When coping is not enough
promoting positive welfare states in animals
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When coping is not enough
promoting positive welfare states in animals

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Setting the scene  
When coping is not enough: promoting positive welfare states in animals

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Abstract

In common with other scientific disciplines during the last 30-35 years, ideas in animal welfare science have evolved. Here the well-known Five Freedoms, formulated in 1979, are outlined briefly, but of particular importance in view of the key word ‘coping’ in the title of this Scientific Seminar, is the explicit mention made in Don Broom’s 1986 definition of animal welfare as the state of an animal in its attempts to cope with its environment.

It is noted that the words ‘cope’ and ‘coping’ in this definition imply struggling against threat, contending with difficulties and attempting to overcome them, i.e. at best, only just managing. This implication was understandable because in the mid-1980s the overwhelmingly focus was appropriately on numerous areas of animal welfare compromise. Also noted here is the emergence of and relationships between three key orientations towards animal welfare thinking, namely, biological function, affective state and natural living.

The Five Domains of Potential Welfare Compromise (the Five Domains) model, developed in 1997, is then described. This modal was devised to enable comprehensive assessments of welfare status by considering internally generated sensory inputs in four physical/functional domains, as well as externally generated sensory inputs, all of which, after brain processing, give rise to sensations, emotions or affective states experienced in the mental domain. The model integrates the biological function and affective state orientations to animal welfare thinking.

Today this thinking strongly emphasises subjective, emotional or affective states as major contributors to an animal’s welfare status, because animal welfare is now understood to represent what the animal itself experiences. Such experiences can range from strongly negative to very positive. Negative experiences dominated animal welfare science activity until 10-15 years ago when positive experiences and their promotion started to be given increasing attention.

The emergence of Quality of Life (QoL) concepts, which in many ways appear to be equivalent to ‘animal welfare status’, emerged at this time and also emphasised the importance of the animal’s individual experiences and especially its positive experiences. The welfare significance of positive experiences has more recently been highlighted in discussion of the value of providing animals with ‘lives worth living’ or ‘good lives’, as opposed to ‘lives worth avoiding’ or ‘lives not worth living’. The laudable aspirational commitment to achieving the very best QoL for animals above a neutral point of balance between negative and positive experiences which these ideas represent is acknowledged, but imponderables relating the required long-term assessment of QoL and imprecision in the definitions of what ‘lives worth living’ and ‘good lives’ would be, means that as they stand these notions are of little value for incorporation into regulatory codes of practice or welfare.
Finally, reference is made to the value of integrating our increasingly cogent knowledge of the neurophysiological, neuropsychological and bio-behavioural foundations of motivation and reward in animals. This knowledge now engenders a far greater sense of confidence when an animal’s behaviour is interpreted in terms of what it is intending to achieve, its active and positive engagement in goal-directed behaviours, the rewards its may experience when goals are achieved, and frustration when thwarted, and the wide range of pleasurable experiences the animal may have. These experiences may now be suggested to include feelings of satiety, appetitive and consummatory satisfaction, reward, goal-directed engagement, curiosity, vitality, playfulness, calmness, contentment, affectionate companionability, and feelings of security.

Introduction

Concern for animals has been evident for many centuries, albeit expressed at each time in terms of the then dominant ideas about the place of animals in society (Fraser, 2008). In contrast, concepts of animal welfare and their scientific study have only become prominent over the last 30-35 years (Green and Mellor, 2011). During the 50-75 years before that much scientific effort was focused on previously intractable health and production problems in livestock. More specifically, effort was directed at finding solutions to debilitating nutritional deficiencies or excesses, problematic animal-environment incompatibilities, and devastating infectious diseases, and this eventually led to many notable successes that indirectly improved animal welfare before welfare emerged as a legitimate focus of scientific endeavour (Mellor and Bayvel, 2008; Mellor, Patterson-Kane, Stafford et al., 2009).

Most such studies were directed at body mechanisms in order to understand, for example, their functioning during good health, their responses to various pathophysiological and pathological challenges, and how they could be manipulated to promote recovery from ill health and/or to improve production levels (Mellor, 2013). This approach, enthusiastically embraced by fundamental and applied scientists and many farmer beneficiaries of the knowledge they generated, usually had three key steps: (1) identify the problem, (2) clarify the operational details of the relevant body mechanisms, and (3) manipulate the mechanisms and/or the circumstances of the animals to solve the problem (Mellor, 2013). Throughout much of this earlier period, therefore, the dominant strategy was to identify what was wrong functionally and to correct it using mechanism-based interventions. In other words, the focus was on negative states and correcting them, a focus that was strongly favoured 30-35 years ago when science-based ideas about animal welfare began to emerge. It was therefore quite natural for these then fresh ideas to reflect such contextual thinking.

Table 1. The ‘Five Freedoms’ and recommended actions to promote them

<table>
<thead>
<tr>
<th>Freedom</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>From thirst, hunger and malnutrition</td>
<td>By providing ready access to fresh water and a diet to maintain full health and vigour</td>
</tr>
<tr>
<td>From discomfort</td>
<td>By providing an appropriate environment including shelter and a comfortable resting area</td>
</tr>
<tr>
<td>From pain, injury, and disease</td>
<td>By prevention or rapid diagnosis and treatment</td>
</tr>
<tr>
<td>To express normal behaviour</td>
<td>By providing sufficient space, proper facilities and company of the animal’s own kind</td>
</tr>
<tr>
<td>From fear and distress</td>
<td>By ensuring conditions and treatment which avoid mental suffering</td>
</tr>
</tbody>
</table>

Thus, the now well-known Five Freedoms, formulated in 1979 by the UK Farm Animal Welfare Council (FAWC) (Webster, 1994; Anonymous, 2009), made explicit reference to thirst, hunger, malnutrition, discomfort, pain, fear, distress and restricted behavioural expression, and to actions that could be taken to free animals from these states (Table 1). The well meaning, but potentially
misleading use of the word ‘freedom’, implied erroneously that a complete absence of these states was possible (Green and Mellor, 2011), but, at the same time, it quite rightly highlighted the objective of minimising them. Also, in 1986 when Don Broom defined welfare as an animal’s state with regard to its attempts to cope with its environment, his emphasis was on indicators of poor welfare (Broom, 1986). The Five Freedoms and Broom’s definition gave impetus to early scientific investigations of animal welfare aimed at identifying what negative states may exist. These investigations also sought to clarify how such states arise functionally and how they may be identified with the specific further objective of correcting or preventing them. Note, however, that the words ‘cope’ and ‘coping’ in Broom’s definition implied struggling against threat, contending with difficulties and attempting to overcome them, i.e. at best, only just managing. This is the implication of the word ‘coping’ in the first part of the title of this Seminar, ‘When coping is not enough.’

Three major orientations towards animal welfare

Scientific ideas evolve. Those in the fledgling discipline of animal welfare science were (and are) no exception, significant impetus being provided in at least three ways: first, by input from a wider range of scientists who had different perspectives on the subject; second, by continuing improvements in knowledge of relevant areas of biological functioning; and third, by societal views having an increasing influence on what were considered to be acceptable and unacceptable ways of treating animals (Broom, 2008; Fraser, 2008; Green & Mellor, 2011; Mellor, 2012a). The outcome was the emergence of three major orientations towards animal welfare (Fraser, 2003). These may be seen to have channelled the direction of scientific activity, the interpretation of results and the nature of the contributions these scientific studies made to wider discussions about how animal welfare should be managed nationally and internationally (Fraser, 2003, 2008; Broom, 2008; Mellor & Bayvel, 2008; Green & Mellor, 2011). These three orientations are biological function, affective state and natural living (Fraser, 2003).

The ‘biological function’ orientation emerged first, during the early 1980s. It held that an animal has good welfare when, among other attributes, it grows well, is in good health, reproduces successfully, and is relatively stress free (Barnett & Hemsworth, 2003; Fraser, 2003; Mellor, Patterson-Kane, Stafford, et al., 2009). This emphasis on the biological performance of animals was supported by well-established physiological and behavioural indices of their physical wellbeing. However, at that time scientists were still strongly discouraged from inferring that animals could experience subjective states or feelings (Wemelsfelder, 1997; Duncan, 2005; Fraser, 2008), with the consequence that the biological function orientation had that limitation. A correction occurred in the early 1990s when increasing attention began to be given to the mental experiences animals may have (Duncan & Petherick, 1991; Fraser & Duncan, 1998; Duncan, 2005). Now known as the ‘affective state’ orientation, this proposition became well accepted by the early 2000s (Gregory, 2004; Duncan, 2005) and today is the basis of much animal welfare science thinking (Wemelsfelder, 2007; Broom, 2010; Mellor, 2012a). Thus, the sophisticated nervous systems of mammals and birds are now widely considered to support conscious mental experiences or feelings (Duncan, 2005; Kirkden & Pajor, 2006; Denton, McKinley, Farrell, et al., 2009) such as breathlessness, thirst, hunger, nausea and pain (Mellor, Patterson-Kane, Stafford et al., 2009; Webster, 2011). In addition, mammals and birds are considered to experience negative and positive emotional or affective states (Duncan, 2005; Kirkden & Pajor, 2006; Mendl, Burman & Paul, 2010). Such negative feelings are likely to include anxiety, fear, frustration, boredom, helplessness and loneliness (Mellor, Patterson-Kane & Stafford, 2009; Mendl, Burman & Paul, 2010). Probable positive feelings are considered to include satiety, vitality, reward, contentment, curiosity and playfulness, and are thought likely to accompany good health, companionship, exploration, foraging and play (Panksepp, 2005; Mendl, Burman & Paul, 2010; Mellor, 2012a). According to the affective state orientation, therefore, an animal’s welfare will be good when it adapts with positive emotional experiences and/or without negative experiences during its interactions with other animals, people and the environment (Fraser, 2003).

It is worth noting in passing, to be emphasised later, that ‘to cope’ also has a positive connotation in that an animal may be seen to be coping well or successfully with the environmental challenges it faces.
The ‘natural living’ orientation developed in parallel with the other two orientations. It incorporates the view that the closer an animal is to its natural, wild or ancestral state, especially with regard to its ability to express natural behaviours, the better its welfare may be (Fraser 2003). Without human intervention, however, animals living in the wild may be in poor physical condition as a result of nutritional inadequacies, climatic challenge, disease states and predation, to give just a few examples of factors that would have negative impacts on their welfare (Mellor, Patterson-Kane & Stafford, 2009). Hence, using natural living as a sole welfare reference point is probably not adequate. However, in highlighting negative behavioural consequences of restrictive housing conditions, for example, it is useful to consider natural living together with the biological function and affective state orientations (Mellor & Bayvel 2011).

The Five Domains

The concept of the Five Domains of Potential Welfare Compromise (the ‘Five Domains’) was originally formulated in 1994 (Mellor & Reid, 1994), and has undergone a number of subsequent refinements (Mellor & Stafford, 2001; Mellor, 2004; Williams, Mellor & Marbrook, 2006; Mellor, Patterson-Kane, Stafford, 2009). The concept was formulated to remedy difficulties with the Five Freedoms alluded to above. Expressed in terms of compromise, and not freedoms, the Domains address more directly the practical reality of what can go wrong with an animal’s welfare. The Five Domains are: nutrition, environment, health, behaviour, and mental state. The first four Domains are predominantly physical/functional, and the last, mental state, represents the overall experience of the animal, i.e. its welfare status. In this way the Five Domains helpfully integrate the biological function and affective state orientations as identifiable entities (Figure 1).

**Figure 1. Domains of potential welfare compromise divided into physical/functional and mental components the integrated effects of which give rise to the welfare status of the animal - diagram modified from Mellor, Patterson-Kane & Stafford (2009)**

Note that each Domain should not be visualised as a functionally independent entity. Indeed, in accord with the extensive interactivity of all organ systems of the body there is a significant degree of overlap between the Domains. However, this does not detract from the primary purpose of the Five Domains concept as originally envisaged. This was to provide a template or model that would
help to ensure that assessments of animal welfare status would be comprehensive (Mellor & Reid, 1994). Indeed, the Five Domains concept has been used as an integral part of the New Zealand regulatory system for managing animal-based research, teaching and testing since 1997 (Williams, Mellor & Marbrook, 2006), and continues to be used to assess negative impacts on such animals to this day (Beausoleil & Mellor, 2012). Moreover, it can be applied to welfare assessments of the wide range of animals used or managed by people for other purposes, including farm, companion, recreational, sports, service and working animals (Mellor, Patterson-Kane & Stafford, 2009). And finally, adaptations of the Five Domains model have been developed to assess the humaneness of vertebrate pest control methods in Australia (Sharp & Saunders, 2008) and New Zealand (Beausoleil, Fisher, Mellor et al., 2012), and have been incorporated into an animal welfare position statement recently developed by the Zoo and Aquarium Association of Australasia.

The four physical/functional Domains (nutrition, environment, health, behaviour) and the mental Domain of the model are envisaged to interact in a manner illustrated by the following examples (Figure 1):

- **Nutritional Domain** - water deprivation leading to dehydration or food deprivation leading to a negative energy balance may give rise to the subjective experience of thirst or hunger, respectively
- **Environmental Domain** - extremes of cold or heat may lead to chilling-related debilitation or hyperthermic distress, respectively
- **Health Domain** - infectious diseases causing lung damage, gut inflammation and/or fever, or injuries causing tissue damage, inflammatory reactions, impaired mobility and/or escape capacity may lead to a number of experiences including breathlessness, nausea, sickness, pain, distress, fear or anxiety
- **Behavioural Domain** - impeded behavioural expression and/or activity due to space restrictions, isolation or barren environments may lead to feelings such as physical weakness, boredom, frustration, loneliness or helplessness
- **Mental Domain** - internally derived sensory inputs arising from compromise in the other four Domains, plus cognitive inputs and related mental activity arising from external environmental challenges that elicit ‘fight-flight-fright’ or other responses, may give rise to sensations of thirst, hunger, weakness, debility, breathlessness, nausea, sickness, pain, distress, fear, anxiety, helplessness, boredom, and so on. It is noteworthy that this list of potential negative experiences significantly extends that incorporated originally in the Five Freedoms (Table 1).

As well as such negative subjective states, animals are likely to have positive experiences (Duncan, 2005; Yeates & Main, 2008; Mendl, Burman & Paul, 2010). Thus, good animal welfare is now considered to result both from an absence of negative experiences and from the presence of positive experiences or sensations (Kendrick, 2007; Yeates & Main, 2008; Mellor, 2012a). Indeed, a longer list of positive experiences than that noted above and by Mellor, Patterson-Kane & Stafford (2009) may now be suggested to include feelings of satiety, appetitive and consummatory satisfaction, reward, goal-directed engagement, curiosity, vitality, playfulness, calmness, contentment, affectionate companionability, and feelings of security (Mellor, 2012a,b). It therefore follows that some forms of welfare compromise may result from an absence of such positive feelings so that their presence might be considered to represent a ‘need’ in the mental domain.

Considered in these terms, therefore, an animal’s welfare may be said to be good when its nutritional, environmental, health, behavioural and mental needs are met, and meeting these needs can be accomplished by managing animals in ways that both avoid negative mental states and promote positive mental states (Mellor, Patterson-Kane & Stafford, 2009).

Underlying these insights is the following integrated perspective on the principal features of much contemporary understanding of what animal welfare represents (Mellor, Patterson-Kane & Stafford, 2009; Green & Mellor, 2011; Mellor, 2012a).

- Animal welfare is a state within an animal. It is not management procedures applied to the animal, nor features of the animal’s environment, which may affect its welfare.
The animal must be phylogenetically and developmentally sentient; i.e. it must have a brain with sufficient functional sophistication to transduce impulses in sensory and other nerves into experienced sensations.

As animal welfare relates to experienced sensations, the animal must be conscious; unconscious animals cannot experience anything.

These experiences can be negative, neutral or positive.

These experiences arise as the integrated outcomes of sensory and other neural inputs from within the animal’s body and from its environment.

These inputs are processed and interpreted by the animal’s brain according to its species-specific and individual nature, and past experience.

The integrated outcome represents the animal’s current experience (i.e. its welfare status), and this changes as the balance and character of the inputs change.

These experiences are emotional or affective states and, based on human experience, are likely to include negatives such as thirst, hunger, nausea, pain and breathlessness, and positives such as satiety, contentment, exploration and play.

As subjective states they cannot be measured directly, but there are informative indirect indices of such experiences.

These indices, which are based on established knowledge of physiological and behavioural responses to specific welfare challenges, have been critically evaluated as useful and relevant in many contexts.

The welfare status of an animal at any one time may vary on a continuum between extremely bad to very good.

Quality of Life

The prior notion of human Quality of Life (QoL) clearly influenced ideas about animal QoL (Taylor & Mills 2007), and the emergence of these ideas coincided with the later developments in animal welfare thinking referred to above. The detailed discussion of animal QoL provided by Green and Mellor (2011) has not been repeated here; rather, some key points have been summarised:

At present there is no widely agreed definition of QoL in animals;
When they emerged, QoL notions gave greater emphasis to positive affects than did most of the orientations to animal welfare up to the mid-2000s;
QoL emphatically highlights the animal’s internal experience of its own state;
QoL represents the overall balance between positive and negative experiences that an animal has at a particular time;
As animal QoL ideas had their origin in the human QoL concept, they constructively underscore empathetic consideration of animals, but care must be taken to avoid unjustified or incautious attribution of human feelings to animals;
Species differences must also be considered for some states as sensory capacities, related affective experiences and ecological niches occupied differ across a wide range of taxa.
QoL concepts are compatible with the Five Domains concept because of their focus on the animal’s mental state.
QoL concepts are also compatible with the three animal welfare orientations of biological function, affective state and natural living, but they are firmly rooted in the affective state orientation and strongly emphasise positive affect.
In fact, the terms QoL and ‘animal welfare status’ are more or less equivalent (Broom, 2007; Mellor & Stafford, 2009), except that QoL emphasises a longer time scale whereas ‘animal welfare status’ usually relates to quite short timeframes.

