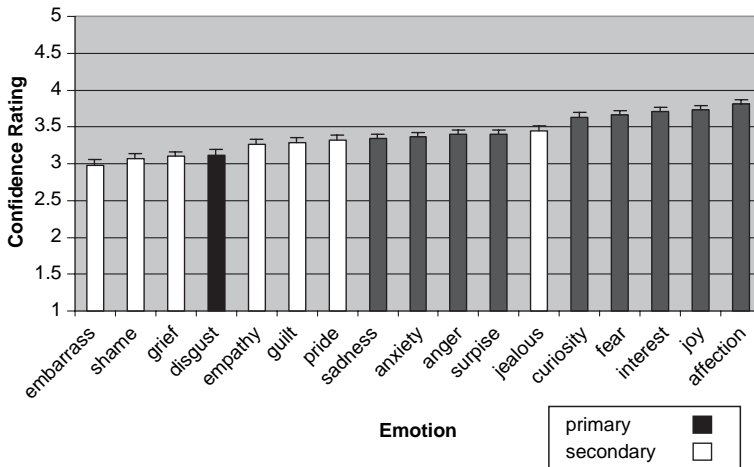


Figure 2. Mean confidence rating (+SE) on a 5-point scale, 1 indicating “little confidence”, 5 indicating “great confidence”.

comparison using χ^2 revealed that with the exception of the comparison between pride and empathy all other comparisons between self-conscious and self-conscious evaluative emotions were significant ($<.0001$) all with large effect sizes (Cramér’s V over .3 or above in all cases) demonstrating that self-conscious emotions were reported more frequently than self-conscious evaluative emotions.

The distinction between self-conscious and self-conscious evaluative emotions was less distinct for mean confidence levels. Participants were most confident about jealousy but participants were less confident about empathy than pride and guilt. Embarrassment was reported least frequently (18%) and with least confidence of all the emotions.

Between animal groups comparisons

Species effects. There was a difference in the frequency of reporting of emotions between species collapsed across all emotions (dog 72%, horse 68%, cat 67%, bird 59%, rat 53%, hamster 52%, rabbit 51%, guinea pig 45%), albeit with a relatively small effect size, $\chi^2 = 405.77$, $df = 1$, $p < .0001$; Cramér’s $V = .17$. There was a similar pattern for the confidence data—mean confidence (one low, five high) dog = 2.92, horse = 2.73, cat = 2.72, bird = 2.24, rat = 2.24, rabbit = 2.06, guinea pig = 1.97, hamster = 1.96 ($F = 4.82$, $p = .0001$); $F(7, 128) = 4.82$, $p < .0001$, $\eta^2 = .21$).

Species differences in reporting of primary and secondary emotions. The most striking aspect of the between-species comparisons is the difference in

TABLE 2
 Percentage of participants reporting individual primary and secondary emotions as a function of species

Emotion (%)	Species							
	Dog (N=337)	Cat (N=272)	Guinea Pig (N=37)	Horse (N=69)	Bird (N=75)	Rat (N=32)	Rabbit (N=51)	Hamster (N=34)
<i>Primary</i>								
Sadness	87	68	62	78	72	78	70	58
Anxiety	77	72	56	94	78	84	56	61
Surprise	82	83	76	98	84	75	71	65
Anger	65	82	40	80	76	44	60	73
Curiosity	94	97	89	96	98	100	96	82
Interest	94	94	89	95	97	97	92	91
Affection	97	98	89	94	88	81	88	73
Joy	99	96	89	100	97	84	90	91
Fear	93	96	97	100	95	94	96	89
Mean % primary	88	87	76	92	87	81	79	76
<i>Secondary</i>								
Embarrass	30	17	5	8	8	3	2	6
Shame	51	24	5	27	4	9	5	5
Disgust	34	54	8	21	6	21	11	14
Guilt	74	35	8	36	24	12	17	15
Empathy	64	57	3	67	12	9	7	2
Pride	58	62	8	81	54	16	15	8
Grief	49	40	37	47	46	43	25	23
Jealous	81	66	27	79	67	47	37	17
Mean % secondary	55	44	12	45	27	20	14	11

Note: Secondary emotions reported in >70% of animals in bold.

variability of reporting of primary and secondary emotions across species (see Table 2).

