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Does owning a companion animal influence the belief that animals experience emotions such as grief?

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Abstract

This paper investigates public attitudes towards emotional experiences in animals. We surveyed 1,000 members of the public to investigate how companion animal ownership affects the attribution of emotions to animals and beliefs about whether animals can grieve. Respondents who owned a companion animal were more likely to believe that some animals can experience grief compared with respondents that did not own a companion animal. The non-owning respondents were more likely to believe that animals do not experience emotions including: anxiety, distress or depression, do not show behavioural changes when they are experiencing grief and do not grieve as a result of separation from a conspecific. Our findings show that companion animal ownership plays a significant role in the public perception of the emotional experiences of animals and belief in the animals' ability to grieve.

Keywords: *animal welfare, companion animal, emotions, grief, public attitudes, separation*

Introduction

The study of emotions in animals has engaged scientists since Darwin's founding work *The Expression of Emotions in Man and Animals* (1872) and is one of the essential elements of animal welfare (Dawkins 2001). The fundamental complication in investigating emotions is that we are unable to measure the internal experience of another being (Panksepp 1998) and are therefore unable to know conclusively whether animals experience emotions. Scientists engaged in this field of study have been undeterred by this impediment and in endeavouring to measure animal emotions, a number of methods have been developed and applied. Examples include: neural homologies (eg Panksepp 2007, 2011); behaviour and physiology (eg Reefman *et al* 2009; Zimmerman *et al* 2011; Reimert *et al* 2013); appraisal theory (Boissy *et al* 2007; Greiveldinger *et al* 2007), human judgment of subjective experience (Wemelsfelder *et al* 2001) and most recently, measurement of cognitive appraisal (Harding *et al* 2004; Mendl *et al* 2009). A further complication to the study of emotions is the differentiation between basic emotions, such as joy and fear, and emotions considered more complex, like guilt or embarrassment (Ekman 1999). Although there is general agreement that differentiation between basic and complex emotions exists, the categorisation of some individual emotions is still debated (Ekman 1992; Panksepp 2005; Sabini & Silver 2005; Morris *et al* 2008).

Regardless of science evidencing the existence of emotions in animals, the belief that animals experience emotions underlies public concern regarding animal welfare (Dawkins 2001; Burman *et al* 2008), and improvements to animal welfare legislation are primarily driven by public attitudes towards animals (Kirkwood & Hubrecht 2001; Serpell 2004). The purpose of this paper is to investigate the effect that companion animal ownership has on beliefs regarding the emotional experience of animals. Companion animal ownership promotes positive attitudes towards animals (eg Wells & Hepper 1995; Fidler 2003; Cutt *et al* 2006; Daly & Morton 2009). These attitudinal effects have been investigated for both children and adults (Paul & Serpell 1996), and findings suggest that strong attitudes towards the use of animals are formed early in development (Wells & Hepper 1995). Schoolchildren that own pets show high levels of concern regarding activities that lead to the death or injury of animals (Wells & Hepper 1995). Children (and adults) who own dogs have a more positive attitude towards dogs in general when compared to those who do not own dogs or those that own cats or other pets (Lakestani

et al 2011), and children that do not own dogs are more likely to describe dogs as 'scary' (Lakestani *et al* 2011). Adult companion animal owners rate the acceptability of specific uses of animals (including medical research, behavioural research, product testing, educational uses, luxury garment and labelling as pests) significantly less acceptable than respondents that do not own companion animals (Wells & Hepper 1997; Cutt *et al* 2006). This relationship has been demonstrated to be species specific, with less support shown for the use of animals that people have had previous experience with (Knight & Barnett 2008). In a recent study by Izmirli *et al* (in press) companion animal ownership was found to have a strong relationship with the moral values of veterinary students in both Australia and Turkey and positively influenced their decision to study veterinary medicine. Companion animal owners also award other animals a significantly higher status (compared to that of humans) than non-owners (Fidler 2003).