QoL is problematic to grade, rank, assess or measure because of its focus on the mental state of individual animals, the subjectivity of those states and the complex interactions between numerous physical/functional, behavioural and affective factors that contribute to QoL. Nevertheless, as noted above, numerous well established physical/functional and behavioural indices may be used to confidently infer when negative subjective, emotional or affective experiences may be present or absent, and/or when remedial actions have corrected or failed to correct different forms of functionally-based or environmentally-induced welfare compromises experienced in the mental Domain.
Scaling Quality of Life

In a recent development, FAWC explored the possibility of extending the general notion of QoL to include categories of ‘a life not worth living’, ‘a life worth living’ and ‘a good life’ (Anonymous, 2009; Wathes, 2010). The Council’s purpose was to suggest an approach to QoL assessment where these categories would represent different segments on a scale that ranges from the worst imaginable life, to a life that is neither good nor bad, through to the best life imaginable. Among a number of points made in a subsequent evaluation, James Yeates introduced the concept of ‘a life worth avoiding’ (Yeates, 2011). Reflecting upon these categories and the prior expositions on them (Anonymous, 2009; Wathes, 2010; Yeates, 2011), Talia Green and David Mellor saw merit in combining the categories into a four-point scale, with two positive categories above and two negative ones below a neutral point of balance (Table 2). As their reasoning has been explained in detail in their paper (Green & Mellor 2011), only some of its key outcomes have been presented here.

A good life

All positive experiences greatly outweigh all negative experiences. This would be achieved by far higher standards than are achievable by compliance with minimum standards in codes of practice or welfare (Anonymous, 2009). Thus, they must comply with all best practice recommendations so that:

- Available food meets biological needs and is pleasurable to locate and eat.
- Environmental choices are available
- Disease is controlled and treated by the strictest measures
- Mutilations are restricted or banned
- Certain husbandry practices are prescribed (positive) or banned (negative)
- Behavioural expression is encouraged
- Harmless wants and needs are met
- There are opportunities for animals’ comfort, pleasure, interest and confidence
- The highest standards of veterinary care are provided
- And importantly, the highest standards of husbandry are maintained.

A life worth living

All positive experiences, on balance, would outweigh all negative experiences but not to the same extent as with ‘a good life’. This would be practically achieved by at least good husbandry, handling, transport and veterinary care, and good stockmanship, and the manner of death should also be humane (Anonymous, 2009). Overall, this should result when all minimum standards in codes of practice or welfare are met. ‘A life worth living’ does not exclude negative experiences if the overall balance is positive, as may be the case with, for example, short periods of pain due to tail docking or other husbandry or therapeutic interventions that lead to QoL benefits.

Point of balance

This is the theoretical neutral point where all positive and negative experiences are equally balanced.

A life worth avoiding

All negative experiences would, on balance, outweigh all positive experiences, but in being the first category on the scale below the ‘point of balance’, the net negative QoL would be less extreme than for the ‘a life not worth living’ category. The major negative experiences of animals in this category would respond sufficiently well to veterinary or husbandry interventions to enable the QoL to be improved at least to the neutral ‘point of balance’. Of course, those responsible for such animals would be required to remedy such QoL problems, because the clear implication here is that minimum standards in codes of practice or welfare would have been breached.
A life not worth living

This category would be reserved for extreme cases where negative imbalances in QoL were very severe and veterinary or husbandry interventions would be so ineffective that euthanasia would be required to put such animals out of their misery. Animals in this category would be better off dead, as the name of this category implies.

Table 2. A quality of life (QoL) scale where the different categories are defined in terms of the relative balance of positive and negative experiences animals may have (derived from Anonymous (2009) and Yeates (2011))

<table>
<thead>
<tr>
<th>Category</th>
<th>General description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A good life</td>
<td>The balance of salient positive and negative experiences is strongly positive. Achieved by full compliance with best practice advice well above the minimum requirements of codes of practice or welfare</td>
</tr>
<tr>
<td>A life worth living</td>
<td>The balance of salient positive and negative experiences is favourable but less so. Achieved by full compliance with the minimum requirements of code of practice or welfare</td>
</tr>
<tr>
<td>Point of balance</td>
<td>The neutral point where salient positive and negative experiences are equally balanced</td>
</tr>
<tr>
<td>A life worth avoiding</td>
<td>The balance of salient positive and negative experiences is unfavourable, but can be remedied rapidly by veterinary treatment or a change in husbandry practices</td>
</tr>
<tr>
<td>A life not worth living</td>
<td>The balance of salient positive and negative experiences is strongly negative and cannot be remedied rapidly so that euthanasia is the only humane alternative</td>
</tr>
</tbody>
</table>

Utility of scaled QoL assessments

Briefly addressed here is the question of how useful such scaling as this would be in formulating regulatory definitions relevant to standard setting and managing animal welfare. Green and Mellor (2011) have provided a more detailed account.

A major strength of the categories of ‘A life worth living’ and ‘A good life’ is that they refocus attention of those responsible for animals on the promotion and the celebration of positive welfare states, while at the same time recognising that negative states will still require attention. As QoL categories, they emphasise subjective or affective states, animal-based welfare outcomes, individual animals not groups, and that sustained, not transient, factors usually have the greatest overall effects on QoL.

Significant weaknesses of QoL assessment are that incautious empathetic speculation about what animals may experience may be misleading, and that its subjective character is such that even McMillan (2005), a strong exponent of the use of QoL assessment, acknowledged that the outcome might be a ‘best guess’. However, Green and Mellor (2011) drew attention to two approaches that had been applied to welfare status assessments and could enhance the rigour of QoL assessments. The first method was based on Francoise Wemelsfelder’s qualitative behavioural analysis approach (Rousing & Wemelsfelder, 2006; Wemelsfelder, 1997, 2001, 2007; Wemelsfelder & Farish, 2004; Wemelsfelder, Hunter, Mendl et al., 2000; Wemelsfelder, Hunter, Mendl et al., 2001; Wemelsfelder, Nevison & Lawrence, 2009) and the second on the Five Domains approach (described above). Ngaio Beausoleil and David Mellor saw benefits in combining these two methods, because of their complementary strengths, and called them ‘Qualitative Whole Animal Profiling’ and ‘Systematic Analytical Evaluation’, respectively (Beausoleil & Mellor, 2012). It is also worth noting that informed experiential observation underlies daily welfare or QoL assessments that have long been undertaken by veterinarians, animal-based scientists, stock handlers, observant pet owners, zoo staff and others who have daily engagement with animals in clinical, production, scientific, domestic and other contexts.
However, the above assessments relate especially to the short-term prior or current welfare status of animals, and can be informative, whereas FAWC envisaged the possibility of lifelong assessments of QoL (Anonymous, 2009), which is much more problematic (Green & Mellor, 2011). The reasons for this include the following:

- Early life experiences about which there may be no information may influence later responses in unknown ways;
- The absence of negative states may permit positive states to be experienced and the impacts of that are difficult to assess;
- The presence of positive states may make negative ones more tolerable and the impacts of that are likewise difficult to assess;
- Scoring the relative noxiousness of for example thirst, hunger, nausea, breathlessness and different types of pain is seriously problematic, as is scoring the relative pleasantness of for example satiety, engaged exploration, foraging, bonded companionship or play;
- QoL varies throughout life, so there would be a practical need to undertake lifelong monitoring;
- Finally, the word ‘worth’ in the categories focuses on what the animal itself would value (Yeates, 2011). Although this might be accessed by preference, motivation and aversion tests (Kirkden & Pajor, 2006), the animal’s priorities may change over time, and temperament differences between animals may also be an issue.

The following key conclusions may be drawn regarding using scales of this character as a basis for regulatory management of animal welfare. Skilled QoL assessments conducted at the whole animal level may be more reliable over a short timeframe so that repeated short-term assessments would be necessary to cover more of the lifespan. Nevertheless, lifelong QoL assessments would remain problematic, especially because of the numerous interactive factors that may reasonably be assumed to affect QoL and their unknown relative impacts. Finally, the different categories on the QoL Scale are themselves poorly defined and therefore lack the rigour required for their use in regulatory contexts.

As aspirational dicta these notions have the positive effect of strongly focusing attention on the promotion of positive welfare states and on a good QoL - i.e. they represent a positive general target for animal welfare initiatives. In their present form, however, they are founded on too many imponderables to make them conceptually rigorous enough to be useful in regulatory terms. Thus, the formulation and use of codes of practice or welfare that outline minimum standards and recommendations for best practice will continue to be necessary and useful regulatory instruments in the foreseeable future.

Promoting positive animal welfare states

Although, as noted above, the initial predominant focus of animal welfare science was on identifying and rectifying negative welfare states (Green & Mellor, 2011; Mellor, 2012a, 2013), during at least the last 25 years the existence, value and potential for the promotion of positive affective states have been recognised and increasingly emphasised (Fraser, 1993; Fraser & Duncan, 1998; Duncan 2005). The outcome is that these ideas are now key elements of animal welfare science thinking (Dantzer, 2002; McMillan, 2005; Boissy, Manteuffel, Jensen et al., 2007; Broom, 2008; Yeates & Main, 2008; Mendl, Burman & Paul, 2010; Green & Mellor, 2011; Mellor, 2012a).

Positive affective or emotional states may include pleasure, comfort, contentment, curiosity and playfulness. However, such states cannot be monitored readily using physiological, pathophysiological, clinical and other physical/functional indices commonly applied to welfare compromise induced by nutritional, environmental and health challenges; rather, the principal indices are behavioural (Knierim, Carter, Fraser et al., 2001; Duncan, 2005; Fraser, 2008). This has been a source of concern among some scientists, veterinarians, farmers and other professional animal carers whose welfare management activities have often relied heavily on using the quantitative physical/functional indices. This is partly because positive affective states of this type appear difficult to define rigorously, and partly because the neurological links between these states and their assigned behavioural indices also appear to be poorly defined - until recently that is. Now, however, there is an increasingly secure scientific understanding of the neurological foundations of affective states and the motivational drives that energise and direct their associated
behaviours. The interested reader is referred to the published accounts of the underlying
neurophysiology, neuropsychology and bio-behavioural interactions for detailed descriptions (e.g.
Knierrm, Carter, Fraser, et al. 2001; Panksepp, 2005; Boissy, Manteuffel, Jensen et al., 2007;
Denton, McKinley, Farrell et al., 2009; Mendl, Burman & Paul, 2010; Mellor, 2012a). Suffice it to
say here that this extensive body of work now engenders a far greater sense of confidence when an
animal’s behaviour is interpreted in terms of what it is intending to achieve, its active and positive
engagement in goal-directed behaviours, the rewards its may experience when goals are achieved,
and frustration when thwarted, and the wide range of pleasurable experiences the animal may
have. As noted above, these experiences may now be suggested to include feelings of satiety,
appetitive and consummatory satisfaction, reward, goal-directed engagement, curiosity, vitality,
playfulness, calmness, contentment, affectionate companionability, and feelings of security
(Mellor, 2012a, b).

A final word on ‘coping’: Don Broom has long recognised the existence and importance of positive
welfare states, and for at least the last 25 years has included in his use of the word ‘coping’ its
positive connotation of ‘coping well’, meaning that such animals are experiencing positive affects
or emotions (Broom, 1998, 2000, 2008, 2010). Thus, in considering the title of this Scientific
Seminar we should note that the word ‘coping’ is here used to emphasise the minimalist position of
animals only just coping with what we ask of them on our behalf, not theirs. This then forms the
‘ground zero’ from which we should deploy our fresh insights into animals’ capacities to have
pleasurable experiences in order to at least improve, if not maximise their opportunities to do so.

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Promoting positive animal welfare in undergraduate teaching

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Abstract

The teaching of animal welfare involves integration of many factors, including science, economics, ethics, politics and societal values. The latter is particularly relevant, as since our understanding of animal behaviour and cognition has increased, so too has public concern for the way animals are treated. Instead of simply considering animals should be free from disease and pain, people now lobby for them to have a better, or more positive, quality of life. University programs producing graduates who will work with animals, including veterinary and animal sciences, must reflect these societal changes in their undergraduate curricula.

When considering curricula it is important to recognise content is not the only important factor. Good teaching is not simply a passive transfer of facts, but facilitates acquisition of knowledge by students, leading to changes in the way they view the world. This paper will summarise examples of active teaching of animal behaviour, welfare and ethics used by the author, and evidence that these have resulted in attitudinal changes in the students. In the first example, a student practical class instructs students how to use clicker training to teach chickens to peck on objects of different colour and shape. This practical class teaches two important areas: the basics of good animal training, and that chickens are intelligent animals that learn quickly. In the second example, students take on roles in an online simulation of a controversial debate on animal use, either battery cages for layer hens or farrowing crates for sows. Involvement in the debate and decision making processes from varying sides allows students to understand the complexity of public debates involving animal use, and to view the debate from varying sides of the argument. Finally, Team-Based Learning has been effectively used to open students up to new ideas within a team and integrate value-based judgements and scientific knowledge relating to animal welfare and animal ethics. It is particularly important for students to learn to work and communicate with others of differing views, as attitudes to animal welfare vary widely in society.

These examples of active and student-centred teaching activities provide evidence that as students acquire knowledge about animal welfare, their view of how animals should be treated do change. The goal is for these students to contribute in practical ways in the future, promoting positive changes in the lives of the animals with which they will live and work.

Introduction

As our understanding of animal behaviour and cognition has increased, so too has concern for the way in which animals are treated. This has resulted in a change from only pets receiving special attention, to more interest in how all types of animals are kept, including those used in agriculture, research and entertainment. Thus instead of simply considering these animals should be free from

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disease and pain, people now lobby for animals to have a better quality of life. The consumer-led shift in Australia away from sow stalls in intensive piggeries is an example of this change. University programs with graduates planning to work with animals in their future careers, including veterinary and animal sciences, must reflect these societal changes in their undergraduate teaching curricula.

When ensuring students are adequately prepared to work with animals, it is necessary to not only pay attention to what is taught, but also how it is taught. In the past teaching was considered simply a passive transfer of knowledge from an instructor to a student. However, it is now acknowledged deeper learning is required for professional graduates to be able to not only know, but also apply and use the information they have acquired. Traditional lectures allow more academic students to learn at this deeper level as they put in extra effort, but less academic students will only learn at a deeper level when teaching methods are optimised. Such optimisation includes active teaching methods, in which students must interpret and apply their new knowledge in the activity.

Active teaching methods are particularly important in professional programs, in which society expects high standards of professional behaviour. There is an added imperative when teaching animal welfare, as it is such a complex and interdisciplinary area involving, for example, science, ethics, law and psychology. Active teaching methods can ensure students integrate information from different spheres into a fuller understanding of animal welfare and what it means. We cannot teach students what to think, but by teaching well we facilitate them being able to view the world differently, as eloquently stated by Biggs (1999):

“Learning is thus a way of interacting with the world. As we learn, our conceptions of phenomena change, and we see the world differently. The acquisition of information in itself does not bring about such a change, but the way we structure that information and think with it does. Thus, education is about conceptual change, not just the acquisition of knowledge.” (1)

If we begin by teaching students about animal behaviour and learning, they may reflect on the similarity between themselves and other animals. If their instruction then includes animal welfare, and how establishing welfare standards relies on science and values, students will integrate this knowledge and may re-think their own values on how animals should be treated.

Examples of active teaching methods

There are already excellent examples of active teaching methods used in teaching animal welfare (Lord & Walker, 2009; Wright, Powney, Nevel et al. 2009). This article will discuss teaching examples I have used and following which attitudinal changes in students have been observed, or stated in the students own words. These methods have been used in a first year course, Principles in Animal Behaviour, Welfare & Ethics (PABWE), taught to both BSc (Veterinary Bioscience) and BSc(Animal Science) students. This course was first taught in 2008, when we demonstrated that student attitudes towards animals were more positive in the veterinary students following the course (Hazel, Signal & Taylor, 2011). Since 2008 the class size has increased to approximately 140 students in 2012, and new teaching activities have been incorporated to increase student engagement and learning. The following is a description of three of these activities.

Clicker training in chickens

Part of the curriculum in the course has always included learning theory. This is because: 1) animals are learning even when people do not realise it. People handling or managing animals need to be aware of this in order to cause the least stress to animal and handler; 2) it is my personal belief that incorrect animal training causes as many adverse welfare outcomes as any other single reason.

To teach learning theory at a deeper level, students need to be able to apply the theory. In 2008, a practical class was provided (run by Lisel O’Dwyer) in which a demonstration was given of clicker training in horses, and students had limited opportunity to practice clicker training on horses themselves. However, horses are large animals and care needs to be taken in having first year students with limited practical horse handling experience interacting with them, and only a few
horses were available for the class. Until 2012, I had not found an alternative animal species to use, until encountering chicken clicker training. Terry Ryan, an animal trainer in the USA, has developed Chicken Training Camps into a successful model, and now teaches Chicken Clicker Training Workshops around the world (http://www.legacycanine.com/workshops/chicken-camps.html). In July 2012, I attended one of Terry Ryan's workshops in the Adelaide Hills and with the help of Lisel O'Dwyer was able to adapt the training into a 2-hour student practical class.

The initial response of most people when you talk about clicker training chickens is “Why?” There are some compelling reasons including:

- People have not generally had experience in training chickens before they come to a class, thus enter with no ‘baggage’ about what does and does not work, or what they were always told to do by older/more experienced animal handlers/trainers;
- Chickens never want to please us, so if they are not trained right they just will not do it. Contrast this with the dog, who will do its best to get it right to please you;
- Chickens are fast. In fact, some chickens are very fast. If you can successfully train a chicken then you can successfully train anything; and
- Finally, chickens are relatively small, easy to handle, and unlikely to cause physical injury to a student.

In PABWE, students were involved in an 8-week rotation of practical classes, meaning each class ran for 8 weeks, with ~18 students per class. Chickens were kept in a secure housing facility in cages, as biosecurity concerns on the Roseworthy campus unfortunately made free range impossible. The class was approved by the University of Adelaide Animal Ethics Committee. At the end of the semester all chickens found a new free range home.

