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Owner perceptions of companion dog expressions of positive emotional states and the contexts in which they occur

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Abstract

*Promotion of positive experiences in companion animals is essential for maximising good welfare. However, the dearth of published literature on the experience and expression of positive emotional states in companion dogs suggests they are less well understood than negative emotions. Owner knowledge can provide a basis for generating hypotheses for experimental research, and can inform education initiatives. An online survey of 445 dog (*Canis familiaris*) owners in the United Kingdom and the Republic of Ireland was used to identify key contexts and behaviours perceived by owners to be associated with positive emotions for companion dogs, and to examine factors which influence owner reports of key behaviours. The contexts most commonly associated with positive high arousal (PHA; 'happy and excited') were anticipation of walks or food and with positive low arousal (PLA; 'happy and relaxed') were resting and gentle stroking. Respondents' behavioural profile for canine PHA involved barking, head held high, wide open and 'bright' eyes, ears pricked, tail wagging, mouth open, and active, playful behaviour. For PLA, respondents collectively described their dogs as silent, head resting, eyes closed or slightly closed, ears 'down', mouth closed and a calm/relaxed activity level. Notably, PLA states were described in less detail than PHA, suggesting the former may be less well understood or difficult to interpret. Dog breed and age, and owner experience and level of attachment to their pet significantly influenced respondents' likelihood to report certain behavioural indicators, and may influence assessments of pet behaviour and underlying emotion. Further work is required to determine the validity of the behavioural expression and contexts perceived to be associated with positive experiences in dogs.*

Keywords: *animal welfare, behaviour, companion dogs, owner assessments, positive emotion, survey*

Introduction

Animal welfare is concerned not only with physical health, but also with psychological well-being (Fraser *et al* 1997). An owner's duty of care towards their pet covers broad aspects of welfare and behaviour, including the promotion of quality of life (Yeates & Main 2009). Emerging research suggests positive experiences may mitigate stress and sustain or improve animal health and cognition (Brydges *et al* 2011; Colonnello *et al* 2011; Zebunke *et al* 2011). Yet, for many species, identification of contexts and behaviours which are reliably associated with and indicative of positive emotion is still required to accurately recognise and promote positive experiences (Boissy *et al* 2007).

For domestic dogs (*Canis familiaris*), specific behaviours are being increasingly studied as putative indicators of positive emotional states (eg tail wagging: Quaranta *et al* 2007; vocalisation: Farago *et al* 2010). However, scientific exploration of the full repertoire of canine behaviour which may indicate positive states, or indeed of those contexts which reliably induce them, has yet to be achieved. In the absence of further understanding, the information that owners can provide, although not without limitations, is useful for hypothesis generation and experimental design (eg Pongracz *et al* 2001; Morris *et al* 2008; Lit *et al* 2010); with implications for better assessments of canine welfare and the dog-owner relationship.

Companion dog owners self-report good understanding of canine emotional states (Kerswell *et al* 2009) and owner knowledge is often used as a proxy for assessment of animal well-being (eg Wojciechowska *et al* 2005; Ireland *et al* 2011). However, there are factors which may improve or impair the accuracy of pet behaviour descriptions. Although effects on behaviour associated with positive emotions have not been specifically examined, perceptions of pet behaviour may be biased by anthropomorphic views of animals (Kiesler *et al* 2006; Bradshaw & Casey 2007). Fidler *et al* (1996) found that people with experience of owning a dog or a cat used more descriptions of desires, feelings and understanding when describing the behaviour of dogs in video footage, compared to those with little or no experience of pets. Strong attachment to pets may also influence descriptions of pet behaviour; owners that were more attached to a pet reported more favourable perceptions of that pet (El-Alayli *et al* 2006; Woodward & Bauer 2007).

In addition, compared to men, women were reported to have perceived their pet more favourably and had a greater level of attachment to their pets (Woodward & Bauer 2007). Gender differences in owner social interactions and the level of care given to pets have also been found (Adamelli *et al* 2005; Prato-Previde *et al* 2006). Behaviour assessment may improve through experience, formal qualifications or training (Diesel *et al* 2008), although Tami and Gallagher (2009) found no difference between veterinarians, dog trainers, dog owners and non-dog owners in their ability to correctly label dog behaviour, but instead found individual differences between observers.

