Welfare Considerations Relevant To Behaviour Modification In Domestic Animals

Jonathan Cooper\textsuperscript{1} and Daniel Mills\textsuperscript{2}

\textsuperscript{1}Animal Behaviour Research Group, Department of Zoology, University of Oxford, South Parks Rd, Oxford. OX1 3PS, U.K.

\textsuperscript{2}School of Agriculture and Horticulture, De Montfort University Lincoln, Caythorpe Court, Caythorpe, Lincs. NG32 3EP, U.K.

Introduction

Domestic animals are usually housed in conditions which differ from those in which their ancestral precursors evolved, and consequently their behaviour may differ considerably from that observed in their wild or feral conspecifics. Their behaviour is often considered undesirable, either because it reduces the animal’s quality of life, or because it appears unsightly, offensive, or incomprehensible. Behavioural modification is, therefore, commonly undertaken either to improve welfare, or for our convenience, or to allow more aesthetically pleasing natural behaviour. A number of approaches can be used including: prevention of the behaviour itself; removal of its causal factors; redirection of the activity to more desirable substrates; and increasing behavioural competition. This paper will discuss the implications of an animal’s behaviour for its welfare, the causes and effects of undesirable responses, and the effect of modification on both reducing undesirable behaviour and on quality of life.

Behaviour and Animal Suffering

Suffering can be thought of as a range of anxious states, such as fear, pain and frustration that are subjectively experienced (Dawkins 1980). These will have evolved as adaptive responses to environmental challenges to maximise reproductive fitness, avoid injury or minimise the risk of death. Whilst suffering is a concept that can not be directly assessed or precisely measured in animals, it can be inferred from their physiological and behavioural responses (Dawkins 1980). An animal’s behaviour can relate to welfare in four ways; firstly it can have no implications for welfare; secondly it can cause suffering in the performer or in others; thirdly it can be an indicator of poor welfare; and fourthly it can be a means of reducing suffering.

Behaviour which cause harm

Many activities found in captive animals are harmful either to the performer or to other animals. Self injury occurs with scald lick lesions in dogs (Goldberger and Rapoport 1991), trichothickening in cats (Wiener et al 1990), and flesh-biting by stallions (Doddman et al 1988). Tail-chasing in pigs, for example, can wound and lead to secondary infection (Colyer 1979). Aggression is generally recognised as the most common clinical behavioural complaint in dogs (Borchelt and Voith 1985). An estimated 10,000 livestock are killed annually by dogs in the UK (Council for Science and Society, 1988) and bites to people represent a serious public health concern (Wright 1996). Mills (1995), in a review of 245 cases of canine behaviour problems, reported that aggression related to 72.2% of the caseload. In cats it is the second most common complaint after elimination problems (Borchelt and Voith 1985) and carries the heightened risk of serious infections such as cat
scratch disease (Griesemer & Wolfe 1971) and Pasteurellosis (Acha & Szyfriges 1989) to both men and other animals.

Where a pattern of behaviour is overtly harmful then there is a strong case for behaviourial intervention for the benefit of those who may be injured. It is, however, dangerous to apply this reasoning to all problem behaviours. The welfare implications of intervention must be evaluated against the prognosis for success and the potential risks left by non-intervention. Veterinary surgeons have an obligation to do the utmost for the well-being of animals committed to their care, so where a pattern of behaviour does not directly cause harm, the justification for modification on welfare grounds is less clear.

**Behaviour which is of no welfare significance**

Behaviours that are unique to captivity are not necessarily related to the well-being of the performer, but may simply be an alternative means of expression of the animal’s behavioural repertoire. An animal’s behaviour is an adaptation to its environment as a result of natural selection. During the decision making process, however, the animal can not know the ultimate consequences of every action for its long term reproductive fitness. It will therefore use short-term or proximate rules of thumb (McFarland 1989) that over evolutionary time scales have been selected because they approximate to optimal behaviour (Krebs and Davies 1987). In captivity, animals will adhere to these rules of thumb, even though the long term evolutionary consequences no longer hold, and consequently they may behave in a manner that appears to be dysfunctional, incomprehensible, unnatural, unattractive or even "stupid".

This can occur because motivationally significant cues are encountered out of context. Robins, for example, perform aggressive territorial behaviour which can be initiated simply by presenting the robin with a tuft of red feathers; sticklebacks respond aggressively to models with red markings that bear a crude resemblance to rival male sticklebacks (Manning and Dawkins 1992); and well fed, indoor cats may pounce on moving shiny sweet wrappers. In these situations the animal is responding to key features of its environment, which in the wild would be biologically meaningful, but can be manipulated in captivity to elicit apparently pointless responses.