During the class, students worked in pairs, with one student being the trainer and one a helper/observer at each training repetition. Background was discussed on why we were using chickens in the training; how to handle the chickens appropriately (which was revision as students had handled chickens in first semester), and; the principles of clicker training. The students started with exercises between pairs using stencilled dots and pens, with one student pretending to peck with the pen and the other clicking when the pen ‘pecked’ in the dots, to improve their reaction times. A demonstration using the clicker to shape a student’s behaviour was used to facilitate an understanding of what it is like for an animal guessing what the person wants them to do. One student left the room while the instructor told the other students what they wanted the absent student to do, and then when the student returned the trainer (Lisel O'Dwyer) clicker trained tasks such as standing on one leg, or turning around. These demonstrations were both amusing to the students, but also instructive. When the students finally brought the chickens out to their tables they were adequately prepared.

Clickers were mounted on the handle of a plastic cup, so that a click could be given and food delivered to the chicken in a smooth movement. During the initial practice, students got used to always clicking before moving the cup to feed the chicken. The first time each group brought the chicken to their table their first task was simply to hold out the cup, let the chicken peck once in it, then return to a relaxed position with the cup next to their stomach and above the eye level of the chicken. In repetitions of 45 seconds, students then trained the chickens to peck on a red circle, and colour discrimination when a green, purple and yellow circle were sequentially added. One difficulty we anticipated was the chickens were trained for 8 weeks, but students were novices each week. However, this turned out not to be a major problem, although would certainly have slowed the training of the chickens to complete their tasks as the novice trainers made mistakes.

At the end of the final rotation, students evaluated what they had learnt from the practical classes. The chicken clicker training class achieved 99% broad agreement (Likert scale of 5 or higher) that students learnt a lot from the class, surpassing the previous favourite class with a Guide Dog instructor teaching students about temperament testing of dogs (80% broad agreement). At the end of each class students responded to the question “What was the most interesting or satisfying part of the clicker training for you.” There were numerous responses on the surprise the students felt that chickens are actually intelligent animals:
During the classes we named each chicken. Students took ownership of their own chicken’s success, with one student stated:

“I was very proud of Cecilia. Interesting how quickly they learn.”

Students were not only proud of their chickens and what they learnt, but the appreciation of the intelligence of chickens also seemed to result in an attitudinal change in some students:

“I like the fact that chickens are smart, not just here to eat and lay eggs!”

“see chickens differently after witnessing what they’re capable of”

“Actually teaching her something. She was so smart. I really like chickens & now so much more, lots of respect for smart animals.”

The third comment suggests that this student considers ‘smart’ animals deserve more respect and better treatment, and moving the chicken into the ‘smart’ category for them would necessitate different treatment.

As the students closely observed the chickens, they also became aware of their emotional state. The star of the practical classes was a chicken called ‘Priscilla’, who was both very fast in her responses and also quick to learn new tasks. Pairs working with Priscilla had to come up to speed quickly to be able to keep up with her. One student noted:

“Priscilla seemed to particularly enjoy the task, and that was nice to see a happy chicken.”

Online role-play

In a role-play, students take on roles within a realistic scenario in which a decision must be made. Participants represent different stakeholder positions with varying responsibilities and points of view. Within the role-play itself no solution is provided, meaning participants have to come up with their own arguments. Ideally the issue or problem does not have a ‘correct’ outcome and there is enough inherent conflict to spark debate. Actors must question all statements and their implications. At the end of the role-play students are marked not on ‘right’ or ‘wrong’ answers, but on their reflection of the issues raised and a deeper understanding of the process itself and what they learnt from it.

A very successful online role-play called the Mekong e-Sim has been run at the University of Adelaide for over ten year (Maier & Baron, 2005). Using the Mekong e-Sim as a template, in 2009 an online role-play was set up for first year veterinary and animal science students: the Chicken & Egg e-Sim (Hazel 2010). In the scenario the State Government planned to construct a large battery cage facility using tax payer money. The trigger then comes when there is a budget shortfall, and the decision on whether the battery cage facility will be built or not is opened to a public inquiry. In 2010, the same scenario was run, but in 2011 it was alternated with a scenario relating to legislation to ban the use of farrowing crates in intensive piggeries. This has allowed examples of student work to act as exemplars for the following year.

Groups of three to four students adopted different perspectives: (1) stakeholders; (2) media (local and national); and (3) a decision-maker group representing the SA State Government. Moodle, free Open Source software for educational use, was used as the platform for the e-Sim, with wikis, discussion forums, chat pages and emails available for public and private communication. Two separate e-Sims (A and B) were run simultaneously due to the large number of students.

Three phases of the e-Sim were used: (1) familiarisation and interaction, (2) public inquiry decision-making, and (3) debriefing.
(1) Familiarisation and interaction
In the briefing stage students familiarised themselves with the online learning environment, their various roles, systems of production and the related animal welfare legislation. Also in the briefing stage two online quizzes were completed, one on systems of production and the other testing knowledge of the groups involved in the e-Sim.

(2) Public inquiry and decision-making
In the public inquiry phase stakeholder groups worked together to prepare a public inquiry submission. This included a 1000-word submission on a private wiki page, plus a 400-word summary entered onto a public forum. Stakeholder groups responded to other submissions to either refute or reinforce their arguments. Alliances were formed with like-minded groups. Following this debate the Decision-Maker group, using a separate public forum, released their final decision on whether or not the development would go ahead, with stakeholders able to question the decision that was made.

(3) Debriefing
In the debriefing stage, students left their roles and tried to understand the events and discussions of the entire e-Sim. A separate debriefing session was held for each e-Sim, with a chance for the participants to ask the Decision-Maker group questions relating to how they reached a decision. Discussion was then facilitated on the factors affecting the decision-making process. Finally, students completed an individual debriefing report, including questions relating to whether or not their own group objectives were achieved, group dynamics, and the e-Sim as a whole.

Quotes from the final reflective report demonstrate what students learnt about animal welfare from the e-Sim. Student attitudes to the production system changed following the e-Sim; in the case of battery cage chickens some students hadn’t known the animal welfare problems caused by the system. However, other comments highlighted the fact students had not known much about the alternative systems and their potential problems either. For example:

“(b)efore we did this E-sim I didn’t know that free-ranged systems had these issues and had a one-eyed opinion that all production systems should be free-ranged, now after completing the E-sim I have a wider understanding and feel caged eggs have their positives too.”

The students that graduate from this course may go on to do research in animal welfare science, and the fact that they understand research is needed to improve alternative systems to make them a more viable option is a positive outcome. Other students understood more about the complexity of the decision making process and the many conflicting issues involved. For example:

“The e-Sim exercise made me realise that society does not view animal welfare alone as a reason to change practices. I had previously underestimated the impact of economic influences in particular, as well as not fully appreciating the problem of continuity of supply.”

In 2008, feedback forms were given to the students. One of the statements used was ‘My personal viewpoint on the use of battery cages or alternative systems for laying hens changed during the e-Sim.’ A Likert scale of 1 (strongly disagree) to 7 (strongly agree) was used. Out of 66 responses, 59% of students broadly agreed that their viewpoint had been changed (Likert response of 5 or higher). This change in attitude was also illustrated in student comments in the reflective report. For example:

“From an educational perspective, participation in the chicken and egg e-Sim broadened my mind in respect of the way Australia, & other countries treat their production animals. As a consequence I have made changes in the way I choose my food.”

There can be no more powerful illustration of an attitudinal change than changing consumer preferences. Thus what students learnt during the e-Sim included a conceptual change, not simply an acquisition of knowledge.
Team Based Learning

Team-Based Learning (TBL) is an example of an active teaching method. It is based on sound knowledge of how students learn and work in teams, and was developed in the late 1970s by Larry Michaelsen. However, it was not until 2001 when TBL users received a grant for medical educators to trial its use that TBL use started to expand around the world (Parmelee, Michaelsen, Cook et al., 2012). TBL has similarity to Problem Based Learning (or PBL), but does not require multiple tutors and rooms for small group meetings, and provides more structure to the students.

The steps of TBL include:

- Student pre-reading: prior to the TBL class, students are given learning activities with specific learning outcomes. This is usually written material, but can be supplemented by recorded lectures, videos etc.
- Individual readiness assurance test (I-RAT): each individual student is given a multiple choice test consisting of 10-20 questions based on the pre-reading.
- Team readiness assurance test (T-RAT): The same questions are answered by a team of 5-7 students. Teams are formed by the instructor to maximise diversity of learning resources (e.g. An Immediate Feedback Activity Form (I-FAT; http://www.epsteineducation.com/home/about/default.aspx) is used with teams scratching off answers to the MCQs until they reach the right answer. Scores are lowered for each additional scratch).
- Instructor clarification: While the teams are completing the test, the individual MCQs are marked using a scanner in class. This allows rapid feedback on any questions that students have struggled with. Some of these will have been clarified after the team tests, but if there are any areas students are still struggling with they are discussed in a mini-lecture, which also allows students to ask questions of clarification.
- Appeals: it is intrinsically difficult to write good MCQs, and any questions that students think are ambiguous or the wrong answer has been given can be appealed. Appeals are only done if the team got the question wrong, and successful appeals result in individual marks being re-graded.
- Application exercises: after the students have gone through the readiness assurance you can be sure they have mastered the course content and can apply it to a real-life problem to solve. Good application exercises are really the crux of TBL; getting students to apply the knowledge that they have gained. There are a variety of ways in which application exercises can be set up, but for them to work most effectively they need to comply with each of the 4 S’s principles devised by Larry Michaelsen. These are that:

1. it is a significant (and authentic) problem,
2. the same problem is used for every team,
3. there is a specific choice each team must make, and
4. teams simultaneously report.

Typically the first steps take approximately one hour, and application exercises should take at least one to two hours. In 2011/12, TBL sessions were run in the following discrete units in PABWE:

1. Learning Theory
2. Animal Welfare
3. Physiological Measures of Animal Welfare
5. Pain
6. Animal Ethics

The pre-reading for each TBL session was made available on MyUni (Blackboard Inc. Washington DC, USA) at least one week prior to the TBL on that topic. Pre-readings included a review article (Fraser, 2008), book chapter (Sandøe & Christensen, 2008) and readings put together specifically for the TBL. Each session followed the outline of TBL provided above, with 10 MCQs in the individual and team tests. Application exercises included multimedia (YouTube videos and images) and written scenarios.
Assessment relating to the TBL sessions included:

- 10% of course mark for MCQs (5% individual/5% team)
- 5% of course mark for peer review of team member contributions (formative peer review performed followed by final summative review)

Feedback was provided by the students following the final TBL session. Feedback forms were anonymous, with a good response from both years (72% or 91/126 in 2011 and 87% or 120/138 in 2012). The responses confirmed the active learning nature of the method, with 90% or greater broad agreement in both years to the statement ‘I felt actively involved in the Team Based Learning Classes’. As an added bonus, 77% of students in 2012 agreed with the statement ‘Team based learning helped me in developing other important skills (e.g. teamwork, communication).’

Students were also given space for free text responses to what they most liked or what they would change about the TBL activities. Many students felt that TBL was better than the 3-hr lecture blocks that it replaced, for example:

“I liked how TBL engages us with our own learning and forces us to actively participate whereas lectures just requires (sic) us to sit and listen.”

As well as being actively engaged, one student commented that it also was “emotionally engaging”. Some students also recognised that TBL was a good method to use in an area that could be difficult to lecture on:

“good way to discuss topics that would obviously be difficult to lecture about”

Students could also see the benefit of being able to safely discuss alternative points of view from both within their team, and during inter-team discussions in the application exercises. For example:

“Required me to consider other points of view in animal ethics”

“Allows people with initial extremist views to perhaps see what other people’s views were, avoiding conflict. It was a good way to teach such a sensitive course.”

Thus TBL was demonstrably an effective active teaching strategy for students learning about animal welfare and animal ethics. What a student practices is what they will master, and time spent in open discussions between students of varying points of view prepares them well to work in a society where attitudes to animals are still mixed, albeit changing.

Conclusions

In preparing students to take animals and their welfare more seriously, effective teaching methods are critical. In the same way as scientific methods are updated, educational methods must also be flexible and adapt to feedback. This paper has described three teaching methods: a chicken clicker training practical class, an online role-play, and TBL. In their own words, following participation in these classes, students developed new conceptual maps of animals and their place in society. It is hoped some will continue to play an active role in future discussions of quality of life in animals, and what this entails. A student who recognises a ‘happy chicken’ is in a good starting place.

References


Working like a dog - affectively

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Abstract

Animals in working roles help people around the world in many ways. Working dogs have made a significant contribution to Australia’s economy and are an icon of rural life. The Australian Working Dog Industry currently comprises dogs working in numerous contexts within private, government, assistance and sporting sectors. High standards of animal welfare are an essential component of both industry productivity and sustainability.

The assessment of cognitive states in animal welfare research by scientists has gained momentum in recent years. This presentation reviews current research relevant to working dog welfare. The conclusions about welfare states that have been drawn from observations of canine behaviour and physiology, and the effect of training methodologies and environment on performance outcomes will be explored. The transition in ethos from avoiding negative welfare states to promoting positive welfare states for animals utilised in working and sporting contexts is discussed.

It is recognised that not all people responsible for the care for working animals can be motivated to change their current practices solely to improve animal welfare standards. However, market expectations are moving toward higher standards of animal care and greater transparency of processes. There exists a need to further extend our understanding of working dog welfare to enable delivery of best practice that will result in high welfare and, by extension, sustainability and high productivity outcomes for the industry as a whole.

Introduction

While many animals play significant roles in the lives of people around the world today as companion animals, others perform valuable duties in societies engaged in working roles providing transportation, haulage and also entertainment, through racing and performance industries.

The working dog is an icon of Australian rural life and working dogs have made a significant contribution to Australia’s economy. Australian folklore conjures up an image of bush men huddled around the campfire swapping stories about the exploits of their working dogs. And, whilst stories about the Herculean feats of working dogs still capture the public’s imagination, they have now merged with a more widespread recognition of the range of utilitarian roles that dogs can perform for humans. For example, the functional capacity of working dogs to detect drugs and explosive substances remains unmatched by any modern day technology.

The Australian Working Dog Industry is very diverse. We have previously defined working dogs as domestic dogs kept for non-companion purposes operating in one of the following industry sector contexts: private, government, assistance, or sporting.
The Australian Working Dog Industry includes the following sectors and groups:

- **Private Industry**: Farm (herding; guardian); Hunting; Security/Guard; Detection
- **Government**: Australian Customs Service; Australian Quarantine Inspection Service; Correctional Services; Fire Brigade; Australian Defence Force; Police, Royal Australian Engineers
- **Assistance/Service**: Hearing; Physical; Guide/Seeing Eye; Search and Rescue; Therapy
- **Sport**: Greyhound; Sled; Sheep Trial; Cattle Trial; Schutzhund

**Australian community perceptions**

The support of the Australian community for working dogs originates from the historical role of the working dog in Australian agriculture. In considering the expectations of the Australian community in relation to animals, it is worth noting that, on a number of measures, Australians express increasing concern for animal welfare (Franklin, 2007). For example, in 1993, 42% of Australians agreed with the proposition that animals should have the same moral rights as human beings. By 2004, this figure had increased to 55%. The same study reports that 88% of Australians reported that they ascribe family membership to animals (Franklin, 2007). In 2010, 95% of surveyed Australians reported that the welfare of dogs was very important to them (in preparation, Cobb, Lill and Bennett). Growing awareness of the implications of animal use and management on welfare has led to rising public expectations and lower levels of tolerance for conditions perceived as adequate (Sandøe and Christiansen, 2008).

![Heat map representation based on mean scores of perceived welfare of different working dog groups. Adapted from: Cobb, M., Lill, A. & Bennett, P. (currently in preparation)](image-url)
Whilst a positive public perception extends to most of the working dog industry groups (refer to colours yellow to dark blue in Figure 1), concern has been publicly expressed online (Multiple hits were found via online search engines using key words: ‘Australia’, ‘working’, ‘racing’, ‘dog’, ‘welfare’, ‘drowning’, ‘abuse’, ‘animal rights’) and in the media (e.g. Australian Broadcasting Corporation, 2012) about the welfare of Australia’s working dogs.

Community attitudes and expectations about the dog-human relationship are constantly changing. Indeed, over the last 30 years, ‘traditional’ techniques that were widely used to train dogs for the Second World War are progressively being replaced by approaches based on learning theory and informed by our understanding of affective states.

In line with other disciplines such as human (positive) psychology and approaches in other areas such as education, changing societal views are influencing the field of animal welfare science. We are shifting from a period of assessing and setting standards according to measures of negative welfare states (such as the absence of pain, fear, thirst, hunger), to measures of positive states (such as the promotion of playfulness, comfort, contentment, curiosity) (Mellor, 2012). To enable this, we need to first distinguish what is important and how to accurately measure it.

Assessing animal welfare

Over the past few decades, assessment of animal welfare has been based on numerical assessment of behavioural and physiological criteria (Mellor, 2012). Examples include the scoring of the frequency or duration of behavioural criteria. Measurement of physiological reactivity such as heart rate, respiratory rate, hormone secretion (e.g. cortisol; oxytocin) and health indicators such as weight, incidence of injury or disease and life expectancy have also been carried out.

A challenge of animal welfare assessment lies in interpretation of this information. However, no litmus or pH test for animal welfare (that offers a quick and simple ‘good’ or ‘poor’ indication) has been established. The use of multiple measures generally offers the most robust interpretation of results (Broom, 1988). For example, if data showed that your heart rate rose very rapidly and that your respiratory pattern concurrently became abnormal, it might be reasonable to think that you were in a state of distress. However, if video footage from the same time shows that you were responding to a joke with raucous laughter, a different conclusion regarding your state of welfare may be drawn. Reliance on one measure of animal welfare alone can leave room for error. Individuals can also vary in the way in which they cope, so utilising multiple measures will help to observe responses within and between individuals in a more comprehensive manner (Broom, 1988).

Over time, the patterns emerging from an ever increasing number of studies are being used to build up information as to the reliability of both behavioural and physiological measures as indicators of animal welfare status (e.g. Beerda et al. 1998).