It is important to determine where owner identification of canine emotional states is robust to variation in individual behavioural expression of dogs and variation in perceptual differences by owner characteristics, and hence when owners are more likely to be reliable. Equally, if candidate indicators derived from owner information are subsequently experimentally validated, understanding of any variation in owner perception of these indicators will facilitate identification of potential bias in commonly used owner assessments of health and welfare (Bradshaw & Casey 2007). This is particularly timely since the inclusion of indicators of positive states in welfare assessment has been encouraged by welfare scientists (Boissy *et al* 2007; Yeates & Main 2009). Information on factors affecting owner perception of canine emotional state is critical for education initiatives, so that educational resources can be appropriately focused to target behaviours commonly misinterpreted or ignored. For example, a recent survey by a charity, Cats Protection, found that whilst 69% of cat owners surveyed correctly understood slow-blinking to be a relaxed state, 65% misinterpreted purring as a uniquely positive state, whereas it can also occur during painful experiences (Cats Protection 2013).

The current study aimed to explore contexts and behaviour patterns potentially associated with positive emotional states in companion dogs by examining owner perceptions. Since emotional states can broadly be mapped using valence (positive-negative) and arousal (high-low) axes (Russell & Barrett 1999), we sought to discriminate information associated with different valence-arousal zones (Mendl *et al* 2010). For reasons outlined above, a second aim was to identify whether certain variables, related to the owner and the dog, influenced owner perceptions of canine behaviour and emotion. Since there may be large individual variation, we predicted that the importance of certain behaviours perceived to indicate positive states in dogs will differ depending on dog age, gender, neuter status and/or breed. This may be related to observed individual variation in the expression of emotion in animals, particularly for positive states (Boissy *et al* 2007), or linked to how owners perceive different characteristics of these groups of dogs; for example, differences in perceived trainability of different dog breeds was linked to an interpretation of physical capability rather than cognitive interpretations (Helton 2010). We predicted differences in owner descriptions of behaviour would occur based on the level and type of experience owners had with dogs, and also we investigated gender effects as a possible bias. We hypothesised that more attached owners would favour positive perceptions of their pet's behaviour (Woodward & Bauer 2007), such that they would rate higher levels of happiness for their dogs and report more behaviours as indicating positive emotional states than less attached owners. Finally, we hypothesised that owners describing their dogs as 'happier' would also cite more behaviours for positive states.

Materials and methods

A survey of United Kingdom (UK) and the Republic of Ireland residents was hosted online via SurveyMonkey™ between May–June 2011. Respondents were recruited through leaflets distributed at the Royal Veterinary College (RVC) University hospitals, Nottingham Veterinary School, Writtle College and through messages posted on the RVC intranet, online forums and Facebook™ groups related to dog ownership. The survey comprised several sections (see below).

Respondent and dog characteristics

Information was collected on respondent gender (category: male, female), age (< 18, 18–25, 26–25, 36–45, 46–60 and > 60 years), country of residence, (England, Wales, Scotland, Northern Ireland or Republic of Ireland) experience type (owner, breeder and/or employed in a dog-related workplace, and a combination of these roles), the number of dogs currently owned (one, two, three or more) and the number of years' experience with dogs (less than 1 year, 1–2 years, 2–4 years, 5–8 years, 9–15 years, over 15 years' experience).

Dog information requested included age (grouped into less than 1 year [puppy]; 1–2 years [juvenile]; 2–9 years [adult] and more than 10 years [senior]), gender (male, female), breed (selected from a list of UK breeds, or 'crossbreed') and neuter status (entire, neutered). Respondents were requested to complete the survey for one dog only, facilitated by individual-specific information entry (name, breed, age etc). Respondents owning more than one dog were directed to complete the survey for the dog whose name started with the earliest letter in the alphabet.

Contexts associated with canine emotion

This section presented 29 contexts (Table 1), selected as familiar experiences for companion dogs that were predicted to vary in emotional valence and (for positive emotions only) arousal. Respondents were asked to assign to each context one or more of the following descriptors that they considered best fit their dog's response to it: 'happy and excited' (for positive [valence] high arousal; PHA); 'happy and relaxed' (for positive low arousal; PLA); 'neutral' (indifferent); 'unhappy' (for negative valence); or 'my dog never experiences this'. A further opportunity was given to describe additional contexts that owners perceived to be positive for dogs.

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Table 1 Percentage of response (n = 296)* for each of the 29 contexts rated for perceived associated emotional state in dogs. The emotional responses were rated as PHA (positive high arousal), PLA (positive low arousal), neutral (indifferent), negative or the dog has no experience of the context.