Since it would seem that experience with animals affects how animals are perceived (Knight & Barnett 2008) and ultimately used by humans, the relationship between humans' experience of animals (in the form of ownership) and the perceived mental abilities of animals warrants investigation. Previous research has shown people believe dogs, cats, horses, birds, rodents and fish all have the capacity to experience emotions (Rasmussen *et al* 1993; Morris *et al* 2012), in particular guilt, shame (Rasmussen & Rajecki 1995), jealousy (Morris *et al* 2008) and boredom (Heleski & Zanella 2006). Predictably, owners of a particular species report more emotions for that species than respondents that do not own that species (Morris *et al* 2012). With particular reference to grief, we recently demonstrated that the general public tends to attribute an ability to grieve more to companion animals and animals with higher cognitive abilities including, dogs, cats, chimpanzees, elephants, dolphins, pigs, cows and magpies than to other animals (McGrath *et al* 2013). This public perception of animal grief appears to extend beyond current scientific evidence (McGrath *et al* 2013).

We investigated the difference between companion animal owners and non-owners in their beliefs regarding animals' emotional experiences, in particular the belief that animals can grieve (including situations that initiate a grief response, behaviours affected by grief and how grief may differ in humans and animals). We hypothesised that companion animal owners will be more likely than non-owners to believe that animals are capable of experiencing emotions and, in particular, the complex emotion of grief.

Materials and methods

A questionnaire, designed to be answered in 10 min, was disseminated to 1,000 available respondents via face-to-face interviews in central Brisbane, Australia. Participants were chosen using convenience sampling (Fink 1995) and questioned by three trained researchers. Ethical approval was obtained from the University of Queensland Behavioural and Social Sciences Ethical Review Committee.

The questionnaire was divided into three sections. In the first section respondents were asked to answer 'yes', 'no' or 'don't know' if they believed that animals could experience emotions in general, and more specifically, the following: depression, happiness, anxiety, love, anger, sadness, distress, grief and fear. Respondents were then asked questions regarding animal grief. Respondents were asked to define grief in their own words and then provided with the following definition of grief derived from the literature on human grief (Archer 1999; Granek 2010); "an emotional reaction to loss, including sorrow, distress, sadness, anxiety and depression, which causes behavioural, emotional, mental, physical and social symptoms". Respondents were asked to consider the provided definition when answering the remaining questions. They were asked if they believed 'all', 'some' or 'no' animals could grieve and which specific animal species they thought could grieve from a pre-defined list. Respondents were asked if they believed animals experienced grief in the same way as humans, and if not how they thought it might be different from a pre-defined list: "Do animals experience a different intensity of grief to humans? Do animals experience grief for a different length of time to humans? Do animals experience different emotions to humans during grief?" If respondents answered positively to this final question they were then asked if they believed animals experience anxiety, sorrow, distress, sadness or depression. They were then given a list of behaviours (eating, playing, vocalising, general activity, attention-seeking behaviour, sleeping, hiding and aggression) and asked whether they thought these behaviours would change when an animal was grieving. A list of separation examples was provided and respondents were asked if they believed any of these might cause an animal to experience grief ('separation of parent and offspring', 'separation of other related animals', 'separation of animals that live together but are not related', 'animals being moved from where they live' and 'loss of a mating partner'). All questions required closed responses except those in which respondents were asked to define grief.

The second and third section of the questionnaire covered demographic information about the animal(s) currently owned, as well as those owned during childhood (or owned by the family during the respondent's childhood) and demographic information about the respondent including: age range, gender, nationality, marital status, highest level of education, income bracket and residential location (city, suburban or rural).

Statistical analysis

Data were compiled in Microsoft Excel (2003) and subsequent statistical analysis was carried out in Minitab (version 16). Unanswered questions were coded as missing data. Simple descriptive statistics were initially produced for variables of interest in the data set. The data followed a non-normal distribution established using the Anderson-Darling Normality test. Multivariate analysis techniques were used to test associations between demographic variables and responses. To establish which variables were

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significant predictors (current companion animal ownership, childhood companion animal ownership, age, gender, nationality, marital status, income level, education level and residence location) of respondents' beliefs, nominal logistic regression was used. The regression model was refined using a backwards stepwise technique, sequentially removing non-significant predictors and refitting to identify which predictors were important (Boden & Parken 2008). One highly correlated variable, companion animal ownership during childhood, was excluded from the model as colinearity resulted in unstable coefficient estimates. The final model was as follows:

$Z = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5$

Where Z is the log odds of the dependent variable; b_0 is a constant; b_1 = coefficient for companion animal ownership (X_1); b_2 = coefficient for age (X_2); b_3 = coefficient for gender (X_3); b_4 = coefficient for residential location (X_4); b_5 = coefficient for income (X_5).