The science of working dogs and their welfare

There is limited published data regarding Australian working dogs in the scientific literature. The published research that exists stems from four primary studies and has focused almost exclusively around Guide Dog populations (Goddard & Beilharz, 1986; Champness, 1996; Murphy, 1995; 1998; Batt, Batt, Baguley & McGreevy 2008a; 2008b; 2009; 2010; Tomkins, Thomson & McGreevy 2010; 2011; 2012.). However, further progress has been made in recent years with the support of the Australian Animal Welfare Strategy, a federal government and collaborating stakeholder initiative to advance the welfare of all Australian animals. The Australian Working Dog Survey benchmarking exercise resulted in a database of information on 4195 Australian working dogs (Branson et al. 2010).

This inaugural Survey collected information about the housing, sourcing, breeding, assessment and training, veterinary care and end points across various working dog sectors throughout Australia in 2009. Industry sectors were examined in broad contexts, with emphasis on sectoral trends in efficiency and gross welfare measures (Branson et al. 2010). The current information available suggests there is room for improvement in the way we care for our working dogs.

Research conducted globally in relation to canine welfare over the past twenty years offers much to guide and inform the working dog industry sectors. Unfortunately, the accessibility of these
research results and translation of the findings into practical outcomes for industry has been lacking. Scientific research regarding the welfare of dogs does not suggest that the industry needs to begin again. In fact, a brief review of selected recent findings in relation to the working dog life cycle demonstrates how research outcomes have validated the worth of some existing practices.

Selection/breeding of working dogs

The selection of working dogs varies widely throughout the industry contexts. For instance, using examples from the 2009 Australian Working Dog Survey, a farmer may source an individual pup opportunistically from a neighbour; a detection dog may be selected from a shelter; and a Guide Dog from a large scale purpose-breeding program that deliberately aims to produce numbers surplus to training requirements. This variation in sourcing dogs illustrates not only the variety of investment in dog production and selection, but also raises consideration of varying levels of commitment to efficiency in translating the individual dog from new recruit into successful working dog.

For all Australian working dog industries, dog breeders external to the working dog program were reported as the most common source of working dogs for training. The initial comment that should be made about this result is that dog breeding is an unregulated industry. One potential consequence of obtaining working dogs from external sources is that trainers will be limited in their ability to contribute to either genetic or environmental variables that may relate to training and working dog success. An extension of this finding is that working dog trainers will be able to contribute only to learning, which is only one of the three factors (genetics, environment, and learning) accepted by scientists as determining behavioural outcomes. In this context, ‘behavioural outcomes’ could refer to both ‘training success’ and ‘working lifespan’.

This random approach to the recruitment of working dogs from external sources highlights the risk of ‘behavioural wastage’ - reduced success rates in training dogs to perform specific tasks - an outcome that has consequences for both animal welfare and also industry productivity and efficiency (Rooney et al. 2009).

Working dog programs that have their own breeding program may reduce wastage by defining and evaluating their specific long-term needs and thus refining the phenotypic variance (Scott and Fuller, 1965). Suitability for specific tasks is arguably the area in which most working dog research has been done; with numerous peer-reviewed publications on methods of assessing canine temperament (for a review, see Taylor & Mills, 2007). Australian working dog research has contributed to this field significantly through work conducted in collaboration with Guide Dogs Victoria (Murphy, 1998) and Australian Customs (Champness, 1996).

The subjectivity and consistency of so-called temperament tests in dogs have previously been criticised (Beaudet, Chalifoux & Dallaire, 1994). For example, Murphy (1995) and Fuchs et al. (2005) emphasised that subjective assessment criteria increased the variability of results. Another problem is that response to assessors can be much less repeatable than response to environmental stimuli. Netto and Planta (1997) showed that responses might be context-specific rather than generalised, with dogs often responding with aggression to one stimulus but not others. Taylor and Mills (2006) outlined ways to design and conduct tests to standardise the reliability, validity and feasibility of temperament assessments. A recently published meta-analysis looking at the consistency of canine personality suggested personality consistency was higher in older dogs, when behavioural assessment intervals were shorter, and when the measurement tool was exactly the same in both assessments. In puppies, aggression and submissiveness were considered the most consistent traits, while responsiveness to training, fearfulness, and sociability were found to be the least consistent (Fratkin, Sinn, Patall et al., 2013). Other recent research has emphasised the need for more explicit definition of ‘success’ in working dog programs (Wilsson & Sinn, 2012). The researchers claim that without knowing the precise definition of specific traits that are important for success, it will be difficult for working dog programs to make choices regarding the measurement methods that they use to capture relevant behavioural variation observed in their dogs earlier in life.
Puppy raising

Puppies can learn tasks through observational learning as young as 6-12 weeks of age. This has been demonstrated in various narcotic detection and food retrieval tasks (Slabbert, 1997). A range of factors such as odour presentation to pups in utero, early neurological stimulation, suitably enriched environment and early training/learning programs have been shown to affect the performance of working dogs (as reviewed in Branson et al., 2012). In light of the importance of these early influences on performance, an objective evaluation of puppy walker-type rearing programs is indicated. The PennVet Working Dog Centre at the University of Pennsylvania is commencing research in this domain. Whilst it is common practice, recruiting members of the general public to rear potential working dogs is not necessarily best practice. It may just be better than rearing young dogs in a deprived kennel environment. This, like many other working dog industry practices, requires objective assessment prior to being considered to be best practice.

Training methods

The Australian Working Dog Survey results that varied the most between working dog industries were those that related to the approach and equipment used to train working dogs. The way in which the different sectors have evolved their training methods is indicative of their isolated development. Factors such as remote location, lack of resources to engage in ongoing education and the absence of a peak body to distribute information and education across industry sectors has contributed to a relatively siloed progression of practices.

One of the Key Findings of the Australian Working Dog Survey Report (Branson et al. 2010) was that correction and electric shock collars are most commonly used by working dog trainers who have not received any formal certified education in dog training. This finding is of particular interest and concern, given that it contrasts so sharply with the training approaches embraced by marine mammal trainers e.g. International Marine Mammals Trainers Association and contemporary elephant trainers (e.g. Human Elephant Learning Program - HELP). The sophisticated level of training achieved by marine mammal and elephant trainers is on a par with that required for working dogs. The success of such groups not utilising such techniques clearly demonstrates that choosing an aversive approach to animal training is not required. Instead, these areas of animal training for work and entertainment purposes are based on behaviour modification through operant conditioning and do not involve the use of electric shock, fear, intimidation, choke or prong collar. It is interesting to consider how such dogs were trained one hundred years ago before the advent of e-collars. Indeed, the use of behaviour shaping and reward based training has been dubbed “so old, it’s new again” by renowned dog trainer, veterinarian and animal behaviourist, Ian Dunbar (1996).

A survey of dog owners by Hiby et al. (2004) found that punishment by owners was associated with an increased incidence of problematic behaviours. Similarly, Haverbeke, Laporte, Depiereux et al. (2008) found that military dogs that were punished using aversive training techniques had lower performance scores. As such, problematic behaviours that are caused by, or result in, a state of anxiety may be associated with compromised welfare.

Handler education

Currently, a significant and abiding weakness of the Australian Working Dog Industry, with significant implications for working dog welfare, is that its knowledge base resides predominantly at the level of the individual dog trainer. It has previously been stated that “much of the training of greyhounds is based on knowledge handed down over time, and often this methodology is out of date, flawed or unacceptable in today’s society” (Beer, Willson & Stephens, 2008). Given the maturity of information technology and information management systems, it is incumbent upon the industry itself to consolidate disparate learning resources into a shared knowledge base and provide opportunities for its dissemination. It is time that the Australian Working Dog Industry sought external validation of existing professional expertise. Such a process offers the opportunity for the existing skill base to be formally recognised.

The predominant learning framework for Australia’s working dog trainers is through an informal spontaneous development of skills, rather than a structured learning process. Such informal training, described as 'Dogmanship' (McGrevey, Starling, Branson et al., 2012), can be highly
successful and may even parallel a number of formally recognised theoretical frameworks. These deal with the principles of animal learning such as applied animal behaviour science, genetics, animal welfare science, psychological learning theory and education service providers such as Coach Educators. In other circumstances, however, the outcomes of informal training may run counter to what has been evaluated on the basis of the evidence available from a number of sources as best practice. This mismatch has the potential to compromise the welfare and, by extension, the productivity of Australian working dogs. Under a spontaneous development framework, an individual’s knowledge base develops through conversation, personal and shared experience.

Essentially, therefore, a large proportion of Australia’s working dog trainers, especially in a resource-deprived rural environment, are operating in a professional development vacuum, relying largely on techniques that they themselves have found to be successful. There are a number of similarities in this regard between the Australian Working Dog Industry and the training development of other skilled worker groups e.g. nurses and tradesmen. Training programs for these other skilled professions originally involved only on-the-job training. This is no longer the case. Most professions (e.g. tradespersons, nurses) now include components of both on-the-job training and formal education, with evidence of ongoing education being required to maintain registration with the professional body organisation. Structured learning programs offer a range of opportunities to skilled professions, such as formal recognition of expertise and quality assurance for the wider community.

Endpoints

The time-point at which working dogs are retired, or endpoint, often attracts the attention of the media and can be considered an area of high importance in regard risk management of public perception (Moore et al. 2001). A robust, uniform system for identifying individual dogs (such as mandatory microchipping and nationally consistent registration requirements) could help to track working dogs through the industry of origin and beyond.

Housing and health care

Many working dogs in Australia are privately owned and are consequently housed on private properties and out of the public eye. At this stage, we can only speculate as to the wide range of housing conditions such dogs may experience. Environmental and social enrichment, such as access to toys and group housing, have been shown to reduce the stress responses of dogs housed in kennel facilities (Hubrecht, 1993; Coppinger & Zuccotti, 1999; Wells & Hepper, 2000; Wells, 2004; Lefebvre, Giffroy & Diederich, 2009). However, research in this area is often limited to distinct populations with small subject groups and studies of short duration (Taylor and Mills, 2007).

There is a clear need for further research to better understand the acute and chronic effects of handling, transport, housing and environment as sources of distress, and the relation of these to the overall welfare and performance of working dogs. It would also be useful to investigate interactions between stress and performance in working dogs and it is noted that research is currently underway in Australia to investigate whether manipulation of housing environment (including opportunities for social and environmental enrichment) might in turn improve the welfare, performance and efficiency of working dog programs.

The future

The economic value of the working dog has ensured that it is now recognised internationally as being worthy of scientific study. The International Working Dog Breeding Association (IWDBA) was established in 1999. Its mandate is to support professional education and interaction regarding applied animal behaviour science, veterinary care and husbandry, and program management issues related to the selective breeding, rearing, and assessment of working dogs.

The Scientific Working Group on Dog and Orthogonal Detector Guidelines (SWGDOG) was developed in North America in 2004 to address the broadly expressed need to improve the performance and reliability of detector dog teams. SWGDOG has 55 members who include local, state, federal and international working dog agencies and its goal is to assist with the establishment of consensus-
based ‘best practice’. SWGDOG has developed a number of Approved Guidelines. For example, the SWGDOG Terminology Guideline document provides a list of agreed definitions for terms commonly used in the working dog industry. SWGDOG also acts as a focal point for researchers interested in this field, with its website currently assisting to unite researchers and practitioners for participation in a research project conducting independent assessments of puppy-raising foster programs for working dogs.

It is highly encouraging on the domestic front to see collaborative industry, government and university research initiatives such the current project underway at the University of Sydney looking at ‘Valuable Health and Behavioural Phenotypes in Australian Farm Dogs’. Similarly, Greyhound Racing Victoria has funded postgraduate research in collaboration with the University of Melbourne investigating ‘Risk Factors Associated with Injury in Greyhound Racing’.

A potential conflict of interest for all animal industry stakeholders is placing financial considerations ahead of the welfare of animals. Indeed, it has previously been concluded that the welfare of the individual working dog may compete with the needs of the program to produce and maintain a sufficient number of dogs capable of performing the tasks required (Burghardt, 2003). Many animal industries have developed quality assurance schemes and registration processes in order to ensure community expectations are met in light of this potential conflict of interest.

The prevalence and importance of ‘quality assurance’ in our community at large is set to increase. General information about the development of standards is provided by the International Organisation for Standardisation. Such programs already exist in the field of laboratory animal research (e.g. Association for Assessment and Accreditation of Laboratory Animal Care International [AAALAC]; Good Laboratory Practice [GLP]) and livestock production (e.g. ProHand: a livestock handler training program; Australian Pork Industry Quality Assurance Program [APIQ]: an on-farm quality assurance system based on following Good Agricultural Practices [GAP]). In Australia, egg, pork, chicken and turkey producers whose farms meet the RSPCA’s standards can apply to join the RSPCA Approved Farming Scheme. A range of other schemes have been adopted, for example, Animal Welfare Approved, a product labelling system that certifies to the consumer that the producer’s practices have been audited against a third-party’s animal welfare standards.

Recent trends both overseas and in Australia suggest that Governments, industry bodies, the general public and end users will soon call for the incorporation of welfare audit documentation into a quality assurance (QA) program for the training, handling and management of animals used in working contexts. Thus, to be effective in the long term, the Australian Working Dog Industry will require the introduction of an appropriate training program designed to achieve consistency in the attitudes, behaviour and practices of working dog trainers and handlers. A key component of establishing the validity of such a QA program will be to develop an agreed set of terminology definitions based on objective descriptions that will remain reliable between individuals and sector applications.

It is also worth considering professional standards in terms of industry productivity and sustainability. Animal welfare is a factor which affects public acceptability of animal usage systems and hence sustainability (Broom, 2009). In the Australian Working Dog Survey Report, Australia’s most successful working dog training programs reported that up to 50% of dogs selected for training graduated and became working dogs. Amongst others, the Seeing Eye Dogs Australia, Royal Guide Dogs Tasmania and Guide Dogs Queensland have indicated that the cost to breed, train and place a guide dog is around $30,000. Until knowledge sharing and agreed terminology is adopted as standard practice, it is unlikely that the success rate of working dog programs will improve significantly. In terms of resources and time allocated, the economic burden of this scenario is self-evident.

Purely from a productivity perspective, research has shown that interactions between human handlers and their animals can limit the welfare and performance of the animals (Hemsworth, Coleman & Barnett, 1994; Coleman, Hemsworth, Hay et al., 2000; Coleman, McGregor, Hemsworth et al., 2003). This group has found that one of the strongest predictors of handler behaviour is the attitude of the individual handlers towards interacting with their animals. The ProHand program has demonstrated the ability of a training program to modify human attitudes that have a direct effect on animal fear, productivity and welfare (Coleman, Hemsworth, Hay et al., 2000; Coleman,
McGregor, Hemsworth et al., 2003; Hemsworth, Coleman & Barnett, 1994; Hemsworth, Coleman, Barnett, et al., 2002. This program relies on changing established habits and altering well-established attitudes and beliefs. Improved animal handler job satisfaction, motivation and work performance have been other beneficial outcomes of ProHand. Not only does the animal function well from work performance and welfare perspectives, but life becomes easier for the handler as animals are easier to manage and of course there is an economic benefit to increased productivity as well (adapted from Hemsworth, 2008).

The success of cognitive-behavioural interventions in improving the key attitudes and behaviour of stock people in the pig and dairy industry and at abattoirs clearly demonstrates the potential for similar training in other animal contexts, offering significant opportunities for industries to improve the welfare of their animals. To underestimate the role and impact of the dog trainer and handler on the dog has the potential to seriously jeopardise the welfare, performance and productivity of working dogs.

Further research endeavours, such as those currently underway at the University of Sydney exploring the interaction of dog training methods and cognitive bias (McGreevy, Starling & Branson, 2012), will offer more insight into the important role affective states can offer in relation to working dog welfare outcomes. The promotion of positive welfare will become more evident as integration into welfare codes, or equivalent standards and guidelines becomes more common in the near future. As outlined in Mellor (2012), these subjective experiences may initially appear less robust from a regulatory perspective and potentially susceptible to legal challenge. However, it is anticipated that such practice will be more common as knowledge of the links between functional and affective states is more widely understood. This should aid in the improvement of animal welfare standards from the current status of regulating for neutral welfare, to promotion of good welfare.

It is recognised that not all members of the working dog industry will be motivated to change their current practices solely to improve animal welfare standards. However, it would be cognisant for the industry at large to recognise that market expectations are moving toward higher standards of animal care and greater transparency of processes. Industry-wide adoption of an ethos of continuous quality improvement, voluntary welfare accreditation and certified training qualifications will result in a degree of difference occurring between service providers - both within and between industry sectors. We believe that market forces will influence the adoption of best practice by this industry. Through the ongoing support of the Australian Animal Welfare Strategy, preparations are currently underway for Australia’s first whole-industry conference, providing a unique opportunity for inter-sector collaboration and networking opportunities for all Australian working dog industry stakeholders.

Industries that rely on animals in work and sport contexts should acknowledge the need to increase the understanding of factors affecting animal welfare. Participation, funding and communication regarding industry-based questions that scientists can help to answer (as seen in livestock animal sectors) would be a beneficial step forwards. We have recommended that a multi-disciplinary research program is pursued to enable delivery of the best life cycle animal welfare and, by extension, sustainability and high productivity outcomes to the industry as a whole.

References


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Emotional experiences of dogs and cats restricted to or from backyards

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Abstract

On the basis of their behaviour, it is assumed that the confinement of dogs to backyards, and the prevention of roaming by cats from the backyard or domestic residence, have emotional consequences for them. Their behaviour is considered within the context of Panksepp’s 7 emotional systems. Interpretations are made as a result of dealing with behaviour problems of dogs and cats, and as a carer of confined cats. The valency (positive or negative) of these emotional states on the well-being of the animals is considered. Ways of reducing the negative and enhancing the positive are suggested. It is concluded that an understanding of the relevance of these emotional experiences will improve the well-being of dogs and cats in these environments, as well as other parties affected by their behaviour.