Context	PHA	PLA	Neutral	Negative	No experience
Watching owner pick up the lead	**84.80**	7.09	5.74	0.34	0
Just about to be fed a favourite tasty treat	**81.42**	14.53	2.03	0	0.34
Playing ball games	**76.35**	5.74	9.80	0.68	13.85
Playing tug of war	**72.97**	5.74	5.41	0	13.85
Playing with other dogs that are familiar	**71.96**	13.51	5.07	3.72	3.04
Being walked off the lead	**67.91**	19.33	1.35	0	8.78
Chasing cats or other animals	**67.91**	2.70	7.77	2.03	16.89
Just about to be fed (standard food)	**59.12**	23.99	14.19	0	0.34
Being walked on the lead	**51.69**	33.78	7.77	3.38	0.68
Having strangers in the house	**42.23**	26.35	16.55	10.47	0.34
Swimming	**40.20**	7.77	8.11	15.20	25.68
Playing with other dogs that are unfamiliar	**37.84**	10.47	24.66	17.91	6.42
Resting in own bed/area	2.36	**85.47**	9.80	0	0.68
Resting	2.70	**84.46**	10.81	0	0
Being gently stroked by owner	9.46	**84.12**	3.38	0.34	0.34
Travelling in the car	20.27	**50.68**	17.91	8.11	0.68
Playing alone, eg with Kongs®	32.77	**47.97**	7.77	0.68	7.77
Eating	37.16	**46.96**	12.84	0	0
Being brushed	11.49	**45.95**	25.68	11.82	2.03
Being approached by unfamiliar people	**28.04**	**28.38**	25.34	15.54	0.34
Listening to the radio	2.03	26.35	**55.74**	0.68	11.82
Drinking water	7.09	39.86	**49.66**	0.34	0
Being separated from the owner	0.68	13.18	35.81	**47.30**	0.68
Having nails clipped	0.34	13.51	28.72	**40.88**	14.53
Being bathed	7.09	17.23	31.76	**38.18**	3.38
Being examined by the veterinarian	9.12	25.68	31.08	**30.07**	1.69
Waiting in the veterinarian's reception	19.59	19.26	**28.38**	**29.05**	1.69
Having a muzzle put on	1.35	2.70	12.50	17.91	**62.84**
Being put in a crate or cage	2.03	25.34	14.53	18.24	**37.84**

Text in bold indicates the most frequent rated emotional state per context (percentage of response); multiple states are highlighted if the difference in frequency of response between 2 or more states is less than 1%.
* Respondents with missing values for less than one-third (nine contexts) were included.

Behavioural indicators of PHA and PLA

Respondents were asked to describe, using free-text, behaviours associated with PHA and PLA, which were characterised using simple lay descriptors to facilitate common understanding: 'happy and excited' and 'happy and relaxed', respectively. The terms 'excited' and 'relaxed' are used as examples of positive high arousal and low arousal emotions, respectively (Mendl *et al* 2010). Respondents were required to describe behaviours under the following categories ('modes of expression'): vocalisations, head, mouth, eyes, ears, tail, body, legs and activity; an additional category was included for 'any other signs' that were not covered by these modes of expression.

Dog 'happiness' rating

Respondents rated how 'happy' they felt their dog to be in general, using a 5-point Likert scale with anchor categories at each end of the scale: 1 = 'not at all' and 5 = 'very much'.

Owner attachment

Owners' attachment to their pet was assessed using a short 8-item pre-existing scale (Stallones *et al* 1990).

Data analysis

Data from respondents who did not complete at least the demographics plus one other section of the survey were excluded. For specific variables, the number of data cate-

gories analysed needed to be reduced, eg pooling two adjacent categories, to ensure adequate sample sizes for statistical tests. Since there was large variation in individual breeds of dogs owned, breed data were coded into UK Kennel Club breed groups (Gundog, Terrier, Pastoral, Hound, Utility, Working, Toy) and a 'mixed breed' category. The type of owner experience was collapsed into two groups — those who owned dogs, and those who had more experience with dogs (ie, owned them plus worked with or bred dogs). The number of years' experience was collapsed into two groups — less than 15 years' experience and more than 15 years' experience. A continuous variable for owner attachment to their pet was calculated from the sum of scores for all eight scale items (Stallones *et al* 1990).

To minimise difficulties in interpretation, maintain key detail, and accurately reflect descriptions given by respondents, words or phrases obtained using the free-text paradigm, were conservatively grouped and separate categories were made where extra details were given (eg 'tail wagging' vs 'fast tail wagging').