There is little difference across species in the reporting of primary emotions; the mean percentage of primary emotions ranged from 76% for hamsters and guinea pigs to 92% for horses; however, the range is much greater for secondary emotions (11% for hamsters to 55% for dogs). Chi-square tests of presence/absence of emotion by species were all significant (except for fear); however, the effect sizes were much larger for the secondary emotions (mean Cramér's V for secondary emotions = .36) than for the primary emotions (mean Cramér's V for primary emotions = .20), indicating that the effect of species on the reporting of emotions was greater for the secondary emotions than the primary emotions.

Perhaps the most striking findings are that over 70% of dog owners report jealousy and guilt in their dogs and over 70% of horse owners report jealousy and pride in their horses.

The confidence data was not analysed as there were so few data points in some species for many secondary emotions.

One aspect of the confidence data presented so far is slightly misleading. In previous figures it appears that participants are in general not very confident about any particular emotion or any particular species. However, if the confidence data is broken down by emotion and species it is clear there is great confidence in the identification of certain emotions in particular species, for example dog, cat and horse owners are very confident about identification of affection in their animals with confidence rating averaging around four for all three animals ($M = 4.12$), which is close to total confidence.

Discussion

In summary, most owners with years of interactive experience with their animals report that cats, dogs, horses, rabbits, guinea pigs, hamsters, rats and birds have the primary emotions of sadness, anxiety, surprise, anger, curiosity, interest, affection, joy and fear. Most owners of dogs and horses also report a restricted range of secondary emotions (jealousy and guilt in dogs, jealousy and pride in horses) at levels comparable with primary emotions.

The notable exception to the pattern of reporting of primary emotions was disgust, which was reported infrequently. Rozin and co-workers (Rozin, Lowery, Imada, & Haidt, 1999) draw a distinction between distaste as an instinctual bad-taste reflex evolved as a reaction to avoid bodily harm, and disgust as a mechanism that develops relatively late in human ontogeny as a system to cope with internalised moral value. We suggest that participants

are using a Rozin moral definition of disgust rather than a definition of disgust as a bad-taste reflex.

With regard to primary emotions, it is clear that, in general, our data are consistent with contemporary emotion theory. However, the reporting of secondary emotions is more in line with the predictions of Buck (1999).

The claims for secondary emotions in non-primate species is controversial. Furthermore, despite our arguments that we take the reports of animal owners as evidence for the presence of emotions in animals, the first study revealed nothing about the basis upon which the participants were making the claims for secondary emotions. Thus we thought it important to undertake a further study to investigate the behaviour and contexts (if any) that participants were using to ground their claims for secondary emotions. We chose to examine jealousy in dogs as this was the most frequently reported secondary emotion in any species, and because of the easy accessibility of dog owners.

The initial question to be answered by the second study was whether participants could give accounts of specific episodes of jealousy, or were their claims based on global beliefs that could not be tied to particular contexts and behaviours? We were further interested in the actual reports of behaviour and contexts; were they consistent across participants? Finally, were the contexts and behaviours taken to indicate jealousy, consistent with the label jealousy? If participants were unable to give accounts of particular episodes of jealousy, or there was no consistency in contextual and behavioural accounts of jealousy, and/or such accounts were not consistent with the emotion jealousy, this would undermine the case for jealousy in animals. Given that jealousy was the most frequently reported secondary emotion, and one of the most frequently reported emotions of all emotions, a failure to provide support for jealousy would seriously undermine the case for all emotions. We do not claim that if participants provide coherent and consistent accounts of jealous behaviours this proves their existence, but we do suggest that the failure to find such evidence would definitely be evidence that such claims are mere folk beliefs. To investigate these questions we carried out an in-depth structured interview study with dog owners about the contexts and behaviours related to their claims for jealousy in their animal.

STUDY 2

Method

Participants. Forty dog owner/carers were interviewed. Participants were recruited via response to an advertisement placed in local veterinary surgeries and direct requests to members of the public observed with dogs by the researcher.

The interview. Structured interviews lasting between five and ten minutes were recorded and transcribed verbatim. A range of information was collected including basic demographics of dog, e.g., sex and age, and details of household, e.g., number of pets and children. For the purposes of the study the important questions were: Does your dog get jealous? Can you give examples of the situations in which your dog gets jealous? Can you describe the behaviours your dog displays when it is jealous? Can you think of an alternative explanation other than jealousy to describe the behaviour?