Introduction

For the purposes of this paper, I will assume, as did Charles Darwin (1872) did 141 years ago, that dogs and cats experience the same basic emotions as people. The scientific basis for this assumption has been evaluated and found to be compelling by Panksepp (2005). In recent years, brain imaging has allowed activity in specific areas of the brain to be associated with emotional states, as recently described by Denton, McKinley, Farrell et al. (2009).

For humans, 3 levels of consciousness (experiential states) are recognised, namely:

1. Primary process (or prototype) consciousness that is composed of raw sensory/perceptual feelings as well as internal emotional/motivational experiences;
2. Secondary forms of consciousness that are called awareness (thoughts about experiences);
3. Tertiary consciousness that considered to be awareness of awareness.

It would appear therefore to be quite reasonable and defensible to assume that, as dogs and cats have the same basic brain structure as people and other mammals, they share the same basic emotional states (or affects) that arise from activity in those common brain circuits.

Meanings

For the purposes of this paper I will use:

- emotions to be synonymous with feelings;
- emotionally driven responses to mean physiological and behavioural changes resulting from activity in emotional circuits in the brain; and
- a backyard to be a barricaded area of a residential property that is outside the dwelling and opposite the street entrance.
Panksepp’s 7 emotional systems

In his book *Affective Neuroscience: the foundations of human and animal emotions*, Panksepp (1998) proposed that at least 7 primary process (or prototype) emotional systems (circuits) exist. He named the circuits, purposefully in capitals to avoid attributing excessive meaning to them, as: SEEKING; RAGE; FEAR; LUST; CARE; PANIC; and PLAY. These produce emotionally driven responses that will be considered in the context of the species and environments under discussion.

**SEEKING**

Its function is to search, investigate and make sense of the environment in order to obtain food, water, appropriate temperature, sex or social contact. There is a feeling of anticipation or expectation. Examples are roaming and predatory attack.

Clearly these activities, and hence the associated feelings, are thwarted by effective confinement to the small area of a typical backyard, dwelling or other enclosure. However there may be opportunities for some predation on prey species such as birds, rats and skinks.

It appears that increasing numbers of cats are confined to the living quarters of their carers, purpose-built enclosures, or escape-proof backyards, in order to prevent them roaming.

Whilst many people intuitively feel that dogs get bored in small backyards, and that cats should be allowed to roam as “free spirits” there does not appear to have been a systematic study of the existence or consequences of the frustration of SEEKING. The possibility exists that dogs experience a state of boredom when confined for long periods in barren backyards with little novelty, variation in stimulation, or opportunity for interactions that provide reasonably achievable challenges. Such circumstances could hypothetically lead to frustration of a genetically inherited requirement for unpredictable and challenging environments. But how common is frustration in the backyard dog, and is boredom a major contributing factor? We just don’t know.

Anecdotally, some clients report their dogs as showing agitation and increased reactivity that is consistent with frustration, when they don’t take their dogs out for their daily walks and free-running (off-leash) exercise. Common observation of dogs pulling their owners along on a leashed walk, and dogs “shooting the breeze” with their noses outside a moving vehicle, strongly support the emotional satisfaction in activation of SEEKING. This argument can be logically extended to the use of a slow-release food device (e.g. the hollow rubber cone device called the “Kong”) as an enrichment aid. Providing dogs with a good, i.e. 180 degrees, view of a busy street scene can keep them calmly occupied for extended periods. This phenomenon has apparently been successfully utilised as environmental enrichment for dogs, but is most conveniently done from the front yard that has a street boundary (Holmes 2001). Dogs will even climb on high vantage points (think surf lifesavers chairs and then an equivalent) to see activity on the other side of barriers. This monitoring of their external environment may well be another expression of SEEKING.

Initial confinement to the house of a cat previously allowed to roam is commonly reported to result in orientation towards, pacing and unusually repetitive vocalisation in the vicinity of the previous exit point. With time, extinction of this behaviour can occur with absolutely consistent confinement. However, occasional randomly occurring escapes are the most effective reinforcement of attempts to do so. One of the environmental enrichment techniques is for owners to provide erratically moving objects or spots of bright illumination (e.g. laser pointer) to elicit chasing. Cats also vote with their feet, and will utilise vantage points in which to have a view of the outside world. In other words, they are great “sticky beaks”.

In summary, activation of SEEKING is a positive emotion, but is limited during confinement. Leashed walking and, in particular, free-running exercise provides acceptable expression for dogs. A few cats are also successfully walked on a leash. Backyard enclosures for cats appear to provide an acceptable expression of the SEEKING system. Allowing readily accessible and comfortable positions in which to view changes outside the property would appear to emotionally positive.
RAGE

The purpose of this system is to vigorously deal with compromise (irritation, restraint or frustration). The associated feelings are of anger, aggression and frustration, which may be considered mild rage.

A common example is the barrier destruction shown by dogs during thunderstorms in their attempts to gain access to the house interior. That is not to say that they are necessarily calm once they have gained access to the house. Sometimes dogs confined to the house will cause damage in their attempt to get out. I know of one dog that broke a window to get into the house, and another to jump out of the second storey down into the backyard. It survived. The desire to get into the house or to escape from it would appear to be activated by the FEAR system that will be described later.

Dogs in back and frontyards commonly bark with or without rushing at or lungeing at dogs, people or other animals seen or heard in the vicinity of, approaching or entering the area. This can be considered as defence of area, and hence categorised according to physical circumstances as territorial aggression. The present model used by veterinary behaviourists to explain this aggression is that it is a result of anxiety. The aggression is an attempt to control the perceived possibility of a threat to the highly valued resources contained within the area. As will be mentioned under FEAR, anxiety may be considered a mild form of fear. This anxiety-associated barking in backyards could therefore be an example of simultaneous or sequential activation of circuits of the 2 systems, RAGE and FEAR.

An example with confined cats is the occurrence of a resident cat, upon seeing through a house window an alien in the front or backyard, viciously attacking its companion cat or carer. This behaviour is contextually categorised as displaced or redirected aggression. It can have particularly serious and long-term consequences for the health of and relationships between the resident cats and their carers. Again it would appear that both RAGE and FEAR are implicated. To date, I am unaware of such aggression occurring with cats within or having access to outside enclosures.

In summary, the RAGE circuit appears to be commonly activated in many backyard dogs. I suggest that by itself it should be regarded as reducing the well-being of dogs. However, the possibility exists that it has environmentally enriching value through activation of SEEKING. For cats, activation of RAGE would a priori be considered to impair their welfare.

FEAR

The function of the FEAR system is to perceive and anticipate pain or danger. Alarm, insecurity or anxiety are the associated feelings. Anxiety may be just mild fear. Examples are fight, flight or freezing.

As mentioned under RAGE, some thunder phobic dogs attempt to get into the house. Other responses include:

- escaping from the property and taking flight up to several kilometres;
- getting under the house and seeking a den;
- lying immobile and shivering in the backyard.

All these responses can be considered to be a consequence of activation of the FEAR system.

There is an interesting relationship between thunder and separation-associated behaviour problems (SABPs), namely that 40% of thunder phobic dogs also showed SABPs but only 8% of dogs with a SABP were also thunder phobic (Overall, Dunham & Frank, 2001). One suggestion is that if a dog is thunder phobic then it has a reasonable (40%) chance of developing an SABP. Consideration of SABPs appears later under PANIC.

The occurrence of what is currently considered to be anxiety was also previously mentioned in the context of RAGE. Both species are considered to be territorial. Territory can simply be defined as “any defended area”. The perception by the resident animal of possible entry by an alien cat into
the backyard or other defended area can be considered to activate the FEAR system. Urine spraying by cats is commonly associated with anxiety. The sight or smell of an alien cat outside but in proximity to the indoor cat is a frequently identified trigger for spraying.

Confinement of more than one cat produces the potential for alarm, insecurity or anxiety in a recent arrival or anxiety-prone cat that is attacked by another. Providing areas in which to feel secure, or much greater spacing (particularly vertical) as can be provided with an outside enclosure, has reduced the outward expression of tension between the cohabitants.

Any activation of this system, certainly in a chronic manner, would be expected to have a negative impact on the welfare of both species.

LUST

Reproduction is the function of this system that is associated with feelings of sexual arousal and orgasm. It is the circuitry behind mating and associated behaviour. The seeking of a sexual partner, precopulatory behaviour and copulation are clear examples. The occurrence of intra-gender aggression (fights between sexually active female dogs, and fights between sexually active males of both species) appear to be likely candidates for conjoint activation of RAGE and LUST systems. The motivation to roam in order to possibly find a sexual partner would appear to be the result of simultaneous activation of both SEEKING and LUST.

In the context of Australian backyards, LUST would only be a consideration in either species with entire (non-desexed) males, and with females about the time of oestrus (“heat”). The possible undesirable consequences for the animal’s state of well-being are frustration of the expression of LUST and SEEKING by confinement resulting in RAGE, and the activation of RAGE and LUST when there is conflict between animals over access to a sexual partner.

If we accept (purely for the purposes of this paper you understand) that sexual arousal and orgasm are pleasurable states, and moreover improve an animal’s well-being, then activation of LUST alone would be beneficial. At the risk of stating the obvious, sexual activity however has consequences.

In summary therefore, LUST is irrelevant to the desexed, and the sum of its consequences to the sexually active in this context is unknown.

CARE

Its purpose is nurturance (usually maternal) and protection of others (usually of same group and hence genetically related). The feelings are those of caring. Maternal behaviour is an obvious example, but altruism may also be an emotionally driven response of this system.

The giving of maternal care is clearly limited and not an issue specifically relevant to this context. However, grooming between cohabitants would appear to be pleasurable for at least the groomer, and neutral at worst for the groomed. It would appear to be an expression of amicability between cohabitants, and as such a sign of at least temporary positive well-being. The same can reasonably be interpreted for the grooming by the human carer of a confined dog or cat that freely cooperates with and facilitates grooming.

Regular cooperative and recipient-facilitated grooming may well be pleasurable to the recipient. As such it can be an element of a daily program of environmental enrichment. I am unsure which, if any, of Panksepp’s 7 emotional systems are activated in a groomed animal. The provision of an amicable cohabitant for a confined dog or cat is likely to activate the CARE system in the groomer, and enhance the well-being of the groomed.

Activation of the CARE system should therefore be encouraged in the contexts under discussion to produce at least temporary states of increased well-being.
PANIC

The use of this single word as the identifier of this system has caused difficulty for some. Mellor (2012), for instance, preferred the word BONDING instead of PANIC.

The function of this system is the maintenance of the social support system. The feelings are of loneliness, separation distress and grief. Examples of associated behaviours are vocalisation, attempts to rejoin, and anorexia.

From my perspective, this is the most significant welfare issue for dogs confined to backyards. Such confinement may well be the greatest cause of suffering as measured by severity and frequency of occurrence. It is largely unrecognised by the public. Surveys have indicated that 50% of dogs will experience it in their lifetime (Bradshaw et al. 2002), and that 14% of dogs going into veterinary practices at any one time show at least one sign (Landsberg, Hunthausen & Ackerman, 2003).

Separation-associated behaviour problems (SABPs) of dogs, such as vocalisation, destructiveness, escaping, pacing, and unusual elimination, have typically been attributed to and often described as “separation anxiety” or “separation distress”. Implicit in that usage is an assumption that such behaviour is driven by the emotional state of anxiety as a result of lack of access to at least one person or other animal. It can be argued that the lack of success of vocalisation, attempts to follow an absent carer, or otherwise gain access to a carer or interior of the house, may lead to frustration that intensifies the emotional arousal. This could be contributing to states variously described as distress, panic or hysteria shown by some dogs in their frenzied vocalisation or attempts to breach barriers. SABPs are consistent with activation of FEAR and PANIC circuits.

But why, as a member of a very highly social species, does not every dog show a SABP when left alone? The reasons, I suspect, include the variable of temperament. A simple categorisation can be made using the dimensions of extraversion/introversion, and stable/unstable first used by Pavlov (Lindsay 2000). Are the reported cases of SABPs just those of dogs that protest when they do not have perceived access to a particular animal, member of a particular species, or a specific environment? What of the others? Are some of them introverts, who are just not expressive, and have others developed learned helplessness or depression? In other words, are there dogs that are suffering in silence? We just don’t know.

There are a number of interventions available for attempted treatment of SABPs. As a single intervention for SABPs, allowing an outside dog access to some, or all, of the house interior during the absence of people, has been notably successful in some but not all cases. It would appear that access to the house interior, and in particular to the carer’s bed, reduces arousal of at least some dogs in the absence of the carer. Given the freedom to move at will between the interior of the house and the backyard, common observation is that almost all dogs “vote with their feet”. Whilst their carers are at work during the day, the dogs spend the greater part, if not all the time, of the day inside the house. Given the opportunity, that time will usually be spent on the carer’s bed.

Contrary to popular and intuitive belief, providing an unfamiliar canine companion rarely solves the problem. Even the presence of a familiar dog can fail to prevent an SABP. There are instances of one of a pair of littermates that have never been apart showing separation distress whilst the other is not apparently doing so. The affected dog is an example of the many dogs that develop stronger attachments to humans than to members of their species. Quite simply, they just want to be with us. Another anomaly about their behaviour is that such dogs have a tendency to be promiscuous, in that they are calmer in the presence of any human, not necessarily their carer. They are, to put it bluntly in the vernacular, “tarts”. For some affected dogs, the view of the street provides sufficient interaction with people to prevent them dogs becoming distressed. Bringing them from the backyard and allowing them a view of human activity from the frontyard has been a successful intervention in a few cases. This is consistent with the occurrence of some dogs escaping from backyards whilst left without human company, only to go around and sit at the front of the house.

All this has lead me to strongly support the generalisation that the backyard is no place to keep a dog.
Cats, in contrast, are rarely presented for SABPs. As a solitary species (Turner & Bateson 2000) this is unsurprising. However, SABPs do occur, and should be expected to occur with greater frequency as confinement of cats is more widely adopted.

Observations of numerous dogs kept in backyards can be summarised as such confinement resulting in a significant risk of activation of the PANIC system, and hence risk of serious welfare impairment. The effect on cats in general appears to be markedly less.

PLAY

Although the definition and function of play behaviour have been the cause of considerable debate, according to Panksepp the purpose of the PLAY system is to learn life skills by exploration, discovery and experience. It is associated with feelings of happiness and joy. Rough-and-tumble, as well as chasing, are considered play behaviour in the appropriate context of an absence of serious intention.

Given the reinforcing nature of an opportunity to play, and our intuitive or anthropomorphic interpretation of its enjoyment by dogs and cats, there is considerable scope to increase the well-being of confined cats and dogs.

The assumption that the presence of another dog will increase play was questioned by studies of pairs of juvenile Labradors kept in backyards. Rather than play, these pairs as well as the single dogs studied, spent the almost all their time monitoring the human activity inside the house (Kobelt, Hemsworth, Barnett et al., 2007). Activation occurred when people went out into the backyard, suggesting the dogs were dependent on human presence in order to play in the backyard. Activation of play is also commonly seen when dogs are released into free-running exercise areas associated with the presence of other dogs with which to play.

In summary, it appears that considerable potential exists for activation of the PLAY system to improve the welfare of confined dogs and cats. However, the duration and quality of play would appear to require human involvement, either in the play or a change in environment that stimulates play activity.

Conclusion

It is reasonable to accept that dogs and cats have the same basic emotions as people. Observations of their emotionally driven responses give us reasonable cause to suspect that many dogs and at least some cats are experiencing negative emotional states when confined to and from backyards respectively. These consequences can be detrimental to their welfare. However, human management and activities can have beneficial emotional effects.

For dogs, consideration of Panksepp’s 7 systems suggests that SEEKING, CARE and PLAY can readily be utilised by carers to increase the welfare of dogs confined to backyards. RAGE, FEAR and PANIC require carer awareness and action in order to reduce the chances of activation. For cats similar considerations apply, although with less emphasis on SABPs as a result of PANIC.

It would be valuable to know whether the positive emotional states can compensate for the negative in order to produce “a life worth living” as proposed by Yeates (2011; these proceedings), and in order extend animal welfare assessment as suggested by Green & Mellor (2011)

If we wish dogs and cats of differing temperaments to, on balance, have positive welfare states in confinement we need to:

- identify the expressions of the primary emotional states;
- work out the variables affecting the expressions of those states;
- identify the frequency of occurrence of those states;
- investigate the interactions of the emotional states;
- attempt to create an index of the sum of the emotional states relevant to the daily well-being.
Meanwhile, it can be argued that the backyard is no place to keep a dog, but it appears to be a good idea to allow dogs and cats to have voluntary access to a secure outside enclosure from within the house.

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Seeking positive welfare states and strategies for animals in research

John Schofield, johnawo@xtra.co.nz

Abstract

Animals used in research testing and teaching can be subjected to a range of manipulations. These can often result in negative experiences for the subject, particularly when the user treats the animal as a simple laboratory chemical bench reagent, without regard for the five domains of potentially compromised welfare. This paper will propose some strategies which might be applied to ameliorate the ‘fear, rage-assertiveness and panic’ systems, and also strategies to promote the ‘seeking, care, play and lust’ systems.

Action-oriented systems

Dr Jaak Panksepp has published his theory that animals have, genetically programmed within them, a series of action-oriented systems, detailed in Table 1 below. To reinforce the genetic aspect of his theory, I offered the view at the seminar, that some of us are convinced that teenage daughters are genetically programmed to hate their fathers.

Table 1: Action-oriented systems

<table>
<thead>
<tr>
<th>System</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEEKING</td>
<td>Energised investigation/interaction with environment</td>
</tr>
<tr>
<td>FEAR</td>
<td>Avoidance, fright, freezing, flight</td>
</tr>
<tr>
<td>RAGE-ASSERTIVENESS</td>
<td>Offensive or defensive attack behaviours</td>
</tr>
<tr>
<td>BONDING</td>
<td>Affectionate companionship, avoidance of social isolation, maternal behaviours</td>
</tr>
<tr>
<td>CARE, PLAY, LUST</td>
<td>Maternal care, social play, sexual activity</td>
</tr>
</tbody>
</table>

The seeking system is believed to be the most important. This is the state in which an animal sniffs and roots around, telling itself, “I’m alive, I’m alert, I’m looking for something, and I have the ability to find it”.