Frequency data were collated for both context and behaviour sections, and are expressed as the percentage of response for all respondents. For each free-text behaviour category, frequency of response was also calculated as percentage of response within each mode of expression. Statistical analyses were conducted in Excel® via Microsoft® 2007 and PASW® (IBM®, version 18). To identify whether human or dog variables influenced owner descriptions of dog behaviour in each positive context, multivariate binary logistic regression models included behaviours reported by ≥ 20% respondents and categorical variables for dog (age, breed group, gender, neuter status, dog 'happiness' rating) and owner (gender, years' experience, number of dogs owned, experience type). Pearson's correlations between variables were assessed prior to model inclusion, to ensure independence. Only those variables reaching $P \leq 0.2$ in preliminary univariate analyses were included in the final multivariate models (backward Wald method). Where significant, the multivariate regression model indicated whether citation of specific behaviour was more likely for a particular predictor category compared to a reference category (denoted in presentation of model results with superscript 'R'). False Discovery Rate correction (Benjamini *et al* 2001) was applied to control for multiple testing; a *P*-value of $P \leq 0.01$ indicated significance for logistic regression models.

Further non-parametric Spearman's correlation tests were conducted to identify whether owner attachment was associated with the number of behaviour indicators cited by respondents (summed across all modes of expression, and across both PHA and PLA), and with ratings of their dog's 'happiness'.

Results

Demographics

The survey website was accessed 805 times within the defined time-frame; 445 respondents provided valid data (demographics plus at least one other section), of which 85.7% were from England (Scotland: 10.0%; Northern Ireland: 1.7%; Wales: 1.9%; Republic of Ireland: 0.7%).

Of the respondents, 80.0% were owners and 15.3% owned and bred or worked with dogs; 54.8% overall had more than 15 years' experience with dogs. Half of survey respondents owned one dog; with 29.3% owning two, and 20.7% owning more than three dogs. The majority of our owner sample was female (88.5%) and respondent age was almost evenly distributed between four bins — 18–25 years (22.5%), 26–35 years (21.2%), 36–45 years (20.3%) and 46–60 years (26.8%). Fewer than 10% of respondents were under 18 or over 60 years old.

Surveys were completed predominantly for adult dogs (64.9%), dog gender was evenly distributed (56.6% male) and 72.2% of all dogs were neutered. Over 190 breeds were represented: Labrador retrievers (8.1%) and Border collies (5.6%) were most common. When grouped for analysis, 'mixed breed' was the largest category (24%), followed by Gundog (19.8%), Terrier (16.4%), Pastoral (12.4%), Hound (8.3%), Utility (8.1%), Working (6.3%) and Toy (4.7%).

Contexts perceived to promote canine emotion

The frequencies of respondent-assigned emotional states for each context are provided in Table 1. Attributing multiple emotional states within-context for an individual dog was rare (10.8%); these responses could not be easily interpreted and therefore are not reported here. Of the contexts prompted by the questionnaire, those most commonly perceived to promote PHA were anticipation of a walk (84.80%) or food (81.42%). Those most commonly perceived to promote PLA were resting in the dog's own bed or area (85.47%), resting (in general: 84.46%) and being stroked gently by the owner (84.12%).

In the supplementary free-text question, the most common additional contexts described for PHA (n = 183) were: agility training (13.8%), reward-based training (6.7%), the owner returning home (6.7%) and the dog meeting people (5.4%). For PLA (n = 187), respondents suggested: resting with the owner (18.8%), lying or sitting in the sun/garden (17.5%), meeting people/visiting houses (9.4%), the whole family unit being together (7.6%) and sleeping (6.7%). In comparison to positive emotions, the most frequently cited contexts for neutral emotion were listening to the radio (55.74%) and drinking water (49.66%), and for negative emotion were being separated from owner (47.30%), and having nails clipped (40.88%).