Model validity was assessed using log-likelihood P-value of < 0.05 and goodness of fit Pearson and deviance Chi-squared P-values of > 0.05. Following nominal regression, prevalence ratios (PR) were calculated because odds ratios (OR) tend to overstate effect sizes when the prevalence of the outcome of interest is not rare (as is the case in this study) (see Osborne 2006 for a detailed discussion of this). PR are reported in the results section as 'x as likely' (where x = times) as this is a more accurate method of presenting the results than the use of direction language, eg 'more likely' or 'less likely' due to unbalanced differences between unbounded increasing PR (0 to infinity) and bounded decreasing PR (0 to –1) (Osborne 2006). Corresponding OR and P-values are provided in brackets. PR was calculated based on the following formula (Osborne 2006):

$PR = OR/[(1-P0) + (P0 \times OR)]$

Where PR = Prevalence ratio; OR = Odds ratio; P0 = The proportion of non-exposed individuals that experience the outcome in question.

Only statistically significant findings are reported in the present study. Significant findings relating to gender differences can be found in Walker *et al* (in press).

Results

Respondent demographics and pet ownership

One thousand questionnaires were collected but one was discarded due to partial completion. The resulting sample of respondents (n = 999) comprised 521 males and 478 females with 27% of respondents aged 18–25 years, 21.5% 26–35 years, 16.5% 36–45 years, 14.4% 46–55 years, 12.6% 56–65 years and 7.8% 66+ years. The majority of respondents (68%) were Australian nationals, 12% were from New Zealand and the United Kingdom, and the remaining 20% were 'other' nationalities. Respondents who had never been married comprised 52% of the population. Education levels ranged across the different categories, with the median standard of attainment being a university diploma. Most respondents resided in suburban (63%) or urban (26.5%) locations. Income levels ranged across eight categories, with the median income level being $A31–50K per annum.

Seventy percent of respondents (n = 695) currently owned (or had owned within the last five years) one or more animals (n_{tot} = 1,203, mean [± SD] = 1.67 [± 0.92]), of which 58% owned one pet, 24% owned two pets, 12% owned three pets and 6% owned four or more pets. Dogs, totalling 47%, were the most popular species owned, followed by cats (25%), fish/reptiles/insects/amphibians/spiders (11%), birds (9%), horse/pony/donkey (2%) and other species (2%). The majority of respondents (86%) had owned one or more companion animal(s) during childhood (n_{tot} = 1,163, 1.83 [± 0.8]). Cats were the most common species owned during childhood (32%) followed by birds (21%) and small mammals (13%). With the exception of pet ownership statistics the demographics are consistent with the most recent census information (ABS 2006).

What emotions can animals experience?

Ninety-six percent of respondents (n = 954) indicated they believed animals can experience emotions, generally. When subsequently asked if animals could experience specific emotions, an increased number of respondents (n = 972) indicated they believed that animals could experience all of the emotions posited (fear 99%, n = 959; happiness 96%, n = 937; distress 95%, n = 928; sadness 92%, n = 898; anger 86%, n = 834; love 85%, n = 823; grief 84%, n = 820; and depression 70%, n = 682).

Respondents who did not own a companion animal were 3.2× as likely to believe animals do not experience emotions (OR = 3.37, $P = 0.006$) and 4.2× as likely to be uncertain as to whether animals experience emotions (OR = 4.27, $P = 0.012$) than respondents who did currently own a companion animal (see Table 1; available at the supplementary material to papers published in *Animal Welfare* section at the UFAW website, www.ufaw.org.uk). These respondents were 1.5 and 2.7× as likely to believe animals do not experience depression (OR = 1.62, $P = 0.022$) or anxiety (OR = 2.98, $P < 0.0001$), respectively. They were 1.6, 5.3 and 3.4× as likely to be uncertain whether animals experience depression (OR = 1.74, $P = 0.017$), distress (OR = 5.83, $P = 0.001$) or anxiety (OR = 3.76, $P < 0.0001$), respectively (Table 1).