The data from the interview study was content analysed using a protocol based on Neuendorf (2002). The reliability of categorisations using Cohen's *Kappa* were all above .7.

Results

Based on an initial sample, a codebook (Neuendorf, 2002) was constructed with four domains; domain one was a categorisation of responses to the question about whether the dog was jealous; domain two was a categorisation of the situations identified as provoking jealousy; domain three was a categorisation of behaviours labelled as jealous; domain four, alternatives to the interpretation of jealousy. It was difficult to follow the usual procedures of content analysis for responses in the first two domains as there was so little variation. Our participants were remarkably consistent, and their responses required organisation rather than categorisation.

Domain one: Does your dog get jealous?

Participants' responses to this question were almost perfectly consistent. All participants (with one exception) agreed without qualification in response to the question, they just said "yes", often supplementing the yes with "definitely". Only one participant was more circumspect, "They appear to display what I believe to be jealousy". Thus 39 out of the 40 participants agreed without qualification that their dog was jealous.

Domain two: Can you give examples of the situations in which your dog gets jealous?

Three levels of response were identified to this question, level one the context, level two who was present, and level three the behaviour that elicited the jealousy. All participants reported that the context identified was a social triad involving the "jealous" dog, the carer and "other" (two participants also mentioned that they had observed "jealousy" over food in addition to people or animals). The most frequent "other" was a person (50% of participants), second most frequent was another dog or animal (45% of participants), the least frequent was a cuddly toy (5% of participants). The

behaviour that elicited the jealousy in the dog was in all cases the carer giving attention to the “other”. The reports from owners were very consistent, e.g., “On the rare occasion that we have a cuddle he’ll start barking and whining”, “If my Mum pays attention to other dogs or even my brother actually, if she pays so much attention to my brother then she doesn’t really like it”, “If I’m showing any affection to my wife, like giving her a cuddle or something like that”, “When my husband and I are sitting simply just watching TV and we either go to have a kiss or hold hands”.

The most common form of attention that elicited “jealous” behaviour was affection (25% of participants). The specific affectionate behaviour that was most commonly mentioned was cuddling (22% of participants).

To summarise, almost all the contexts regarded as eliciting jealousy was a social triad involving the carer, jealous dog and an “other”. The stimulus behaviour involved was attention given to the “other”, especially affection.

Domain three: Types of jealous behaviour

All jealous behaviours were categorised as forms of attention seeking. There was variability in the types of attention-seeking behaviour. The most common single behaviour was where the dog pushed against the carer (appears in 50% of the accounts); in most cases the dog pushed between the carer and the third party. There is again clear consistency in the reports, e.g., “Generally put himself in a situation may be between you and somebody else”, “He tends to nudge you, sit on your foot, try and get between you and the other animal or child”, “He tries to stand between us, me and the other dog”, “The big one will bark at her and shoo her off literally push her away”.

Other frequent behaviours mentioned in the descriptions of attention-seeking behaviour were barking/growling/whining (40%).

Other participants regarded aggression as part of jealousy, either specifically mentioning aggression, or specific behaviours that are unambiguously part of aggression, e.g., “She gets aggressive and tries to butt the dog ... and maybe even bite the dog, another dog she might bark if I’m touching another dog as well”.

In summary, jealous behaviour was always attention seeking, the most common form of attention-seeking behaviour was pushing between the carer and “other”.

Domain four: Alternatives to the interpretation of jealousy

In response to the question: “Can you think of an alternative explanation other than jealousy to describe the behaviour?” Sixty-seven percent of the participants could think of no alternative. The alternative descriptions of the remaining participants included protectiveness × 1, territorial × 2, security ×

2, sulking \times 1, feeling sappy \times 1, playful \times 1, boredom \times 1, territorial \times 1, hierarchy \times 1. However, in all cases participants regarded jealousy as the most likely explanation.