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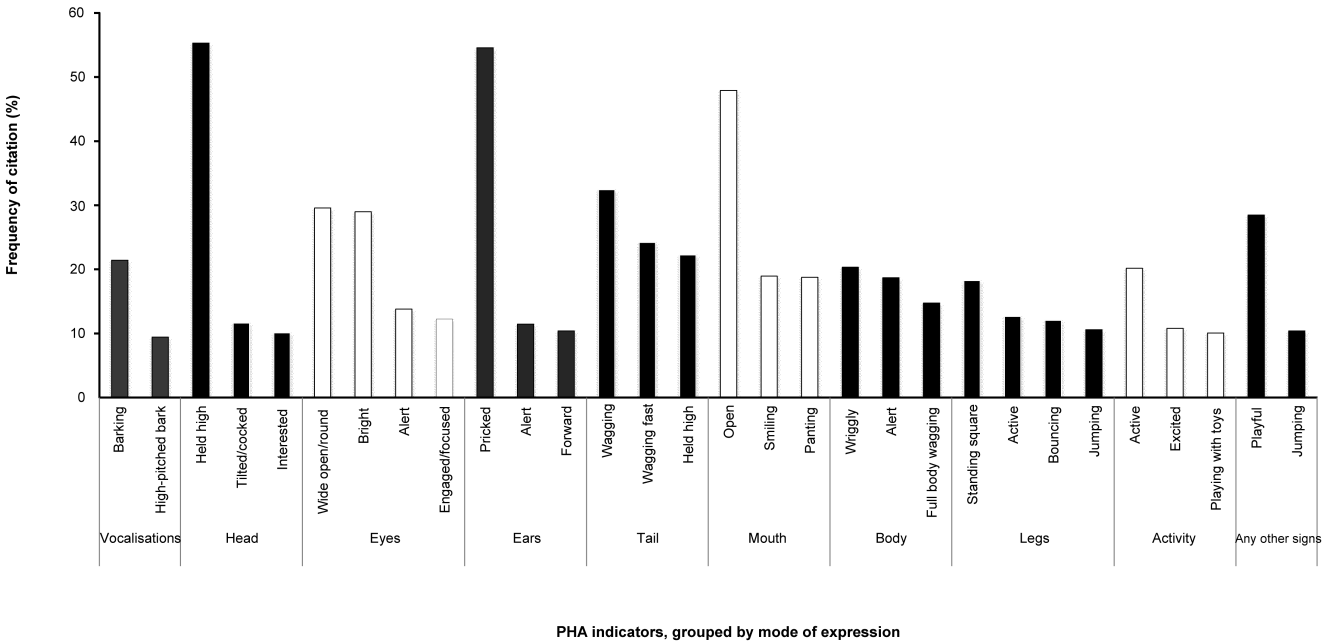
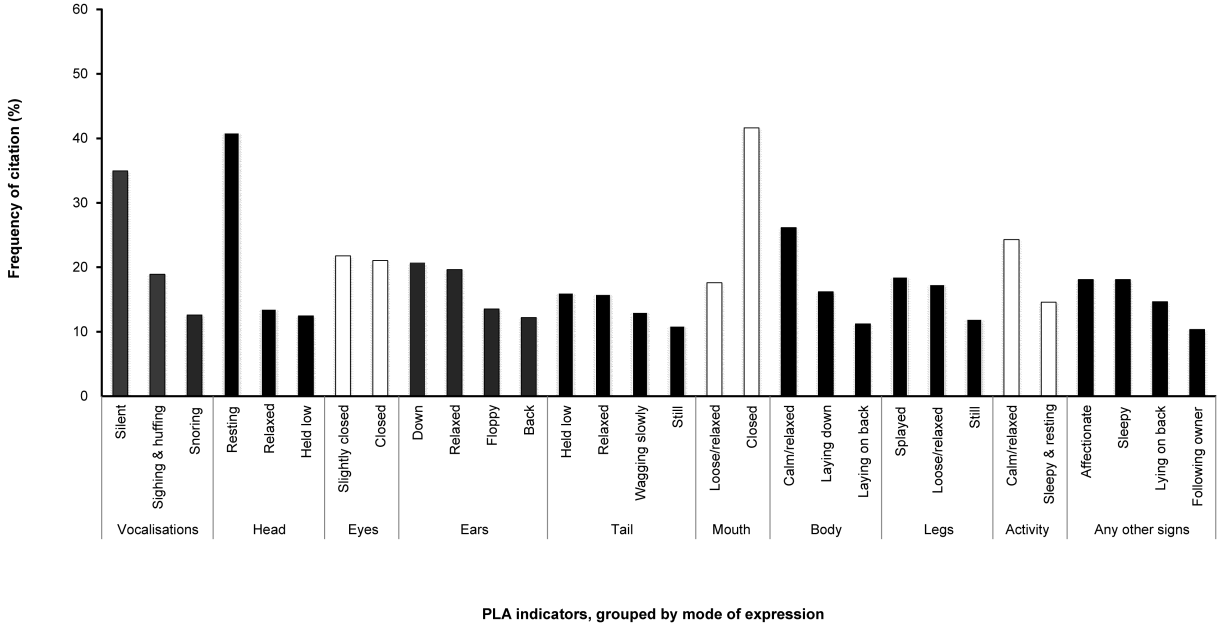
Figure 1



Behavioural indicators described, by dog-owning respondents (n = 445) using free-text within the ten modes of expression provided, for canine positive high arousal (PHA) states. Only indicators reported by over 10% of respondents are displayed (grouped by mode of expression).