As the age of respondents decreased they became more likely to believe that animals do not experience depression (OR = 0.85, $P = 0.02$), distress (OR = 0.47, $P = 0.007$), love (OR = 0.83, $P = 0.03$) or anxiety (OR = 0.72, $P = 0.002$) and more likely to be uncertain as to whether animals experience distress (OR = 0.64, $P = 0.039$). Conversely, as the age of respondents increased they became more uncertain as to whether animals can experience depression (OR = 1.28, $P < 0.0001$) and more likely to believe that animals do not experience happiness (OR = 1.7, $P = 0.005$) or sadness (OR = 2, $P < 0.0001$) (Table 1).

Respondents that lived in an urban location were 1.7× as likely to believe that animals do not experience love as those respondents that lived in a suburban or rural location (OR = 1.79, $P = 0.019$).

Table 2 The percentage of respondents that did not believe animals experience grief in the same way as humans.

Factor	Belief	N (%)
Do animals experience a different intensity of grief to humans?	Yes	126/152 (83%)
	No	26/152 (17%)
Do animals experience a higher or lower intensity of grief than humans?	Higher	11/123 (9%)
	Lower	112/123 (91%)
Do animals experience grief for a different length of time to humans?	Yes	122/143 (85%)
	No	21/143 (15%)
	More	4/121 (3%)
	Less	117/121 (97%)
Do animals experience different emotions to humans?	Yes	74/110 (67%)
	No	36/110 (33%)
Sorrow	Yes	50/74 (68%)
	No	24/74 (32%)
Distress	Yes	67/74 (91%
	No	7/74 (9%)
Sadness	Yes	62/74 (84%)
	No	12/74 (16%)
Anxiety	Yes	51/74 (69%)
	No	23/74 (31%)
Depression	Yes	43/74 (58%)
	No	31/74 (42%)

Respondents' definition of grief

Eighty-nine percent of respondents (companion animal owners, n = 633, non-owners, n = 258) defined grief in their own terms. A descriptive analysis of these definitions revealed two main descriptive words used by respondents to describe grief; sadness (or sad), n = 614/891, (companion animal owners, n = 436 [71%], non-owners, n = 178 [29%]) and loss, n = 484/891, (companion animal owners, n = 358 [74%], non-owners, n = 126 [26%]).

Can animals grieve?

Respondents were provided with our definition of grief and subsequently asked whether they believed 'all', 'some' or 'no' animals, could grieve. Respondents that did own a companion animal were 1.1× as likely as those that did not to believe that 'some' animals can grieve (Z = 2.33, OR = 1.78 (CI = 1.1–2.89), P = 0.02). Age and gender also had a significant influence on respondents' beliefs regarding this question and are detailed in McGrath *et al* (2013). No significant differences were revealed between respondents who currently owned a companion animal and those who did not when questioned as to which animal species (from a pre-defined list) they believed could experience grief ($P > 0.05$).

Is animal grief the same as human grief?

Over half of the respondents (66%, n = 593) said they believed that an animal's experience of grief is the same as that of humans. Those that did not were asked a series of questions to establish how their beliefs differed. Of the respondents that answered these questions, most (83%) said that the intensity of grief felt by animals is different to that of humans, and in nearly all cases they believed it was lower (91%). Sixty-seven percent of respondents believed that animals experience different emotions to humans (Table 2).

Does behaviour change when an animal grieves?

Respondents were asked how the performance of certain behaviours would be affected when an animal was experiencing grief, with options of 'change', 'no change' or 'don't know' (see Table 3; available at the supplementary material to papers published in *Animal Welfare* section at the UFAW website, www.ufaw.org.uk). Respondents who did not own a companion animal were 2.1× as likely to believe that no change would occur to eating behaviour when an animal was experiencing grief than respondents who did own a companion animal (OR = 2.22, P = 0.021). These respondents were also 3.9, 3 and 2.4× as likely to be uncertain as to whether eating (OR = 3.94, P = 0.033), play (OR = 3.03, P = 0.038) or attention-seeking behaviour (OR = 2.56, P = 0.006), respectively, would change (Table 3).

As the age of respondents increased they become increasingly more uncertain if vocalisations (OR = 1.35, P = 0.02), attention-seeking (OR = 1.31, P = 0.01), sleeping (OR = 1.52, $P < 0.0001$) and hiding behaviours (OR = 1.35, P = 0.002) would change if an animal was experiencing grief (Table 3).