A ‘life worth living’ and ‘quality of life’

The concepts of a ‘life worth living’ (LWL) and the ‘quality of life’ (QOL) could be said to represent new thinking. And this new idea combines well with Panksepp’s theory of systems. Furthermore, this new idea challenges the current thinking, in respect of using animals in research, testing and teaching (RTT), which is best described in my view by the utilitarian theory: one which states an action is morally right if it benefits the largest number of beings with the greatest good. The
Animal Ethics Committee (AEC) system in Australia and New Zealand is generally based on this utilitarian theory. In practical application, the AEC is expected to determine whether the benefits of using animals in RTT outweigh the harm to the animals. And it is worth noting that the animals used in research studies, seldom if ever enjoy any direct benefit.

From an experimental animal’s point of view, there is more value in considering the LWL and QOL concepts. Animals used in RTT should have a life worth living and their quality of life should be promoted. So how to define a LWL? Clearly such a life would be full of pleasant experiences, and negative experiences would be avoided. For animals, play, foraging, seeking, and the feeling of being well fed- satiety would certainly be pleasant. These would contrast with negative experiences of hunger, thirst, social isolation and pain.

To measure a quality of life, all the animal’s experiences, both mental and physical, would have to be considered. And clearly the QOL depends on the valence, severity and duration of all experiences. Valence is a term used to measure the value of an experience. For example, foraging and play have positive valence, while post-surgical pain would have negative valence. It is argued that for a life worth living (LWL), the positives must exceed the negatives over the lifetime of the animal. Certainly a reasonable idea, but for me the key question to ask is: ‘by how much should the positives exceed the negatives?’

Experimental manipulations and ‘life worth living’ or ‘quality of life’

It has often been said about human conflicts that “war is 90% boredom and 10% sheer terror”. This concept could be applied to animals used in research; for example, we could ask, for the animals involved; is research 90% boredom and 10% terror? Alternatively is research 60% positive and 40% negative for these animals? Whatever the ratio might be, it is useful to ask ourselves the question; ‘is a 60:40 ratio of positive to negative acceptable to us as the care providers?’

To explore this idea further it is helpful to review the types of experimental manipulations which are performed on animals in RTT. These include: surgery, anaesthesia, behavioural testing, prolonged restraint, food/water deprivation, electrical stimulation, radiation exposure and drug testing.

When an AEC approves a study which involves any of these manipulations, the committee has obviously determined that the potential benefits to be obtained outweigh the potential harm to the animals. Otherwise the application would not have been approved. However, how many AECs have considered the quality of life which the experimental animal will endure during the research study? And the related question: ‘will that experimental animal have a life worth living?’

In Table 2, I have set out below some typical manipulation categories and given some examples. The right hand column asks the question about the QOL and LWL.

As you can see, I have not found any easy answers to the key questions. Quality of life will depend on so many factors that a simple response is possible. But the real value of this table, in my view, is the concept itself. For example, an AEC should be asking itself, when faced with a surgical modification which involves intestinal bypass surgery, or prosthetic implantation;” what will be the quality of life for this animal during this study?”
Table 2: What is the quality of life when animals are manipulated?

<table>
<thead>
<tr>
<th>Manipulations on animals</th>
<th>Examples</th>
<th>QOL &amp; LWL factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surgical modifications</td>
<td>Prosthetic implants</td>
<td>?</td>
</tr>
<tr>
<td></td>
<td>Intestinal bypass</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Drug delivery devices</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Brain electrode implants</td>
<td></td>
</tr>
<tr>
<td>Memory testing</td>
<td>Morris Water Maze (MWM)</td>
<td>?</td>
</tr>
<tr>
<td></td>
<td>Skinner Box</td>
<td></td>
</tr>
<tr>
<td>Anxiety testing</td>
<td>Elevated Plus Maze (EPM)</td>
<td>?</td>
</tr>
<tr>
<td>Depression testing</td>
<td>Forced Swim Test (FST)</td>
<td>?</td>
</tr>
<tr>
<td>Drug testing</td>
<td>Safety/efficacy testing</td>
<td>?</td>
</tr>
<tr>
<td>Preference testing</td>
<td>For enrichment, diet, cages</td>
<td>?</td>
</tr>
<tr>
<td>Social isolation</td>
<td>Results from many of these other manipulations</td>
<td>Poor</td>
</tr>
</tbody>
</table>

One of the manipulations listed in Table 2 is social isolation and a few comments on this factor are relevant. In rodent production units, animals spend their whole short lives in groups, until the day they reach the research laboratory. Once in the laboratory they may be individually housed; for the first time in their lives. Rodents, like most animal species, are social animals which prefer the company of other animals. Isolation is well documented as a stressor. The reasons for individual caging are several. Most commonly it is to better manage a post-operative case, to give individual drug treatments and so on. When rodents have head implants on their skulls, which contain electrodes inserted into the brain for neurological studies, it is common in international practice to individually house them to prevent electrode damage by other cage mates. There are alternatives to this arrangement, whereby customised devices can be fitted over the electrode assembly, to prevent cage mate damage and allow groups of rats to live together. However, such alternatives are seldom considered and even more rarely put into practice.

If we combine some new ideas and ask how the Panksepp action-oriented systems might be affected by some standard manipulations, a matrix of some complexity is created, as detailed in Table 3 below.

A series of seven standard manipulations are listed in the left hand column of Table 3 and across the top are the five basic Panksepp systems. I have completed the table according to my experience of these manipulations based on more than 30 years of exposure to this type of research activity.

Clearly I have made some broad generalisations. For example, the Morris Water Maze is used to test special memory. In this test, a rodent is placed in a circular tank of warm water (from which it cannot escape) and it swims around until it finds a submerged platform hidden from view. The animal rests and recovers on the platform which is located a few centimetres below the surface. Using visual cues around the room, which are positioned by the researcher, the animal remembers (or fails to remember) the location of the platform. Subsequent maze trials measure the time to location of the platform. In Table 3, I have suggested that the fear and the seeking systems are activated by this test, and the other three systems are not activated (N) - in my view.

The elevated plus maze is used to test anxiety, while the forced swim test is used for depression.
The complex matrix could be scored a number of different ways and the outcome will very much depend on the valency; severity and duration.

Table 3: Activation of the Panksepp action-oriented systems by manipulations

<table>
<thead>
<tr>
<th>Manipulation</th>
<th>Fear</th>
<th>Rage aggression</th>
<th>Care play/lust</th>
<th>Bonding</th>
<th>Seeking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surgery</td>
<td>✓</td>
<td>?</td>
<td>N</td>
<td>N</td>
<td>?</td>
</tr>
<tr>
<td>Morris Maze</td>
<td>✓</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>✓</td>
</tr>
<tr>
<td>E Plus Maze</td>
<td>✓</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>?</td>
</tr>
<tr>
<td>F Swim Test</td>
<td>✓</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Skinner Box</td>
<td>?</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>✓</td>
</tr>
<tr>
<td>Drug testing</td>
<td>?</td>
<td>?</td>
<td>N</td>
<td>N</td>
<td>?</td>
</tr>
<tr>
<td>Social isolation</td>
<td>✓</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>✓</td>
</tr>
</tbody>
</table>

Strategies to promote positive welfare states

Although the reader may challenge the scores I have indicated in table 3, its value lies in the concept of thinking about how standard manipulations might affect the Panksepp action-oriented systems. In my interpretation, the activation of 'the fear system' is common to most manipulations and 'the seeking system' is not a major feature. Refinements of this matrix may allow us to develop strategies for creating positive welfare states as outlined below.

Light cycles

Rodents are nocturnal. Most laboratory animal facilities have animal rooms equipped with light timers to control the light/dark cycle; typically set at 14:10 or 12:12. A further refinement can be twilight, instead of sudden darkness. During the day when researchers are actively performing science, the rodents are generally asleep until disturbed. Once the room lights go off, the rodents wake up and one can hear the level of physical play activity in a rat room in the dark.

Put into human terms; can you imagine being suddenly yanked out of bed at 2am without warning and transported to a research laboratory? Where you are placed into an experimental device and then subjected to a series of manipulations. And this routine might occur nightly for weeks to months on end. Such is the fate of most laboratory rodents in most research facilities around the world.

However, there is a simple engineering solution. Rats and mice do not appear to see the 589nm wavelength of sodium light, while humans do. Therefore the installation of sodium lighting can provide a more normal environment for rodents; one which simulates their active phase in the dark, yet allows scientists to work under yellow light. Such reversed cycles are considered to produce more reliable research data (McLennan & Taylor-Jeffs, 2004).

Gentling

This term describes techniques to calm an animal and adapt it to human contact. Many readers will probably think of ‘horse whispering’ or ‘horse breaking’, but it can be applied to most species - but probably not to teenage daughters.

Put into human terms; can you imagine a 5 year old child being suddenly and forcibly restrained in a dentist’s chair, without any assistance or support from its mother? Then imagine the dental drill
being used? Sheer terror would be the likely outcome for the unfortunate child, who might be emotionally scarred for life.

Laboratory animals can benefit from gentling procedures. And many readers with laboratory animal experience will be familiar with this technique. It involves the repeated handling and restraint of the animal by the user; who typically is a graduate student working with an animal model to complete a PhD. The end result is generally an animal without raised levels of stress hormones; which is what occurs when gentling is not applied. More reliable research data is usually obtained from gentled animals. The major disadvantage however, is the time taken to adapt the cohort of animals on study. Sadly in my experience, few senior researchers are familiar with the gentling concept and hence their students do not learn the benefits of this strategy.

Social housing

As discussed above, most experimental animals prefer group housing. However, many scientists, in my experience, take no account of this preference. Their perceived research needs take priority over the welfare of the animal.

Put into human terms; most of us can imagine the stress of solitary confinement, even if few of us have actually experienced it.

There is certainly scope for creative solutions to provide group housing for animals, which might otherwise be individually housed, as illustrated by the head-implant example mentioned above. But such scope needs the vision of an AEC committed to seeking positive welfare states. There are a number of cage modifications available which divide a cage to separate two animals, but allow them visual and olfactory contact with each other through a perforated partition. All kinds of home-built designs are possible, with sufficient enthusiasm and commitment.

Feeding regimes

Most laboratory rodents are fed ‘ad libitum’ by a cage design which supplies a constant supply of rodent pellets above or within the cage. This is the most cost effective labour saving arrangement. The food hopper is topped up as needed, generally once or twice a week.

Put into human terms; the equivalent of living at the end of the McDonalds fast food counter, with a ‘big Mac and fries’ always available any time of the day or night.

Rodents in the wild are foragers. However, the laboratory ad lib system denies them basic foraging behaviour activity. Boredom and obesity can result.

Dietary restriction devices are reported in the literature (Kasanen, Inhilä, Vainio et al., 2009). The diet board consists of a flat board, with a series of holes, each one force-filled with rodent pellets. The rodent must gnaw through the board to obtain a meal of pellets. The boards can be constructed in many different configurations, for example in a ‘T’ or an ‘X’ shape, with the board being in a vertical plane. Such devices can serve as enrichment tools and subdivide the cage space.

Holidays, respite care

Some research manipulations on animals demand prolonged food or water restriction, repeated behavioural testing or other enforced activities. Intensive demands on experimental animals can continue for weeks or months without rest.

The astute AEC will always focus on such studies and the key question to resolve is; ‘what exactly will happen to an individual animal?’ For in the review of a complicated AEC application, with multiple treatment groups and different time points, the individual animal details often get overlooked by both the author of the application and the committee reviewing it.

In my experience, there is often the possibility of providing experimental animals with ‘a holiday from science’. A measure of respite from the daily grind of being a research subject. Put into
human terms, we all enjoy the benefits of the 5 day working week and look forward to the weekend. Except of course for graduate students, for whom no quarter is generally given.

Home comforts

The subject of environmental enrichment for laboratory rodents is known to polarise views amongst research scientists and animal welfarists. The literature documents quite convincingly the effects of various cage enrichment devices on many experimental endpoints. So convincing is the evidence that cage enrichment can be considered a non-experimental variable: a term that can strike terror in the heart of any scientist who fears for the reproducibility of their data. In simple terms, novelty and change within the cage environment can affect the brain of the animal. The brain is plastic and responds to such change in a measureable way. Such plasticity may significantly interfere with the experiment.

Therefore there are scientists who refuse to accept that enrichment for their experimental subjects is necessary. Put into human terms, they are working with subjects which live in a solitary cell, sleeping only on a straw-filled mattress. No sheets, no pillows or blanket. No home comforts.

The key problem in this debate is the use of the term ‘enrichment’, in my view. For the term is variously interpreted by the scientist to mean: a device that will alter brain plasticity and is therefore to be avoided at all costs, or alternatively interpreted by the animal welfarists to mean: an essential device that provides a more normal housing environment - a counter to the Spartan bare prison cell.

I prefer a term which I call “home comforts”. Preference studies in rodents confirm that rats and mice choose cages which are equipped with a solid floor with bedding material such as wood chips or corn cobs (as opposed to a wire mesh floor), an opaque nest box (as opposed to no box) and paper strip nesting material (as opposed to no nest material). These are the basic necessities of life for a rodent, in my view, and are the rodent equivalent of a bedroom with blankets, sheets and pillows. They provide basic ‘home comforts’. When such basic essentials are always provided for the rodent, there is no novelty factor at play and hence no scientist could possibly claim that home comforts will alter brain plasticity.

General anaesthesia

The final strategy is simple. When the experimental animal is unconscious, and never wakes up, it avoids a negative experience. There are a range of anaesthetic agents, some in combination, which can provide stable and long term anaesthesia for more than 14-16 hrs.

Most readers will be familiar with the medical report that “the patient was in an induced coma”. Just so for laboratory animals. The astute AEC should be considering this strategy and asking about its applicability for any study where potentially adverse effects may arise.

Conclusions

I hope that the reader will have appreciated my repeated references to the human condition. I have discovered that this approach enables us to better focus on the problem at hand. I make no apologies for this strategy. If it does nothing else, it forces us to step into the shoes of the experimental animal for a moment. And I believe it is entirely in keeping with Panksepp’s approach to exploring animal emotions and behaviour. Throughout my laboratory animal medicine career I have spoken about my mascot: ‘Roger the Rat’. Roger has featured in many of my presentations and he has enjoyed some international notoriety.

With dear Roger in mind, I finish with the following recipe, which captures most of the concepts in this paper. I trust that it may prove useful for others. Although I have recently retired from the University of Otago, I continue to have an active interest in the welfare of animals and would be most keen to assist others in any way possible.
Recipe for a “positive welfare state”

- Take Roger the rat and mix with cage mates
- Stir gently under sodium light until fully adapted
- Return to a home base equipped with comforts
- Repeat this as oft as required but...
- Allow for daily foraging in the kitchen and...
- Arrange for holidays as needed to...
- Ensure a quality of life that was worth living

Acknowledgments

To Professor David Mellor for use of his terminology in respect of definitions of the Panksepp systems and to Dr James Yeates, for his LWL and QOL discussion (Mellor, 2012; Yeates, 2011).

References


Achieving positive animal welfare outcomes in zoos and aquariums

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Abstract

With a growing awareness of animal welfare and changing societal expectations of appropriate welfare outcomes for all animals there is a need for an animal welfare approach that is relevant and applicable to the zoo and aquarium industry in Australia and New Zealand. Due to the diversity of species managed by zoos and aquariums they present potentially challenging environments in which to devise a comprehensive approach to animal welfare. Attaining consistent and positive welfare outcomes in zoos requires an approach to welfare that is contemporary, trans-specific and applicable across the industry. An understanding of the factors that have the potential to influence welfare in zoos and how they differ from welfare considerations in domestic species is also required. Finally animal based welfare outcomes are the key measure of the effectiveness of welfare inputs so a means to assess welfare outcomes in the zoological setting is required.

Contemporary perspectives on animal welfare

An approach to animal welfare that is relevant to modern zoos and aquariums must give consideration to the ethical positions associated with the keeping of wild animals in captivity. However it is important to differentiate between animal welfare and ethics. As democratic nations (within Australasia) we have accepted that our societies utilise animals for a range of purposes including in agriculture, as pets, and for sport and recreation. Zoos and aquariums exist within society with the purpose of providing conservation, education, research and recreation.

Animal welfare science is a relatively recent discipline. Animal welfare science has evolved significantly during the last three decades and, accordingly, considerable advances in animal welfare have been achieved. Consistent with an emerging and evolving discipline are the numerous attempts to characterise and define animal welfare. The Australian Animal Welfare Strategy (AAWS), developed to outline directions for future improvements in the welfare of animals in Australia, recognises the World Organisation for Animal Health (OIE) definition of animal welfare, as does the Zoo and Aquarium Association:

“Animal welfare means how an animal is coping with the conditions in which it lives. An animal is in a good state of welfare if (as indicated by scientific evidence) it is healthy, comfortable, well nourished, safe, able to express innate behaviour and is not suffering from unpleasant states such as pain, fear, and distress. Good animal welfare requires disease prevention and veterinary treatment, appropriate shelter, management, nutrition, humane handling, and humane slaughter/killing. Animal welfare refers to the state of the animal; the treatment that an animal received is covered by other terms such as animal care, animal husbandry, and humane treatment.” (Anonymous, 2008)
Three generally accepted animal welfare orientations have emerged in the last decade. These are the biological function, affective state and natural living orientations which provide different perspectives on animal welfare (Mellor & Bayvel, 2011). An integrated approach to these orientations has been recently proposed giving consideration to the following characteristics (Green & Mellor, 2011; Mellor & Bayvel, 2011):

- welfare is a state that exists within an animal
- animal welfare relates to experienced sensations (negative, positive or neutral)
- the combined sensory and neural inputs from within an animal’s body and from its environment constitute the animal’s current experience (i.e. its welfare status); welfare status can change as the inputs change
- these experiences are subjective states which cannot be directly measured but can be assessed via indirect indices
- welfare may vary along a continuum from poor to good

This characterisation, focusing on the experiences of an animal, emphasises the affective state, or the psychological wellbeing of an animal (Mellor & Bayvel, 2011). This is in contrast to historical approaches which were focused on eliminating and minimising negative experiences in order to avoid negative welfare outcomes. Such approaches strongly emphasised biological function, or the physical wellbeing of an animal, and at best resulted in neutral welfare states. A positive affective state is now recognised, in addition to biological function, as an integral component of an animal’s welfare. A positive affective state can be achieved when both the physical and mental needs of an animal are met. This approach is encompassed in the “five domains” model of animal welfare proposed and subsequently revised by Mellor and others has been chosen by the Zoo and Aquarium Association as a contemporary welfare framework for assessment of animal welfare in the zoological setting (Mellor & Bayvel, 2011; Mellor, Patterson-Kane & Stafford, 2009; Mellor & Stafford, 2001).