Figure 2



Behavioural indicators described, by dog-owning respondents (n = 445) using free-text within the ten modes of expression provided, for canine positive low arousal (PLA) states. Only indicators reported by over 10% of respondents are displayed (grouped by mode of expression).

Canine behaviour perceived to be associated with emotional states

At least one behavioural indicator was provided by each respondent (n = 445) for both PHA and PLA. The relative respondent-perceived importance of each of the modes of expression in descriptions of PHA and PLA may be indicated by the number of behaviours described for each mode of expression. For PHA, respondents referred most to indicators associated with the tail (13.1% of total indicators provided across all modes of expression), activity of the dog (12.2%) and eyes (11%), whilst whole body behaviours (6.8%) were described least. Similarly for PLA, indicators associated with the tail (12.4%), activity (11.9%) and eyes (10.8%) were described most often, whilst leg-related behaviours (7%) were referred to least.

Frequencies of specific behavioural indicators (reported by over 10% of respondents) given within each mode of expression are shown in Figures 1 and 2 for PHA and PLA, respectively, grouped by mode of expression. The most frequently cited indicators for PHA were: head held high (55.3%), ears pricked (54.6%), mouth open (47.9%) and tail wagging (32.4%). For PLA, the most frequently cited indicators were: silence (vocalisations; 34.9%), mouth closed (41.6%), head resting (40.8%) and calm/relaxed body (26.2%).

Variables influencing descriptions of behaviour

For PHA states, dog age, breed and owner's years' experience with dogs had significant influences on the citation of specific dog behaviours. Respondents with younger dogs were more likely than those with senior dogs$^{\text{Reference category, R}}$ (> 10 years) to report 'body wriggly' (puppy < 1 year: Odds Ratio = 2.41, Confidence Interval = 0.99–5.88; $P = 0.05$; juvenile 1–2 years old: OR = 3.18, CI = 1.33–7.61; $P < 0.01$; adult 3–9 years old: OR = 4.12, CI = 1.84–9.18; $P < 0.001$) as an indicator of PHA. Respondents owning mixed breeds^{R} were more likely to report 'ears pricked up' as a PHA indicator than respondents owning Gundog (OR = 2.94, CI = 1.62–5.32; $P < 0.001$), Utility (OR = 5.13, CI = 2.28–11.49; $P < 0.001$) or Toy (OR = 8.21, CI = 2.76–24.39; $P < 0.001$) breeds. Respondents owning mixed breeds^{R} were also more likely to report 'fast tail wagging' as a PHA indicator compared to respondents owning Toy (OR = 6.85, CI = 1.47–31.25; $P = 0.01$) breeds. 'Fast tail wagging' was also more likely to be reported as a PHA indicator by respondents with fewer years' experience of dogs (≤ 15 years) than those with more than 15 years' experience^{R} (OR = 1.88, CI = 1.21–2.92; $P < 0.01$).

For PLA states, respondents with experience of dogs (ie, working with or breeding dogs), compared to those that just owned them^{R} were more likely to report 'no vocalisation' as an indicator of PLA states (OR = 2.21, CI = 1.31–3.73; $P = 0.003$).

Owner attachment

Positive correlations were found between owner attachment and the number of behavioural indicators provided (Spearman's *rho* = 0.204, n = 298; $P < 0.01$), and owner attachment and their rating of their dog's happiness (Spearman's *rho* = 0.199, n = 298; $P < 0.01$).

Discussion

The current study sought to explore contexts and behaviour patterns potentially associated with high and low arousal positive emotional states, as perceived by dog owners, and how behaviour assessments might be influenced by dog and owner characteristics.

Contexts perceived to promote canine emotion

Amongst our respondents, there was consensus in those contexts perceived as positive for dogs. In particular, contexts perceived as positive for dogs tended to centre around interactions with humans. Owners may have anthropocentric perceptions of the contexts which their pets enjoy, ie they choose to interpret contexts based on human values and experience rather than those of the dog (Bradshaw & Casey 2007). This may limit the accuracy of owner information, if a mismatch between owner and dog perception is found to exist (which the current study cannot ascertain). Higher agreement between people in their descriptions of dog and cat behaviour was generally found for scenes relevant to the owner-animal relationship, compared to lower agreement for scenes without owner interaction (Bahlig-Pieren & Turner 1999). Owners may have placed emphasis on, or more easily recognised, events that they control, but the finding may also have reflected close attachment of dogs to their owners (Topal *et al* 1998). A primary role of humans in promoting canine positive emotion is problematic where dogs receive little or disrupted human interaction, eg where dogs are left alone (23% of dogs are left for more than 5 h per day; People's Dispensary for Sick Animals [PDSA] 2011). The emotional valence of reunion with the owner, suggested as promoting PHA by some respondents (when describing additional contexts; 6.7%), should be interpreted with caution since excessive excitement during reunion may be indicative of emotional conflict and separation-related anxiety (Schwartz 2003; Konok *et al* 2011).