Discussion

The results provide clear answers to the research questions. First, all participants were able to ground their claims for jealousy in specific behavioural episodes in particular contexts. Second, the behaviours and contexts described were remarkably consistent across participants indicating a common model of what is meant by the term jealousy in dogs. The typical context that evoked the behaviour they labelled jealousy, involved a triad of the carer, the “jealous” animal and another person or animal. The precipitating activity in this triad was attention or affection by the carer to the interloper person/animal. The typical behaviour that was used as a behavioural index of jealousy was pushing between the carer and the third party.

The ability of participants to readily give accounts of jealousy demonstrates that they are basing their claims on experience rather than a more global folk belief about dog emotions. If they are merely folk beliefs, then they are folk beliefs about a consistent set of behaviours and contexts rather than just a belief about the animals themselves.

Finally, the behaviours, and contexts in which they occurred, are consistent with most contemporary definitions of jealousy; the common element to most definitions is an external social threat to a valued relationship (Buck, 1999; Salovey, 1991). The precipitating context identified by all participants was an intrusion on the relationship between dog and owner. In conclusion, it is clear that participants are basing their claims on contexts and behaviours that at least in humans would most likely be termed jealousy.

GENERAL DISCUSSION

We deal with the second study first as the conclusions drawn from the second study have implications for how seriously we can take the results of the first study. The results of the second study are open to a number of interpretations. We suggest that a large number of psychologists would regard the results as revealing more about lay theories of animal emotion than about emotions in animals. However, the two views are not mutually exclusive. The study definitely reveals something about the basis of lay theories of animal emotion. At least for jealousy, there is clear evidence that participants ground their theory on a restricted and consistent set of behaviours and provocative contexts rather than global impression or

prejudice. Furthermore, the contexts and behaviours are consistent with academic definitions of jealousy (at least in humans). If nothing else this study reveals that participants have a clear and rational basis for their claims.

The more controversial question is whether the results presented can be taken as evidence for jealousy in animals. We break this question down into two parts: one, are the interpretations of the owners an important source of evidence? two, do the accounts of the behaviours and contexts provide compelling evidence? It would be quite possible to dismiss the claims of the owners, but still find the behavioural evidence reported compelling. We have presented similar results (including videos of the behaviours described) at emotion conferences and have asked the audience how they would describe the behaviours reported. There has always been a variety of opinion, but many psychologists (including a number of eminent researchers) interested in emotion agree that it seems to be jealousy. Others have of course disagreed. But the really important point here is that the basis of argument is not the opinion of the owners, but the behaviours and contexts they describe. We think that the label jealousy best describes the behaviours reported but we of course may be wrong; however, the reader has the behavioural reports on which to base his/her own conclusions.

We now deal with the separate claim that the owners' reports should be taken as a source of evidence. As explained in the introduction we regard the history of interaction between the owner and the animal as providing a unique perspective (Reddy & Morris, 2006). The owners have been part of the interactions they report and may have insights not available to the outside observer. We, of course, realise that many psychologists will regard this personal involvement as a source of error, rather than an additional source of information. However, we suggest that the combination of the evidence of the behavioural reports and the interpretation of the owners, does provide a stronger case than the behavioural reports alone.

One purpose of the second study was to evaluate the basis and possible legitimacy of the claims made by participants in the first study. We suggest that the behavioural evidence reported in the second study provides good reason to at least explore the claims for secondary emotions in other species made in the first study.

We have made the argument that the evidence reported in these studies do provide evidence for secondary emotions (in particular jealousy in dogs) in non-primate species. We hypothesise that secondary emotions in animals may have core similarities with human secondary emotions but some major differences. The reports of jealousy in dogs are very different from descriptions of human jealousy. All our participants reported that jealousy was tied to the moment of the provocative cause, whereas human jealousy is characterised by persistent cognitive and behavioural concomitants outside of the relevant social interaction; in fact human jealousy can be based on

entirely imaginary social relations. Given our suggestion of the more limited nature of secondary emotions in animals, they may also not require the fully developed representational structures (Lewis, 2002) thought to be necessary for fully developed human secondary emotions. Although we hypothesise that our findings support the claims of Bekoff (2002) that the divide between human and animal consciousness is not categorical.

In conclusion, we claim that the results provide evidence of secondary emotions in non-primate species. Such emotions may be similar in kind but less sophisticated than comparable human emotions. The distinction between animal and human emotions may be in the complexity of the manner in which they are expressed and experienced, rather than differences in the repertoire of emotions.

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