Respondents that lived in a rural location were 3.2× as likely to believe that eating behaviour (OR = 3.53, P = 0.02) does not change if an animal is experiencing grief, and 3.4× as likely to believe that play behaviour (OR = 3.79, P = 0.01) does not change, than those respondents that lived in an urban or suburban location. Conversely, respondents that lived in an urban location were 1.6× as likely to believe that hiding behaviour (OR = 1.8, P = 0.02) would not change if an animal was grieving than respondents that lived in a rural or suburban location (Table 3).

In which situations might animals grieve?

The majority of both companion animal owners and owners believed that the five situations posited may cause an animal to grieve; 'separation of parent and offspring' (93 and 91%, respectively); 'separation of other related individuals' (79 and 74%, respectively); 'separation of unrelated animals living together' (78 and 71%, respectively); 'movement of an animal from his/her home' (90 and 87%, respectively) and 'loss of a mating partner' (93 and 91%, respectively). Respondents who did not currently own a companion animal were 1.8× as likely as respondents who did own a companion animal to be uncertain as to whether the separation of unrelated animals living together would cause an animal to grieve (OR = 1.88, P = 0.017) (see Table 4; available at the supplementary material to papers published in *Animal Welfare* section at the UFAW website,

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www.ufaw.org.uk). No significant difference was found between companion animal owners and non-owners regarding the other four situations posited ($P > 0.05$).

As the age of respondents increased they became less likely to believe that the separation of related animals (OR = 0.86, $P = 0.04$) and the loss of a mating partner (OR = 0.74, $P = 0.05$) would cause an animal to experience grief. However, they also became more uncertain as to whether the separation of animals living together would result in grief (OR = 1.18, $P = 0.04$) (Table 4).

Respondents that lived in an urban location were 2.1× as likely to be uncertain as to whether the loss of a mating partner would cause an animal to experience grief than respondents from rural and suburban locations (OR = 2.56, $P = 0.03$) (Table 4).

Discussion

Our aim was to investigate public belief in animal emotions, with a particular emphasis on belief in the animals' experience of grief. We found that the majority of respondents (96%) believed that animals can experience emotions, supporting results of Rasmussen *et al* (1993) and Morris *et al* (2012). Over half of the respondents (66%) believed that animals experienced grief in the same way as humans. We confirmed that non-owners were less likely to believe that animals can experience any emotions, and in particular, distress, anxiety and depression than companion animal owners, whilst our companion animal owners were more likely (than non-owners) to believe that some animals grieve.

The influence of pet ownership

Our finding that non-owners are less likely to believe in the existence of emotional experiences in animals may be the result of a lack of familiarity with animals. Experience with animals produces increasingly positive attitudes towards them (eg Wells & Hepper 1995; Fidler *et al* 1996; Fidler 2003; Cutt *et al* 2006; Daly & Morton 2009; Morris *et al* 2012), and animal ownership results in explanations of a more emotional nature for behaviour observed in animals (Kiesler *et al* 2007). This relationship appears to be species specific. For example, dog owners have more positive attitudes towards dogs than to other species (Knight & Barnett 2008; Lakestani *et al* 2011), and the ownership of a particular animal species appears to increase the number of emotions attributed to that species, when compared to the number of emotions attributed by non-owners of that species (Morris *et al* 2012). Companion animal owners have been shown to attribute advanced human capabilities and emotions to their animals but not necessarily to animals owned by others (Shapiro 1990; Sanders 1993; Fidler *et al* 1996; Bahlig-Pieren & Turner 1999). Interestingly, the number of interactions or the number of animals owned does not appear to impact upon attitudes and emotional attributions towards animals (Kiesler *et al* 2007; Morris *et al* 2012). However, the level of attachment to a companion animal may influence the attribution of emotions to animals; Kiesler *et al* (2007) demonstrated that the level of affection towards a fish that participants were given to care for accounted for variation in the emotive terms used to explain fish behaviour. Consequently, the relationship between the species of animal owned, the level of attachment to the animal and the attribution of emotions to animals would be worthy of future research.