Although the validity of these contexts in establishing a positive emotional state in dogs could not be ascertained within this study, the top-cited contexts for canine positive states are in accordance with scientific literature, providing more confidence in their candidacy. Anticipation of reward, particularly food, is suggested as a reliable context for promoting PHA states across species (sheep [*Ovis aries*]: van den Bos *et al* 2003; silver foxes [*Vulpes vulpes*]: Moe *et al* 2006; pigs [*Sus scrofa domesticus*]: Imfeld-Mueller & Hillmann 2012; chickens [*Gallus gallus domesticus*]: Zimmerman *et al* 2011). Walking was also deemed important for companion dog PHA; exercise increases levels of β-endorphins in dogs (Radosevich *et al* 1989), suggesting exercise may enhance mood (Morgan *et al* 1985). Play in animals has long been viewed as positively reinforcing (see discussion in Smith 1982), although some authors discuss play as an indicator of — rather than an inducer of — positive emotions (Boissy *et al* 2007). Stroking, suggested as promoting canine PLA, increases concentrations of neurotransmitters putatively associated with positive emotion in dogs (oxytocin: Mitsui *et al* 2011; phenylethylamine: Odendaal & Meintjes 2003). The perception by 86% of

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respondents that resting is associated with canine PLA contrasts with its use as a neutral condition in studies on other species (eg sheep; Reefmann *et al* 2009). This distinction may reflect true species differences or inaccurate attribution of valence; resting may be linked to boredom in animals (Meagher & Mason 2012), although it may plausibly also be associated with contentment (Graham *et al* 2005).

Contexts perceived by respondents to be associated with negative emotions were also consistent with scientific literature (eg separation distress; Schwartz 2003), but there was less consensus between respondents for these than for positive contexts. The contexts most frequently described as negative by respondents (eg separation, veterinary procedures, bathing, nail clipping) were also comparatively frequently described as neutral (see Table 1). Such mixed views may have reflected individual dogs' differences due to prior habituation and learning (Serpell & Jagoe 1995), or alternatively human misinterpretation, such that behaviours associated with negative states may be interpreted as indifference or *vice versa* (particularly for less intense states, for which behavioural expression may be more subtle; eg Beerda *et al* 1998).

Canine behaviour perceived to be associated with emotional states

Variation and subtlety in the experience and expression of positive emotions (of individual dogs; Boissy *et al* 2007) may explain variation in owner-perceived behaviour, although key behaviours were consistently described across respondents in our survey. Respondents' behavioural profile of canine PHA involved barking, head held high, wide open and 'bright' eyes, ears pricked, tail wagging, mouth open, and active and playful behaviour. For PLA, respondents collectively described their dogs as not vocalising (silent), head resting, eyes closed or slightly closed, ears 'down', closed mouth and a calm/relaxed activity level. Notably, owners appeared to struggle with providing descriptors for PLA relative to PHA; they often 'borrowed' terms from the question ('happy and relaxed') and were less able to provide specific behavioural cues. PLA states such as contentment and relaxation (Russell & Barrett 1999) may be less distinctive than PHA states, because of subtlety or absence of signals.

By requesting information for specific modes of expression, respondents were encouraged to be more descriptive than with unstructured questions (Kerswell *et al* 2009; Tami & Gallagher 2009). Indeed, in the category of 'any other signs', respondents were non-specific and general in their descriptions, eg affectionate, playful. In reality, modes of expression are not likely to occur in isolation, but some may be more important for differentiating emotional states than others, in particular the tail and eyes were most reported here. In dogs, tail wagging is commonly reported by human observers (Tami & Gallagher 2009) and has been linked with positive social experiences (Quaranta *et al* 2007; McGowan *et al* 2010). Using an unprompted question, Kerswell *et al* (2009) reported that vocalisation and gross body movements were most commonly described by dog owners for different canine emotional states. Commonly reported modes of expression perceived by dog owners might actually reflect the parts of the body that they attend to, rather than the parts of the body that are actually most revealing of canine affective state (Kerswell *et al* 2009). For example, eye expression was cited by 71% of respondents in our survey; the eyes are an important area of the body for human emotion recognition (Messinger *et al* 2012) and humans may have a tendency to focus on the facial area in other species, although it may not always truly reflect the animal's emotional state (Leach *et al* 2011). Subtle but important indicators of canine emotion might not readily be reported by dog owners, eg stress behaviours such as gaze aversion, yawning or nose licking (Mariti *et al* 2012).