The five domains: nutrition, environment, health, behaviour and mental state represent areas of potential welfare compromise. The first four domains, encompassing potential nutritional, environmental, health and behavioural compromises, are largely physical or functional. Sensory inputs from these domains result in subjective experiences in the fifth (mental) domain, which also receives sensory inputs elicited by external stimulation (Green & Mellor, 2011).

Animal welfare in zoos and aquariums: strengths, challenges and opportunities

To be relevant and credible an industry specific approach to animal welfare must be consistent with current concepts in animal welfare and as such must be a “living” document that is revised and updated as the discipline of animal welfare science continues to evolve. The “five domains” paradigm of animal welfare assessment provides a contemporary framework for assessing welfare that can be applied across taxonomic groups and as such this paradigm is of particular value to zoological institutions, which hold a diverse array of species.

Animal welfare is potentially difficult to objectively assess but a range of indirect measures can be scientifically assessed to give an indication of the welfare status of a given animal (Mellor, 2004; Mellor & Bayvel, 2011). If the industry is to consistently attain positive animal welfare it is paramount that methodologies to quantify and assess welfare outcomes in captive animals are developed and routinely applied in the zoological setting. Animal welfare science is multidisciplinary in its scope drawing on expertise from multiple scientific disciplines. This multidisciplinary approach is already embraced by zoos and aquariums with scientists from disciplines as diverse as animal behaviour and nutrition engaged in management and research in zoological collections. The approach to animal welfare should be no different with external subject matter experts engaged, as required, to achieve the best possible animal welfare outcomes.

Zoos and aquariums have taken a strong lead in several areas of animal welfare research including behavioural analysis and non-invasive physiological assessment of stress. Despite this a number of authors have identified significant gaps in the science of animal welfare as it applies to zoos and aquariums (Hill & Broom, 2009; Melfi, 2009). For each of the five domains a brief overview of the strengths, potential challenges and opportunities are discussed below.
**Behaviour**

The zoo industry already has a well demonstrated focus on both behavioural research and behavioural enrichment in recent decades (Keay, Singh, Gaunt et al., 2006; Robinson, 1998; Shepherdson, Carlstead & Wielebnowski, 2004; Tarou & Bashaw, 2007). The methodologies employed in these endeavours can be readily applied to the assessment of animal welfare and in attaining positive welfare outcomes. Despite this, gaps in our knowledge do exist and abnormal and stereotypic behaviour have been identified in a range of captive wild animals (Mason, 2010; Melfi, 2009). Various natural behaviours exhibited by some species in the wild have been shown to be predictive for poor welfare outcomes in captivity under typical management regimes (Veasey, Waran & Young, 1996). Examples include the association between wide ranging lifestyles and large home range sizes and a high incidence of stereotypies and high neonatal mortality in carnivores (Clubb & Mason, 2003).

It is important to note that behaviours are stimulus driven and as a result a full range of natural behaviours may not be exhibited in captivity due to the presence of different stimuli in captivity compared with the wild. Behaviours are frequently species specific requiring careful interpretation. The exhibition of wild type behaviours does not necessarily occur as a result of or equate with good animal welfare. Choice and an enhanced level of environmental control are likely to be as important as enrichment practices that promote “wild type” behaviours in attaining better welfare outcomes for captive species.

**Nutrition**

The nutritional requirements of domestic animals are well described enabling nutritionally complete diets to be designed, manufactured and assessed with relative ease. For the vast majority of non-domestic species their nutritional requirements are poorly known. Meeting the nutritional requirements of non-domestic species is a complex task. While many non-domestic species will survive and even reproduce in captivity on diets that may not completely meet their nutritional needs some will suffer diet related health problems which have the potential to compromise their welfare. For example the nutritional requirements of browsing species are poorly understood and captive browsing species experience nutrition-related morbidity and mortality. Further challenges for zoos and aquariums include the requirement to meet not only a given species nutritional needs but also the physical form requirements and an animal’s psychological needs in relation to diet. There is a clear need for institutions to undertake regular and routine dietary nutritional analysis to ensure nutrition is appropriate for animals in their care.

**Environment**

Zoos and aquariums have a responsibility to balance individual and species specific environmental needs with public expectation (aesthetics) and logistical constraints (finances, site etc.) when designing and constructing exhibits for animals in their care. The needs of the animal should be the primary concern in exhibit design. Additionally a realistic welfare assessment of the suitability of housing a given species or individual in a given exhibit or zoo should be undertaken prior to the acquisition or movement of new animals.

**Physical health**

On the basis of the five domains model the health of nondomestic animals can be broadly divided into physical and psychological health. To ensure the physical health of collection animals, zoos and aquariums require not only appropriately trained keeping staff and high husbandry standards but access to veterinary care and systems which ensure timely intervention when veterinary care is required. A preventative medicine program should be in place and be reviewed annually. For some species longevity in captivity exceeds that experienced in the wild and geriatric medicine has become a growing focus of zoological medicine in recent decades. The Zoo and Aquarium Association takes the view that quality of life should take precedence over longevity.
Affective state (psychological health)

A positive affective state can be achieved when needs in the above four physical domains (representing the biological function and natural living orientations) are met. A positive state of animal welfare can exist, in turn, when both physical and mental needs are met. The growing importance attached to affective states does present some challenges as there are potential difficulties associated with assessing the affective state (psychological health) of both domestic and non-domestic animals (Fraser, 2009). Nonetheless there are a number of indirect indices which can be measured (including behavioural assessment) enabling credible and scientific assessment of the affective state of an animal (Mellor & Bayvel, 2011; Mellor, Patterson-Kane & Stafford, 2009).

Assessment of zoo animal welfare

In order to measure the effectiveness of their animal welfare endeavours quantitative assessment of welfare outcomes by zoos and aquariums is required. This requires commitment of appropriate resources. Welfare assessment needs to be of animal-based outcomes which can be measured in a number of ways. Several methodologies are already employed, to a greater or lesser degree, for welfare assessment in zoos and aquariums. These tools allow for assessment of the five domains of potential welfare compromise and fall into four broad categories:

- behavioural analysis (Berger, 2011; Clubb & Mason, 2003, 2007; Davey, 2007, Dawkins, 2004; Fraser, 2009)
- physiological analysis (corticosteroids and other biological measures of responses to stress) (Keay, Singh, Gaunt et al., 2006; Mellor, 2004; Shepherdson, Carlstead & Wielebnowski, 2004)
- health
- population level welfare analysis (Mason & Veasey, 2010; Müller, Bingaman Lackey, Streich, et al., 2010)

Considered alone, each of the above methodologies have potential limitations. When multiple measures are considered in combination, a more accurate assessment of an animal’s welfare can be obtained (Fraser, 2009). Additionally, for individual animals the concept of “quality of life” assessment has recently been proposed (Green & Mellor, 2011). At present, research into and the understanding of non-domestic animal welfare is heavily taxonomically biased towards mammals in particular carnivores and primates. To ensure positive welfare outcomes are consistently achieved across all taxonomic groups the scope of welfare science and research needs to be significantly broadened.

Conclusions

In order for zoos and aquariums in Australasia to ensure consistent and positive welfare outcomes for all animals in the care, i.e. to ensure the animals in the care are thriving and not just coping, a contemporary and industry wide approach needs to be taken. The “five domains” model proposed by Mellor and colleagues has been chosen by the Zoo and Aquarium Association as an approach to animal welfare that can be used by individual institutions in developing their own welfare related policies and procedures. If the key concepts in this model are applied with a sound understanding of the factors that can influence welfare in the zoological setting attaining consistently positive welfare outcomes across a diverse range of species should be feasible. It is imperative that zoos and aquariums demonstrate their good work in this field by utilizing a combination of assessment methodologies to quantify animal based welfare outcomes and ensure the adequacy of their welfare inputs.

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Identifying and integrating measures of farm animal welfare that meet the needs of animals and society

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There is increasing societal concern about the treatment of livestock and their quality of life within production environments. Viable livestock farming requires practices that are not only productive, profitable and sustainable but that also fit with society’s expectations on ethical dimensions such as animal welfare. Transparent demonstration of how these expectations have been met will be paramount in the future.

To establish whether an animal’s physical and emotional needs are being met requires a detailed assessment of its welfare. Welfare assessment is a major challenge as the utility of any assessment methodology depends on the specific situation under examination and the ethical views held by the stakeholder group seeking the assessment. This important area was the subject of a review conducted under the National Animal Welfare RD&E Strategy. The review specifically explored the scientific literature on welfare measures and assessment methods to identify the most credible scientific measures that could be developed into a uniform field index and to identify where further research is required.

The review team concluded:

- The pre-eminent concepts of good welfare employed today encompass biological functioning, affective states and naturalness.
- There is ongoing need to demonstrate the validity of welfare measures (i.e. show that measures accurately reflect an animal’s welfare state or the definition of a good animal welfare state held by the stakeholder group(s) seeking the assessment).
- Welfare assessment is an evaluative process in which values influence the choice of the conceptual framework and consequently the measures, their interpretation and their weighting when the measures are combined in any legislative standard, QA assessment system, welfare management tool or research methodology.
- A better understanding of the emotional range and valence in livestock species is required, as is a better understanding of the consequences of injury and illness for animal emotions. To that end, the ongoing development and validation of behavioural and cognitive methodologies is essential. This goal could be greatly enhanced through the application of neuroscience disciplines to studies of livestock behaviour and emotions.
- There is no one comprehensive, fully-validated system for on-farm welfare assessment that accommodates the diversity of species, production environments and animal management systems practiced in Australia. However, research has shown that assessments based on combinations of health and production data together with observation of behaviour and physical appearance of animals within a group offer reliable and feasible tools for the assessment of welfare. The strategic combination of input or resource-based and outcome or animal-based measures will also be important, particularly in the context of welfare risk assessment and risk management (e.g. assessments of pasture/forage availability and body condition score in cattle and sheep).
- Efforts should be directed at improving the practicability of welfare assessment systems within the various livestock enterprises. Specifically, further effort is needed to find ways to improve the reliability whilst reducing the complexity and invasiveness of methodologies. The development and application of remote automated data capture systems could be valuable in both extensive and intensive animal production systems.
How happy does a happy animal have to be (and how can we tell)?

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Abstract

Animal welfare research - and the majority of formal policy - has predominantly focused on the “negative” side of animal welfare, ensuring animals can “cope” and avoid unpleasant states such as pain, dysphoria and frustration. This can be related to underlying certain controversial welfare positions - that have been ideological, such as the traditional focus on health; philosophical, such as the conclusion that “death is not a welfare issue” and practical, such as some erroneous misuses of general adaptation theory and cortisol measurement.

Recent years have seen the beginning of a wider conceptualisation of animal welfare, to include “positive” states. These include a greater focus on subjective experiences and an appreciation of pleasant experiences. The measurement of these elements remains in their early stages. These can be considered in terms of wider concepts such as “quality-of-life” (adapted from its usages in human “welfare assessment”). In turn, quality-of-life can be temporarily extended across an animal’s entire life to assess whether that life is “worth living” or not - an assessment of potential usefulness in practical decisions on breeding and euthanasia.

Future extensions of animal welfare may consider states that are achieved “beyond coping”. Some will include subjective states such as enjoyment, euphoria and satisfaction. Other states may be based on reflexive concepts such as self-fulfilment and autonomy. Others may involve a return to more objective measures, either in terms of inputs such as opportunities or capacities, or in terms of objective outcomes such as achievement and fulfilment. Other considerations of a “good life” may return to more objective measures such as longevity and (a modified concept of) naturalness.

Such concepts allow us to move forward from a situation where we are merely neutralising negative states to one where we are promoting positive welfare states in animals.

Positive welfare

Animal welfare research - and the majority of formal policy - has predominantly focused on the “negative” side of animal welfare. Within the Five Freedoms (Webster, 1994), four represent freedoms from negative outcomes (and ‘freedom to express normal behaviour’ does not explicitly value positive experiences (Yeates & Main, 2008)). Related to this approach is a focus on the concept of coping, as in Fraser and Broom’s (1990) definition of animal welfare as ‘the animal’s attempts to cope with its environment’. In animal welfare terms, “coping” need not necessarily relate only to negative aspects of welfare, but the approach to conceptualising and assessing coping tend to focus on negative elements. In particular, the concept of not coping tends to be taken as a negative, and unpleasant, failure. Regarding feelings, animal welfare has focused on unpleasant states such as pain, distress, dysphoria and frustration.
Recent years have seen the beginning of a wider conceptualisation (or explicitly so) of animal welfare, to include “positive” states. For example, Broom asserts that ‘it must be possible to refer to poor welfare and good welfare’ (Broom, 1999) and Webster considers animal welfare to relate to, at the more positive end, happiness (Webster, 2005). Such “positive welfare” has had some recent academic attention (e.g. Spruijt, van de Bos & Pijlman, 2001; Boissy, Manteuffel, Jensen, et al. 2007; Yeates & Main, 2008; Mellor, 2012).

The hegemonic focus on negative elements has been appropriate and advantageous in many ways. The animal welfare movement, within scientific, political and practical areas, has had to deal with many significant and widespread welfare compromises (many of which continue). It has been - and continues to be - important to ensure that animals can cope and avoid unnecessary and severe unpleasant states. These major welfare issues have been a legitimate priority (indeed, focusing instead on more positive elements would have been inappropriate). The recognition of positive states is a timely extension.

This negativity has also been associated with a number of different other features of animal welfare as a discipline, some of which relate to certain controversial welfare positions. One example is the traditional focus on health within the movement. This focus is often criticised, especially when it excludes or deprivileges other elements of welfare such as animals’ behavioural motivations or “behavioural needs”. But this focus is entirely explicable when related to the prioritisation of the negative side of welfare. There is not a similarly important positive correlate to poor health (the closest being ideas of “vitality” (see Webster, 2005) or “better-than-well enhancements (see Yeates, 2012a)). Thus a focus on negative states is likely to focus on some of the most important causes of unpleasant feeling - disease and injury. Of course, pathological status does relate to positive welfare states (e.g. disability can limit the satisfaction of motivations), but disease tend to be associated more with negative feelings of “illness”, not least pain, pruritus and malaise.

Another prominent, and controversial, feature of the animal welfare movement, as underpinned by animal welfare science, has been the position that “death is not a welfare issue” (Webster, 2005). While the dying process is considered a welfare issue insofar as it involves suffering, as John Webster put it: ‘being dead is...no problem at all’ (Webster, 1994). This makes sense given a focus on negative feelings, in that death avoids all such feelings and the states that cause them.

A third feature of animal welfare science is the interpretation of measures of ‘arousal’, such as the many thereof based on general adaptation theory. These have been taken as measures of poor welfare, with which they are indeed often associated. However, if we consider arousal and valence as separate “axes” on which feelings can be mapped, then measures of arousal such as plasma cortisol and heart rate can be considered as relating to feelings that are high arousal and of either positive or negative (or neutral) valence. Ignoring the former of these inevitably leads to their measurement in experiments where the hypothesis relates to poor welfare.

Another feature is that animal welfare assessment has focused on measures that apply to all animals, and to some extent disregard or minimise inter-individual variations. Most animals may be expected to want to avoid similar things (disease, injury, predatory threats, loud noises, starvation, thermal extremes), but they may want to achieve different things as individuals (in the same way as humans have very different things that make them happy). Animal welfare science has tended to focus on compromises that apply to all animals (within a species for species-specific issues).

A final feature worth mentioning is that the focus on the welfare compromises of animal use tends to make the description of such animal uses as purely negative terms - for example it makes farming sound like a (purely) harmful or exploitative industry. Even if many areas of animal use are largely harmful to those animals, this does not correspond with how many animal carers (e.g. farmers or pet owners) think about their relationship with their animals - which they may legitimately feel is more about giving their animals enjoyable experiences and valuable lives, rather than simply minimising the harms.
Assessment of positive welfare

The development of the positive welfare field will involve contemporaneous processes of (a) developing what animals enjoy and (b) developing methodologies to determine what animals enjoy. These two processes are interactive, with evidence supporting tested hypotheses adding verisimilitude to the underlying general hypotheses that the content studied is enjoyed and that the method used is one that can assess positive welfare (e.g. that the variable studied is associated with pleasant feelings).

We can think of positive welfare in terms of motivation and in terms of affect. Affect (“liking” and “disliking”) is the feeling(s) associated with reward per se, whereas motivation (“wanting”) is the drive towards/away from an outcome. There may be differences between these, although the objects of each are likely to coincide, and the processes interact in many ways.

These allow a number of different ways to assess positive welfare (Yeates & Main, 2008). Measures of motivation include preference testing (of both unconditioned and conditioned stimuli), measures of anticipation, latency and what behaviours are actually performed (e.g. through ethograms). Means of assessing affect include particular physiological measures, tests of vocalisations and facial (and bodily) expressions. In addition, there may be some states that we consider a priori to involve pleasurable states, such as play, which are especially important in validating methodologies, as methods of assessing play are being developed (see Held & Spinka, 2011). These allow us to note many states where animals appear to experience enjoyment or which animals appear to want.

