

# Science with feeling: relevance of animal emotions to research, testing and teaching

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There is a growing understanding and acceptance that many species have lives that are enriched by their emotions. The theme of this conference is “Science with feeling” and one interpretation of this is that science is frequently carried out on sentient animals, i.e. animals with feelings. How should researchers and animal ethics committee members respond to this and consider the emotions of the animals involved in research, testing and teaching?

The existence of animal emotions has been postulated in science for many years. Charles Darwin used the observation that behaviours indicative of emotional responses are consistent among species as evidence for an evolutionary continuum (Darwin 1872). The concept that emotions are widespread but differ in degree throughout mammalian species rather than being present in a few and absent in most has been supported by subsequent scientific scrutiny. Sentience, which can be thought of as the ability for conscious feelings, is generally accepted to exist in animals and is recognised under European law (Treaty of Amsterdam 1997). Strictly speaking, feelings can differ from emotions in that feelings may be purely based in conscious thoughts whereas emotions are responses to external stimuli and may or may not have a conscious component. Feelings are the conscious consequence of emotions and amplify the perception, understanding and learning from emotional experiences (Damasio 2001).

Emotions (and consciousness) are thought to have evolved as they enable animals to better respond and adapt to variability and unpredictability in their surrounding environment. Emotions are the basic drivers for animals to do things and as such they influence both behaviour and physiology (Lewis et al. 2008). Anatomical and behavioural evidence for affective consciousness and the capacity for emotional experiences are present across mammalian species and there is also good evidence for avian species (Edelman et al. 2005).

Emotions can be categorised as either primary or secondary. Primary emotions are instinctual and evolutionary primitive and include fear, rage, lust, care, panic and play (Panksepp 2005). Secondary emotions require some degree of conscious processing allowing more complex responses such as empathy, guilt, jealousy and embarrassment. It is thought that all mammals possess the primary emotions and there is also evidence for expression of secondary emotions in some species. This wide range of emotional responses determine how animals react and respond to situations in both simple and complex ways. The powerful effect of emotions on both physiology and behaviour should not be ignored as potential influencers on animals in research, testing and teaching.

The study of emotions in animals is an active area of research. The impact of emotional state on the welfare of animals was quickly recognised (Fraser & Duncan 1998) and the consequences of negative emotions has been extensively studied. More recently, there has been a focus on positive emotional states as important contributors to an animal’s quality of life (Boissy et al. 2007). Understanding an animal’s behaviour in terms of its emotional drivers such as

fear and novelty also has advantages for working with animals and meeting their husbandry needs (Grandin & Johnson 2009).

Attributing emotions to animals has in the past been seen as anthropomorphism and unscientific as emotions were considered to reside in the domain of purely human experiences. Discussion of subjective emotional states in animals in a scientific manner has therefore proved to be challenging. One solution has led to the description of emotions in terms of the underlying brain networks that generate them and are common across species (Panksepp 2011). Another option is to consider the usefulness of anecdotes and anthropomorphism (Bekoff 2007).

Anecdotes can provide context to the understanding of emotions and a basis for empirical studies while anthropomorphism can be considered as the human linguistic expression of empathy, an important emotional ability that appears to be common across mammals (Bekoff 2007). Empathy appears to have a basis in the need and benefit of understanding the emotional state of other animals and being able to react accordingly. This is an advantageous ability for many social animals which may be why it seems to be so widespread. Empathy therefore widens the sphere of emotional influence, not only to the animal experiencing the emotion but also to others observing that animal.

It is clear that many of the species used in research, testing and teaching have lives that are enriched by emotions and experiences such as pleasure, pain, frustration and anger. These different emotional states potentially alter the way an animal responds to treatments it is exposed to and thereby affect the results of any study they are involved in. For example, barren cages may cause states of frustration or boredom and provision of enrichments to rats changes their behavioural responses via a shift to a more positive emotional state or cognitive bias (Brydges et al. 2011). It is critical therefore that researchers and those responsible for animals are aware of the environmental factors that could be influencing an experimental animal's emotional state and how these may in turn be affecting the animal's behavioural and physiological responses. This knowledge should be taken into account when deciding on the housing requirements for experimental animals and provision made such as inclusion of enrichments or social contact, to achieve normal or stable emotional states.

The effects of emotional states are so powerful that the validity of assuming results are 'normal' may be challenged if an animal model results in an 'abnormal' emotional state.

Animal ethics committees can play an important role in assessing and ensuring that the emotional needs of research animals are being met in experimental models put before them. In this regard, rather than being dismissed, empathy and anthropomorphic descriptions could be seen as important built-in skills to recognise and understand the emotional state of animals. These instincts should be trusted to help guide the ethical assessments and decisions required.

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