Variables influencing descriptions of behaviour

Amongst our survey population, respondents with a higher attachment to their pet also provided a greater number of positive emotion indicators for their dogs (across PHA and PLA combined), suggesting a higher motivation to describe these states and possibly closer attention given towards their pets' behaviour and emotional state. In addition, attachment scores positively correlated with ratings of canine happiness. This could reflect greater positive attention received by dogs with highly attached owners, however, greater pet attachment may also generate a bias towards more positive interpretations of behaviour (El-Alayli *et al* 2006; Woodward & Bauer 2007), which may not mirror true emotional state.

Age of the dog affected respondent citation of 'body wriggly', likely reflecting age-related decreases in activity and mobility (Salvin *et al* 2011), although it may also suggest greater difficulty in interpreting emotions in older dogs, especially since activity was frequently described as an indicator of both PHA and PLA states. Specific breed groups were reported to be less likely (than mixed breeds) to express pricked up ears or fast tail wagging as indicators of PHA, although breed was not found to influence citation of PLA behaviours. It is unlikely that owners of certain breeds (and not of other breeds) failed to identify behaviours involving such obvious structures, suggesting that owners may be interpreting a real difference in the way breeds express excitability. Morphological traits can influence canine expression of behaviour (Goodwin *et al* 1997), presenting a problem for accurate behaviour interpretation, for example where movements of the tail, ears or eyes are visually obscured or physically restricted. Further, human interpretation of behavioural characteristics (eg trainability) may focus on physical appearance (Helton 2009).

The effect of increased experience of dogs on the accuracy or reliability of behavioural assessments by people has not been consistent across previous studies. Fidler *et al* (1996) report people with little experience of pets tended to describe dog behaviour anthropomorphically and Kerswell *et al* (2009) found puppy owners with no previous experience of owning a puppy reported lower confidence about assessing dog emotions compared to those that had past experience. However, Tami and Gallagher (2009) report that experience of observers had no effect on their ability to properly label dog behaviour; Diesel *et al* (2008) confirm this finding for those who work with dogs, but add that reli-

ability improves in those with formal qualifications or more than eight years of professional experience. In our survey, owners with fewer years of experience were more likely to describe fast tail wagging as a PHA indicator than those with more experience; more detailed descriptions of tail posture or direction of movement may have been given by those with more experience of dogs. Respondents with more varied experience (working with or breeding dogs as well as owning them) described silence (under vocalisations) as an indicator of canine PLA. Absence of vocalisation is likely to occur in a number of emotional and non-emotional states (Manteuffel *et al* 2004) and is not likely to reliably indicate positive emotions. Silence may also be desirable for those who deal with multiple dogs, and therefore may simply reflect an interpretation of 'good behaviour'.

Whilst acknowledging likely bias in survey completion associated with interest, online access and time, the population of owners sampled in this study appear relatively representative of the dog-owning community and comparable with other studies in terms of age (< 60 years) and female gender bias (Bennett & Rohlf 2007; Westgarth *et al* 2007; Kubinyi *et al* 2009; Rooney & Cowan 2011). Our survey sample comprised dog owners that had a good level of experience with dogs; over half having 15 or more years' experience, although this likely related to the longevity of dogs such that owners could have had experience of a single dog. In this case, a high level of experience or interest in our respondents was to our advantage, as these individuals might be expected to provide more detail (eg Kerswell *et al* 2009), and perhaps more accurate information, that can be used to inform further research.

Animal welfare implications and conclusion

Promotion of positive emotional states in animals is important for good welfare and quality of life, yet information on these states is currently insufficient. Owners in this study demonstrated consensus in what makes their dogs happy and how they can tell, suggesting there may be reliable signals of canine positive emotion across individuals and those contexts which promote these states. Anticipation of rewards including exercise and food, social interaction and play were viewed as important positive experiences for companion dogs overall. Interpretation of positive behavioural signals focused on the tail, eyes, ears and general activity, although there are indications of some breed- or age-specific differences in behavioural expression. Empirical testing of owners' proposed indicators of canine positive emotion, using quantitative behavioural of dogs in contexts of pre-determined valence and arousal, is required to determine validity and reliability across different contexts and any effects of dog characteristics (age, breed etc). Further investigation of possible influences (positive or negative) of owner attachment to their pet, experience or vested interests, on owner assessments is warranted, since accurate owner descriptions of behaviour are necessary for identification of health and welfare issues.

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