Alternatively unusual patterns of behaviour can develop because the reinforcing properties of the captive environment differ from those in the wild. Skinner (1938) trained rats to press levers to obtain food within an artifical environment, where provision of environmental reinforcement was instrumental on the performance of novel or arbitrary responses. In this way, bizarre behaviours such as unusual eliminative postures by cats or dogs can be learnt through trial and error and exhibited without illustrating anything about the animal’s well-being.

**Behaviour which is indicative of poor welfare**

It can be argued that all apparently functionless behaviour in restrictive conditions are context specific equivalents of natural behaviours in extensive systems and consequently unrelated to welfare. Bar-biting in stall housed sows (Fraser 1975, Terlouw et al 1991a) may simply be equivalent to the sow’s natural pre- and post feeding behaviours (Vieuxillothomas et al. 1995). This is insufficient, however, to imply that the activities are unrelated to the animal’s well being; firstly, because both behaviours may reflect a common noxious cause and secondly because their performances may differ in how effectively they address the underlying motivation. Activities such as limping on a painful leg or avoiding aversive
situations are overtly functional responses which are clearly related to their causes. However, many apparently functionless responses observed in captivity may indicate noxious challenges. Hens, for example, pace to and fro if they are experimentally frustrated by placing a glass barrier over their food dish (Duncun and Wood-Gush 1972). In stalled pigs, stalls, stereotypies are related to high motivation to feed (Appleby and Lawrence 1987) and oral stereotypes in stalled sows, and rooting and stone chewing in outdoor sows both increase in intensity with feed restriction (Terlouw et al. 1991a, Edwards et al. 1993). In horses a higher incidence of wood chewing, weaving and other abnormal behaviours is associated with the provision of less than 6.8kg of forage per day (McGreevy et al. 1995). All these activities may be expressions of high feeding motivation, and as such indicators of hunger.

The responses may differ in how well they satisfy their motivational origin. Little research has been carried out to establish this and it would be useful to investigate the degree to which unnatural and natural substrates are substitutes for one another. Further research is also required into the potential psychological heterogeneity which may underlie physically similar behaviours (Mason 1991). For example, stereotypic behaviour may reflect an anxiety neurosis (obsessive compulsive disorder, Rapoport 1988) or psychiatric disturbance (Astrand et al. 1972), alternatively, it may be performed subconsciously and of no relevance to the well-being of the performer (American Psychiatric Association, 1994).

**Behaviour which is an adaptive response or "coping" mechanism**

There has been much work on whether an animal's behaviour in captivity is a means of coping with an adverse environment (Cooper and Nicol 1993, Rusten 1993). Bank voles, for example, develop jumping and somersaulting stereotypes when reared in standard laboratory cages and these have been associated with the motivation to escape (Osfberg 1987). Their development affects environmental preferences (Cooper and Nicol 1991), but it is unclear as to how this has come about, whether by altering the vole's ability to discriminate between environments, reducing its motivation to react (Cooper and Nicol 1991) or some other mechanism (Rusten 1993). Prevention of the stereotypes by lowering the cage roof leads to corticosteroid and white blood cell levels that are comparable with those induced by repeated foot shock, except in voles that adopt a novel, pacing stereotype (Kennes and de Rycke 1988). This would suggest that the stereotype has de-rousing properties that might help the vole to cope with adverse conditions experienced in captivity. This does not, however, mean that stereotypes are either unique or equivalent in this respect. Such effects may occur when any activity is frustrated, before the animals finds an alternative means of expression and other forms of stereotype may have no de-rousing properties.

Other evidence for a relationship between undesirable behaviour and stress modulation has been found in pigs and horses. Bar-biting in pigs and cribbing in horses is associated with lowered heart-rates (Schouten 1991; Lebel et al. 1996) and reduced blood corticosteroid levels (Terlouw et al. 1991b). The development and initiation of these behaviours are often associated with arousing situations, but it is not clear as to whether their performance directly affects physiological measures of arousal i.e. it is a genuine coping strategy, or if the effect is co- incidental (Dantzer 1991).

**Behaviour and Animal Suffering: Summary**

An animal's behaviour is the product of many decision making processes and a particular response can result from a number of mechanisms that do not necessarily involve either conscious or emotional processes. This lack of precise measures for suffering does not,
however, imply that animals are incapable of suffering. Animals have evolved similar mechanisms to control their behaviour as humans and this probably extends to the emotional responses (Dawkins 1990). Whilst there may be difficulties in the precise determination of the cognitive processes involved in any given situation, there is nevertheless strong evidence for relationships between behaviour and well-being in captivity from both physiological and motivational studies. It is vital to understand the causes and effects of specific activities before attempting modification so that undesirable behaviour can be treated whilst optimizing the animal’s quality of life. The problem behaviour may be an adaptive response to captivity which reduces or prevents suffering, so preventing the behaviour will only remove the symptoms of a poor environment, but not cure the underlying problem. Alternatively intervention may reduce the animal’s ability to cope with its environment, so treatment by preventative means alone can carry a considerable risk of reducing welfare by disabling the animal’s adaptive responses to captivity.