The ability or willingness to empathise is likely to have played a key role in our respondents' beliefs regarding animals' emotional experiences. It has been theorised that one of the driving forces behind the evolution of humans was our ability to imagine the world from the perspective of another individual and thereby empathise, understand and co-operate with one another (Humphrey 1976). Empathy, as defined by Phillips (2009), is the ability to share the perceived psychological emotional experience of an animal, including relating feelings to observed behaviour. The human emotional experience of empathy increases the perceived similarity between ourselves and another individual (or animal), and assessments of animal welfare are increasingly taking into account the emotional experience of animals through the use of our ability to empathise (eg Wemelsfelder *et al* 2001; Walker *et al* 2010). Companion animal ownership is well documented to have a positive impact on empathy in both children and adults (eg Daly & Morton 2006, 2009; Endenburg & van Lith 2011), which may help explain the difference in attribution of emotions to animals between companion animal owners and non-owners in the present study. It should also be considered, with regard to our sampling technique, that our population of respondents could have been, on average, more empathetic and willing to assist the researcher by partaking in the survey, this in turn may have resulted in more empathy towards animals being recorded and may help to explain why we saw relatively small sub-populations not attributing, or being unsure about attributing emotions to animals.

Anthropomorphism and anthropocentrism may provide another explanation for the significant differences found between companion animal owners and non-owners in their assignment of emotions to animals in the present study. Anthropomorphism is an extension of the human ability to empathise with another individual, amplified to the extent that we attribute human emotions and feelings to another species without scientific evidence that they are capable of such experiences. Anthropocentrism describes the interpretation of animal behaviour exclusively from a human perspective. In the case of companion animals, owners in some cases view their animal as a family member, best friend or surrogate child, dress the animal in human clothing, take them to daycare or day spas, have elaborate birthday celebrations and even weddings (eg Albert & Bulcroft 1988; Archer 1997; Greenebaum 2004; Duvall Antonacopoulos & Pychyl 2008). Owners with a lack of general social support and/or a lack of family social support engage in higher levels of anthropomorphic behaviour (Duvall Antonacopoulos & Pychyl 2010), and lonely individuals are more likely to describe companion animals using supportive anthropomorphic traits, eg companion animal is 'thoughtful', 'considerate' or 'sympathetic' (Epley *et al* 2008a, 2008b). Owners interpret their animal's behav-

ioural signs of affection and dependence as if they were coming from other humans (Bradshaw & Casey 2007) with over 90% of dog and cat owners reporting that they can sense their pets' moods and emotions (Hills 1995). Companion animal owners also describe human-dog interactions more anthropomorphically than non-owners (Albert & Bulcroft 1988; Fidler *et al* 1996; Bahlig-Pieren & Turner 1999; Serpell 2003; Duvall Antonacopoulos & Pychyl 2008). Ultimately, this:

> ...anthropomorphic thinking enables animal companions' social behavior to be construed in human terms, thereby allowing these nonhuman animals to function for their human owners as providers of non-human social support (Serpell 2003; p 83).

An important component of anthropomorphic description of behaviour is the context in which the behaviour occurs and the relationship the behaver has with other beings towards which he/she behaves. When humans and non-humans are depicted similarly as behaving agents, naïve observers describe their behaviour as psychologically similar, eg both human adults, human children, monkeys and dogs are described as 'jealous' when depicted in the same context (Mitchell & Hamm 1997). On one hand, the 'human substitute' function that companion animals play is likely to encourage owners' to attribute more complex emotional experiences to animals than non-owners. Whilst, on the other hand, the close-lived nature of companion animal-human relationships allows owners to understand animals in a variety of ways which go beyond the ideas of instinctual behaviour responses and allow owners to recognise the individual subjectivity of an animal (Fox 2006). Indeed, owners have been demonstrated to provide meaningful and consistent reports about the behaviour of their animals (Morris *et al* 2008).

The treatment of companion animals is profoundly influenced by owners' beliefs about how their animal evaluates the world. However, inaccuracies in these beliefs can be detrimental to the animal's welfare if it is treated in a manner that the owner believes is compatible with its welfare when in actuality it is unfavourable to welfare (Bradshaw & Casey 2007). For example, anthropomorphic interpretations of a 'guilty' look in dogs has been demonstrated to be a dog's response to the owner's cues and the anticipation of punishment rather than an appreciation of a misdeed (Horowitz 2009), consequently, compromised welfare can result from inappropriate punishment. Furthermore, anthropocentric interpretation of animal behaviour does not allow for the diverse sensory experiences of companion animals (eg auditory and olfactory) and could result in distorted perceptions of their welfare needs (Bradshaw & Casey 2007). However, dogs treated in an anthropomorphic manner, eg being 'spoilt' are not more likely to display problem behaviours (Voith *et al* 1992), and anthropomorphic interpretations of behaviour lead to affective empathic responses (Apostol *et al* 2013). Anthropomorphism is a key component of the companion animal-owner relationship and is a factor that may be responsible for the difference in attribution of emotions to animals seen in the present study, however, the relationship between anthropomorphism and attribution of emotions to animals is complex and further research is needed to understand the interaction between anthropomorphism, companion animal ownership and the attribution of complex emotions to animals.