Some examples from rodents (Hawkins, Fry, Wells, et al. 2010) and cattle (Boissy, Manteuffel, Jensen, et al. 2007; Yeates, 2008) are elucidative. Rats have shown conditioned place preferences for the opportunity to interact with another rat, for social interactions, sucrose, social play or sex (Humphreys & Eion, 1981; Burns & Wiley, 1984; Hughes, Everitt & Herbert, 1990; Normansell & Panksepp, 1990; Van den Berg, Pijlman, Koning, et al., 1999). Cows have shown preferences for palatable food (Pajor, Rushen & de Passille, 2003). Rodents have shown anticipatory behaviours towards (expected) sexual contact, social play, food treats and access to enrichments (Inouye, 1982; Burns & Wiley, 1984; Mendelson & Pfaus, 1989; Van den Berg, Pijlman, Koning, et al., 1999; Van der Harst, Fermont, Bilstra, et al., 2003). Cows have shown decreased latency to run down race for pleasurable food rewards (Pajor, Rushen & de Passille, 2000). Rats appear to make ultrasonic vocalisations (“chirping”) in situations that one would expect to involve positive experiences (Knutson, Burgdorf & Panksepp, 2002) (although further work is needed to determine the specificity of this test, as for most positive welfare measures). Similarly, Dellmeier and colleagues differentiated between bovine vocalisations of ‘moos’ and ‘baanocks’ (Dellmeier, Friend & Gbur, 1985). Rats also display facial expressions that are analogous with human expressions in some situations, for example on tasting sugar they will protrude their tongues in a similar way to humans licking their lips (Grill & Norgren, 1978; Wilson, Laidlaw, Butler, et al., 2006).

Life Worth Living

The possibility of having a range of welfare states allows the concept of considering an animal’s life over time. These can be considered in terms of wider concepts such as “quality-of-life” (adapted from its usages in human “welfare assessment”). This can, in turn, be extended into a consideration of the animal’s welfare over his/her whole life to assess whether that life is “worth living” or not. This approach has received some recent attention (e.g. FAWC, 2009; Yeates, 2011; Green & Mellor, 2011; Yeates, 2011; Green & Mellor, 2011; Mellor, 2012).

This allows us to develop and utilise some novel concepts, based on whether an animal’s life has overall positive or negative value for that animal (ignoring any value to other animals including people). Some animals benefit from an overall positive life, and we may say it has a “Life Worth Living”. Other animals we may consider would be better off dead than continuing in their current or expected life (although not necessarily that their lives could not be improved to have a life worth living): to these animals we might ascribe a Life Worth Avoiding or a Life Worth Not Living. In between, some animals may be neither better off living nor better off not living, e.g. an animal that has a life without any experiences, and we may say such an animal has a Life Worth Nothing. This last concept may be less important from a practical point of view, although the limited confidence we may have in the accuracy of our assessments might mean that we have to treat
many animals as having a life of indeterminate value, and in practice we might decide to treat such lives as having neither positive or negative value (alternatively we might err on the side of caution in assuming such animals have lives worth living or avoiding, depending perhaps on our underlying ethical approaches). These assessments, unlike many other welfare assessments, therefore have a non-arbitrary zero point (although they are still not ratio scales). This zero point is the absence of any experiences. This occurs in death or non-existence. It could also occur when an animal is rendered incapable of any experiences, either pharmacologically (e.g. under complete general anaesthesia) or surgically (e.g. a decerebrate animals) or genetically (e.g. an animal modified to be insentient).

The use of such concepts has various ethical implications, depending on how we wish to employ the concepts (Yeates, 2012b). We could say that all animals should have at the very minimum a life worth living, based on non-utilitarian ethical approaches (Yeates, 2012c). This then has certain implications for breeding and husbandry decisions. In particular it reframes. It also allows us to reconceptualise death, away from the idea that being dead is irrelevant from a welfare perspective, and that it might have positive or negative value depending on whether the life it avoids it worth living or worth avoiding (Yeates, 2010).

The future: Beyond coping

Future extensions of animal welfare may consider states that are achieved “beyond coping”. Some will include subjective states such as enjoyment, euphoria and satisfaction. A major area of work can consider what animals want to achieve, rather than purely what they want to avoid (or selecting between two unpleasant options). This work is already underway, and may often simply require reframing to consider positive welfare more explicitly. Other areas of work may look at measures of positive affect. To some extent these may involve physiological measures. Given the less obvious correlations between health and pleasure, these measures are likely to focus less on corporeal, pathological measures and more on neuroendocrine measures. That said, given the differentiation of valence and arousal, positive welfare assessments may be able to carefully use measures of arousal such as cortisol, as appropriate.

This may imply a need to reconsider some of the previous “negative” approaches. Measures of arousal, such as cortisol and heart rate, can be considered as relating to pleasant, high arousal states, such as “excitement” - and further work is then needed to differentiate whether high arousal states relate to pleasant or unpleasant states. This may be difficult, for example differentiating excitement and fear (indeed that can be difficult for ourselves phenomenologically). As another example, open field tests are one type of protocol that have traditionally measured negative welfare, such as fear (Van Reenan, Engel, Ruis-Heutinck, et al., 2004; Van Reenan, O’Connell, Van der Werf, et al., 2005) agitation (Kilgour, Melville & Greenwood, 2006) nervousness (Warnick, Arave & Mickelsen, 1977) or vigilance (Muller & van Keyserlingk, 2006). But they can also be considered in terms of positive welfare. For example, De Passille and colleagues considered behaviours in terms of fear (vocalisation; defecation), exploration (sniffing; licking), and locomotion (running; jumping) (De Passille, Rushen & Martin, 1995). Of these, both exploration and locomotion can be considered as relating to some pleasant experiences. Exploration can involve pleasant “seeking” feelings, satisfaction of curiosity and interest and informational reward. Locomotion can include locomotory play.

Another area of development may come from the recognition that what animals want or enjoy may be subject to greater degrees of inter-individual variation. We may expect to see the use of either measures that are more specific to an individual animal, e.g. through tailoring assessments to their known likes and preferences, and/or measures that allow animals to make their own choices of what they want to achieve, which we might term respecting their “autonomy” (although the concept of autonomy is usually not applied to animals). There are other reasons for the greater recognition of inter-individual variation and development of more individualistic measures (Yeates in press).

Other developments may involve a return to more objective measures, either in terms of inputs such as opportunities or capacities, or in terms of objective outcomes such as achievement and fulfilment. Other considerations of a “good life” may return to more objective measures such as liberty, longevity and (a modified concept of) naturalness.
Such developments will allow us to consider all elements of animals' welfare, assess their quality of life throughout their lives, and reframe welfare improvements not as ways to minimise the harmfulness of our interactions with animals, but as positive ways to ensure that all involved are benefitted from enjoyable lives - worth living.

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Once were wolves - coping with, or enhancing, human-animal relationships

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Summary

One of the characteristics of being human is that we do not live in species isolation but draw in, interact with and live with other animals. For instance, with dogs we have an especially long and close relationship - they are part of society. However, like human interactions with any individual animal or species, there are times when we are unsure of the proper extent and limits of the relationship. Technology, intellectual capacity, values and other factors can result in an asymmetrical or exploitive relationship.

Traditional ethical theories based on consequences, rights and so on appear inadequate in guiding relationships. Instead, the features of a good relationship, for example respect, understanding, companionship and interdependence, can be used to examine the quality of life of both parties in a relationship. Do we demean the animal when we expect it to live ‘naturally’? Do we pay our fair share of the costs when animal welfare is compromised for our benefit? It is suggested that providing a good life for animals, most evident in the opportunity to display normal patterns of behaviour, may require us to look more closely at our place in the relationship with animals.

Introduction

“Individual intelligence probably peaked in the Upper Palaeolithic, and we have been self-domesticated creatures ever since, dogs when we had been wolves.” This quote, from the science fiction novel 2312 (Robinson, 2012) highlights that it is our collective intelligence which has made us successful: brought us all to where we are today. And animals are part of that collective.

Our world is the culmination of thousands of years of interactions, co-evolution and displacement of animals and humans. Wolves and Neanderthals have been replaced by mongrels, Dalmatians, Jack Russells, Chihuahuas and by athletes, soldiers, teachers, prophets and many others. The diversity and success of both dogs and people is arguably due, at least in part, to the extraordinary inextricable and synergistic relationship we share.

We, humans and dogs, share on the whole a good life. To be a domestic animal is to survive and thrive - there are fewer canines in wild or natural populations. And to be human is to draw in and interact with animals (and other life forms) - people do not exist in species isolation (Midgley, 1983). The relationship is founded on symbiosis - among other things, dogs provide assistance and companionship in return for shelter and food. The human and canine traits responsible for this long-lasting symbiotic relationship included reduced fear, acceptance of the other, and even a love of travel (Derr, 2012). The inextricable nature of the relationship is summed up by the Aborigine - “the dog is what we would be if we were not what we are.”

But what was once a mutual or symbiotic relationship has for some animals become asymmetrical or even exploitive. The problem is that we do not know the limits or extent of the relationship. Dogs can be friends and workmates, but they can also be victims, commodities and competitors and treated markedly differently. Many other domestic animals are subject to such ‘split’ or
dysfunctional relationships. Pollan (2002) has suggested that this is partly because, except for pets, the lives and deaths of real animals are no longer part of our lives. Their ‘disappearance’ means there is no reality check on either excessive sentiment or brutality. Eye contact with animals reminds us that we are both like and unlike animals and “upon this paradox people built a relationship in which they felt they could both honor and eat animals without looking away” (Pollan, 2002). The loss of everyday eye contact with animals leaves us confused about the terms of the relationship.

Nowadays, few of us have to face the reality of raising, let alone killing, animals. Instead, we turn to ethics for some sort of guidance and tell each other how animals should and must be raised and killed, usually without cost or risk to ourselves.

**Ethics and animals**

Morality has its roots in co-operation between social beings over resources. Traditional ethical theories typically bring different insights into understanding human-animal relationships. Similar to the different insights we receive from different sciences, e.g. behaviour, immunology, reproduction, each ethical theory also provides different and important insights into how we should interact with animals.

The most well known ethical theory is to consider whether, based on the likely consequences of an action, the benefits outweigh the harms. That does not, however, mean all harms to animals can be outweighed by the benefits to people. As a society we accept that there are some things we cannot do no matter what the benefits and rights theories set a limit to actions regardless of the benefits. Another theory is pragmatism, which not only considers the consequences of an action, but also emphasises the legitimate and necessary role that emotions and sympathy play in moral reflection and choice.

In contrast, another account of ethics claims that it is merely an attempt to fit reason to conventional beliefs, and that its use is limited in difficult decisions where we must draw on other qualities such as intuition or even self-preservation.

While ethical theories are useful, they have not provided simple insights illuminating the place of positive relationships between animals and humans. To do that it is necessary to reflect on relationships between humans. Quality of life is, it is suggested, due to or determined by things like love and companionship, knowledge and understanding, being prepared to compromise, treating each other with fairness and respect, acknowledging our interdependence, finding solace in each other, and enabling each other to flourish. Perhaps two of the most important of these are knowing and understanding each other, and encouraging or enabling each other to flourish. What do these mean for the relationship between animals and humans?

**How well do we know and understand animals?**

We all know eggs – scrambled, fried, in cakes and pavlovas and so on – but very few individuals know the birds which produce them, usually only when they are kept in backyard or farmyard systems. Few, if any, of us really know the birds in caged or colony systems.

Farmyard hens are usually able to range freely, be accompanied by roosters, able to dustbath, have access to water and varied food, even perch in trees – it is imagined an idyllic and good quality of life. But do we understand why this good quality life has been replaced by caged, colony, or intensive free-range systems? The farmyard system produces fewer and more expensive eggs and, despite being cognisant of welfare, most of us value plentiful and inexpensive eggs over the welfare of the birds.

Or more accurately, although we care for bird welfare, we do not care enough to value and pay for systems which give the birds a good quality of life. For example, a recent study asked how much people were prepared to pay to improve the welfare of 1000 hens. The study used a novel technique – people had to bid to move birds from a caged system to an aviary with free access to range, and make decisions based on spending their real money. A third of people were unwilling to pay anything and most would only pay a paltry amount. A minority, less than 10%, were willing to
pay a significant amount (Lusk & Norwood 2011). While it is acknowledged that the insights provided by assessing willingness to pay are contentious (McInerney, 2004), it is tempting to conclude that few of us value animal welfare more than the equivalent of a few dollars. If serious about animal welfare, why not pay for it?

**How well do we enable animals to flourish?**

There are many aspects characteristic of humans and animals flourishing (Nussbaum, 2004; Tulloch, 2011). They include:

- To be able to live a normal length life.
- To have good health and not be disfigured, and to be adequately nourished and sheltered.
- Having freedom of movement, security from violence, and opportunities for reproduction.
- Being able to use the senses to imagine, think and reason and have pleasurable and avoid harmful experiences.
- Be able to form emotional attachments with others.
- Live with and show concern for others and be treated with dignity.
- Live with and show concern for other species and ecosystems.
- Be able to play.
- Have control over one’s environment.

Many of these align with the needs of animals (the Five Freedoms) but a commitment to enabling an animal to flourish might require some adjustment. For example, consider the companion dog, the animal with which we arguably have the most important and special relationship. Aspects of our relationship with dogs which are largely regarded as acceptable, such as breeding of aesthetic traits, periods of confinement and isolation, and control over reproduction, would be questionable under a commitment to positive animal welfare when understood as being able to flourish. Another example are foxes which flourish in urban environments, principally by using their intelligence and resourcefulness – do we demean them when we expect them to act more ‘naturally’? To whom, then, does the quality of life refer to? Or is an unequal relationship an inevitable aspect or phase of domestication (Derr, 2012)? What it does remind us is to be careful what we wish for!

**Discussion**

The promotion of positive experiences such as comfort and contentment have long been part of animal welfare (e.g. Fraser, 1993) but a commitment to progress parts of the ‘quality of life’ approach more recently articulated (Green & Mellor, 2011; Yeates, 2011) will require

- a greater understanding and acknowledgement of the interdependence of animals and humans, redefining some of the relationships if necessary;
- more equitable sharing of the costs and responsibilities for animal welfare amongst all humans, especially consumers of animal products, rather than mainly those in charge of animals;
- articulating the likely gulf between ideals and realities and the inevitable compromises required; and
- determining what we can afford, what is fair and what is a fair share.

In the spirit of the relationship, perhaps there is value in asking what we can learn from animals. In reflecting on living with a wolf, Rowlands (2008) suggested we could more fully consider what is important about being the animal (or a dog or a hen), acknowledge animals’ intelligence and resourcefulness, and help guide and assist them to live in the world in which we place them be it for companionship, utility or whatever.

A final quote again comes from a novel, *The Story of Edgar Sawtelle* (Wroblewski, 2008) and captures what is perhaps our real challenge - “In the end, to create better dogs, we will have to become better people.”
Acknowledgements

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Sow behaviour is dynamic at mixing

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Group housing of sows has welfare implications as the mixing of unfamiliar animals inevitably causes aggressive encounters in order to establish a dominance hierarchy. These fights can lead to stress, injury, the possibility of infection, and potential loss of production. The aim of this study was to develop time budgets for sows mixed into group housing and determine changes in sow behaviour over time. Ten groups of 10 sows were mixed at 5 days post-mating into a group pen with free-access shoulder stalls. Animals were filmed for 2 hours post-mixing. Behaviour was analysed quantitatively according to the proportion of animals performing each action (lying, sitting, standing, walking, investigating or fighting/aggressive encounter). This is useful in the identification of a time window in which to best assess sow behaviour and to select video clips for Qualitative Behavioural Assessments in future studies.
Development of evidence-based housing and husbandry guidelines for animals used in teaching and scientific research

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The Australian Code of Practice for the Care and Use of Animals for Scientific Purposes requires that the design and management of animal accommodation meets species-specific behavioural and physiological needs. The NSW Animal Research Review Panel began developing evidence-based housing guidelines for commonly used research animals about 10 years ago. The objectives are to provide research establishments with guidance on animal housing that meets the physical and behavioural needs of animals and to promote good science. The poster explains the aims and methods used in developing the guidelines and presents some key principles and recommendations from published guidelines for rats, mice, guinea pigs and sheep.
Breed differences in the expression of ‘Boldness’, a personality super-trait

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Background: Previous studies have identified ‘Boldness’ (Svartberg, 2005) as a super-trait in dogs that is believed to represent the shy-bold axis. Boldness differs between breeds, providing evidence for breed-specific behavior (Svartberg, 2006; Bradshaw, Goodwin, Lea et al., 1996), but grouping breeds on the basis of similar behavioural tendencies has proved elusive. This study investigated differences in the expression of Boldness between dog breeds, kennel club breed groups, and sub-groups of kennel club breed groups.

Methodology: An online survey of dog owners in Australia harvested 1054 useable responses. A principal components analysis was run on the survey results and one component was retained. This component had numerous characteristics that align it with ‘Boldness’ in dogs as reported in previous studies1 and it was labeled accordingly. Linear mixed models and ANOVA were used to investigate Boldness in different breeds. Breed had a significant effect on Boldness (df=272, F=1.63, p<0.001). Breeds were categorised into United Kennel Club groups with an additional mixed breed group. Breed group had a significant effect on Boldness (df=8, F = 10.655, p<0.001). Seven of the nine groups were significantly different to each other in Boldness. Herding and gundog groups were broken into sub-groups based on historic breed purpose. Retrievers were significantly bolder than flushing and pointing breeds (N=101; Effect=2.148; S.E=0.593; p<0.001), and tending and loose-eyed herding breeds were bolder (N=23; Effect=1.744; S.E=0.8660; p=0.045 and N=56; Effect=1.842; S.E.=0.6928; p=0.0084 respectively) than heading and cattle herding breeds.

Conclusions: This study supports the existence of the shy-bold continuum in dogs. Particularly bold breeds were among the most popular breeds in Australia based on registration statistics, which raises questions about the interactions between breed popularity and temperament. Differences in Boldness between groups and sub-groups suggest behavioural tendencies may be influenced by historical purpose regardless of whether that purpose still factors in selective breeding.

References