The Modification of Animal Behaviour

Behaviour modification can adopt a number of approaches. It can aim to: prevent the response; to address the causal factors underlying the behaviour; increase the animal’s competition with a view to altering the tendency for the behaviour; or convert the response into one which is more acceptable. These may be achieved by environmental manipulation, pharmacological and surgical intervention, training and psychotherapy. These do not represent the only means of treating behaviour problems since problems may also be resolved through counselling designed to bring about changes in the owner’s perception of the behaviour. In these latter circumstances the welfare implications of treatment relate to the welfare of the ongoing behaviour, since treatment brings about no change in this situation.

Prevention of the behaviour

Prevention can be achieved in a number of ways including the use of: physical barriers such as muzzles on dogs, weaving bars above stable doors, and collars that restrict crib-biting or wind-sucking; psychological barriers such as punishment using electric shock collars on dogs, (Vollmer 1979a,b); pharmacological intervention such as aural reduction with sedatives like acepromazine (Marlet 1991); environmental manipulation aimed at eliminating consummatory substrates, such as the horizontal surfaces used by cribbing horses (McGreevy and Nicol 1995); and surgical intervention, such as myectomy (Forsell 1926) or combined neuroectomy and myectomy (Greet 1982) for cribbing and wind-sucking, debskiving in dogs and declawing in cats (Hart & Hart 1985).

The prevention of behaviour alone may cause distress to the animal. Even apparently innocuous preventative measures such as the removal of cribbing surfaces raises blood corticosterone concentration, unless access is given to hay (McGreevy and Nicol 1995). It is, therefore, important to have good cause to employ these measures, and more often than not preventative measures are employed for cultural or aesthetic reasons rather than the benefit of the animal. Even if there is good reason to modify the behaviour, then prevention may not be the best approach, because the behaviour may be symptomatic of a poor environment or may have adaptive value in artificial or unusual conditions. Preventative measures do not address the underlying causes of the behaviour, so the animal may still be highly motivated to persevere with the response in a reduced, alternative or redirected form. Weaving bars, for example, reduce head-out-of-the-door weaving, but horses can continue to weave within the
stable (McBride 1996), whilst horses prevented from crib-biting on horizontal stable surfaces may use their own knees as an alternative cribbing substrate (Kiley-Worthington 1977).

**Removal of underlying causes**

Behaviour modification can be achieved by addressing the causal factors, either through the removal of causal stimuli from the environment or by manipulation of endogenous factors that link stimulus and response, so the animal is no longer motivated to behave inappropriately. The effect on the animal’s quality of life of these approaches is not, however, equivalent. Removal of eliciting stimuli can reduce the incidence of undesirable behaviours without devaluing the performers environment. Vole stereotypies can be effectively treated by providing hay and straw, which may reduce the motivation to escape by providing a nest or by increasing environmental cover. Similarly digging stereotypies in gerbils can be treated by providing a burrow-like tunnel (O’Farrel 1990, Wiedenmeyer 1996), and placing in caged hens prior to oviposition reduced by providing a nest box (Cooper and Appleby 1995).

The causal mechanisms that link stimuli in the external and internal environments with the animal’s response can be manipulated in a number of ways including: psychological intervention such as systematic desensitisation (Wolpe 1958) and flooding (Baum 1988, Borchelt and Voith 1985); surgical intervention such as treatment of aggression due to hyperthyroidism in the cat; and pharmacological intervention such as the use of phenobarbitone to control a limbic seizure. Other pharmacological treatments that interfere with causal mechanisms include anxiolytics, such as the benzodiazepines (Marder 1991) or F3 pheromone (Pageat 1996); antidepressants, such as fluoxetine, clomipramine (Goldberger and Rapoport 1990, Overall 1992) and selegiline (see Pobel elsewhere in this publication); antipsychotics, such as haloperidol (Yen et al 1970); and opiate antagonists, such as nalorexone (Dodman et al 1987, 1988).

Both the opioid and dopamine pathways are involved in many control systems, including modulation of stress, integration of behavioural responses and the perception of the rewarding consequences of behaviour. The side-effects of psychopharmacological intervention may extend beyond those which can be monitored physiologically and have serious effects which impact on the animal’s welfare (Mills 1996). The use of both narcotic and dopamine antagonists, for example, in people with obsessive-compulsive disorders is associated with a reduction in stereotypic behaviour but this may be accompanied by feelings of severe depression (American Psychiatric Association 1994). The value of drugs should not therefore be assessed solely on the symptomatic effect they may have on an undesirable behaviour. In addition drugs are not universally effective at treating apparently similar activities. Opiate blockers, for example, are less effective at reducing stereotypic behaviour in older animals (Kennes et al 1988; McBride 1996), which may be related to changes in control mechanisms with time.