In the present study, we asked respondents to comment on whether they believed animals experience four basic emotions (happiness, fear, sadness and anger) and five complex emotions (depression, distress, anxiety, love and grief). Based on this categorisation of emotions, it appears that respondents who owned a companion animal were more likely to attribute complex emotions (eg grief) to animals, whilst non owners were less likely to believe that animals can experience them, including depression, distress and anxiety. Other research has also shown that companion animal owners are more likely to report that their animals can experience complex emotions, including jealousy, guilt and pride (Morris *et al* 2008).

Animal grief

Grief is considered a normal, universal human reaction to loss that results in feelings that include (but are not limited to) anger, guilt, anxiety, sadness and despair. These inclusive feelings may contribute to the categorisation of grief as one of a number of complex emotions (sometimes labelled secondary emotions) which have traditionally been cognitively restricted to humans and their closest relatives (Morris *et al* 2008). As a result, behaviours witnessed in non-human animals that appear to parallel those seen during human grieving are often dismissed as manifestations of physiological changes, eg the pronounced behavioural responses to weaning seen in farm animals (for a review of the implications of weaning, see Weary *et al* 2008). In the present study, companion animal owners were significantly more likely than non-owners to believe that animals grieve. A small body of research appears to suggest that primates and dogs may grieve as a result of separation and social isolation (Seay *et al* 1962; Laudenslager *et al* 1990; Schwartz 2003; Cronin *et al* 2011). According to Schwartz (2003) one of the categories of behavioural aspects of separation and social isolation in dogs is 'depression', which includes social withdrawal, lethargy, inappetence and submissive or fearful postures or facial expressions. Respondents who did not own a companion animal were more likely to believe that certain behaviours would not be affected when an animal is experiencing grief. These included eating, play and attention-seeking behaviours. Furthermore, non-owners were significantly more uncertain as to whether the separation of unrelated animals living together would cause grief. It is possible that these uncertainties arise from non-owning respondents lack of familiarity with animals. Owners of horses and dogs with years of familiarity with that species report a range of emotions experienced by those animals, including emotions considered to be complex in nature (Morris *et al* 2008). Similarly, people who have experienced grief themselves are more likely to attribute grief to animals (McGrath *et al*, unpublished data) and it is possible that companion animal owners have previously witnessed what they believe to be grief in their animals, which would explain why they were more likely to attribute grief to animals in general.

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Other demographic variables

Significant effects of age and residential location were demonstrated in the present study. Research has shown that younger respondents are more likely to oppose animal testing (Kruse 1999) and specify that farm animal welfare is of greatest importance to them when purchasing animal-based products (Vanhoncker *et al* 2010). In contrast, we found that as the age of our respondents decreased they became increasingly less likely to believe that animals experience depression, distress, love or anxiety and less likely to believe that the separation of related animals or the loss of a mating partner would result in the experience of grief. It has been suggested that growing up in rural communities results in less concern for animal well-being (Kendell *et al* 2006), however, we found that respondents from urban residences (in comparison to suburban and rural) were more likely to believe that animals do not experience love and were more uncertain as to whether animals would grieve if they were to lose a mating partner.

Animal welfare implications and conclusion

The study of emotions in animals is essential to our understanding of their welfare and can lead to changes and improvement in husbandry practices to meet the animals' needs. Public belief in an animal's ability to experience emotions, regardless of their actual existence, has a direct bearing on public concerns about animal welfare. Consequently, understanding how (and why) the general public perceives the emotional experience of animals is of fundamental importance with regards to the future of animal welfare education. In the present study, companion animal owners showed an increased willingness to attribute complex emotions to animals, in particular grief, whilst non-owners were significantly less likely to believe that animals experience any emotions at all. To help enhance our understanding of the role of animals within our society it is important that further scientific study be focused on investigating the underlying variables that influence the human perception of emotion in animals.

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