Likewise, the removal of what appear to be the causes of the behaviour can also fail to treat an activity. In 2005, large cats and bears continue to pace or weave, when housed in larger, varied enclosures (Meyer-Hopfzapfel 1968), or even when released into the wild, whilst horses which wind-suck or crib in the stable may persist with the behaviour at pasture (Kiley-Worthington 1977). This can be because the environmental change did not actually solve the motivational problem. In dry cows, increasing the size or complexity of the environment without increasing feed allowance has little effect on the performance of stereotypies and related behaviours (Terlouw et al 1991a, Edwards et al 1993). Alternatively, the behaviour may have become independent of its original causes or external
cues in general. In voles, providing natural cover is less effective at reducing stereotypy as they age (Cooper et al. 1996). This can occur either because the behaviour is self reinforcing or the animal has become generally less responsive to external cues (Fentress 1976, Cooper and Nicol 1991).

Where removal of the environmental causes does not reduce an undesirable behaviour, where the causal factors are unknown or where removal of causal factors is inconvenient, then conversion of the response to a more desirable form; or increasing behavioural competition can treat undesirable behaviour without the welfare risks of attempts at outright prevention.

**Redirection of the response and behavioural competition.**

Redirection of undesirable behaviour to less harmful, more convenient or more aesthetically pleasing substrates can be the simplest form of behavioural modification. Straw, for example, reduces bar-biting in stall housed sows (Fraser 1975) by providing an alternative means of expressing behaviour motivated by feed restriction. Similarly, where crib-biting causes excessive tooth wear, then covering the preferred cribbing surface with a less abrasive coating, may be preferable to removing all surfaces (McGreevy and Nicol 1995) and scratching posts or the provision of alternative substrates for furniture-clawing cats prolong a sofa's life (Hart & Hart 1985).

Provision of alternative resources can reduce problem behaviour in a number of other ways. Straw may reduce bar-biting in pigs either by providing behavioural or physical feedback in the form of chewing or gut-fill that reduces hunger, or by increasing behavioural competition with straw manipulation squeezing bar-biting out of the pig’s time budget. Wild animals have a limited time budget which they must distribute in an optimal way. Captive animals may have more “spare” time (Dawkins 1990, Mason et al 1997) as many essential behaviours are satisfied by the provision of a physiologically optimal environment. There is a limited behavioural repertoire and these may expand to fill the available time in a number of ways. Certain behavioural problems associated with dogs left alone may represent the more frequent or intense expression of vocalisation, grooming and investigative behaviours or expansion of these activities onto an extended range of substrates, e.g. furniture chewing.

In these situations, it would be expected that the behaviours would respond well to techniques designed to increase behavioural competition. General changes to the animal's environment such as increased space, housing outdoors, or increased environmental complexity can reduce the incidence of undesirable behaviour, not by removing eliciting factors, or providing more appropriate means of expression, but by allowing the expression of other previously denied activities. These can then reduce the incidence of the undesirable behaviour by competing for time, attention or energy. Specific environmental enrichments for companion animals include the use of foraging toys like the “Buster cube” (Kruuse Ltd) and “Equihull” (See Henderson et al in this publication). However, it is important that these devices do not cause further frustration and associated problems. Responses which compete for expression with a problem behaviour in response to the causal stimuli may be deliberately trained as occurs with counter-conditioning (Hart and Hart 1985).

It may be argued that behavioural competition is increased when the ability to perceive and respond to those stimuli which underlay the problem behaviour are eliminated. This may be done surgically for example by neutering or by olfactory tractotomy (Hart 1981). These processes involve particular concerns for the welfare of the animal. Surgery inevitably involves a compromise of the animal's welfare before the goal is achieved. In addition the
long term effects of sensory deprivation such as anosmia may be distressing and reduce the animal’s general ability to respond to its surroundings appropriately.

Conclusion
Understanding why a specific activity is performed and the consequences of treatment depends on identifying the causal factors in the environment; costs and benefits of the activity and its treatment; whether or not the activity is truly undesirable and to whom. Then the condition may be effectively treated with a view to optimising the animal’s welfare. Many responses to captivity that undergo treatment cause no direct harm to the animal and are conventionally perceived as undesirable on aesthetic, convenience and economic grounds. Before treatment is proposed the therapist must evaluate the risks of frustrating an established behaviour, taking away the animal’s means of adapting to an unfavourable environment, or even disabling its stress modulatory mechanisms altogether. It is often preferable to consider treatments which remove the underlying causes in the environment or deliberately redirect the behaviour to a more desirable form. These carry lower risks of adversely affecting welfare, and reduce the tendency to persevere with the response or express it in a redirected, but still undesirable form.

In situations where the behaviour appears to be independent of its causal factors, where the causal factors are unknown or where their removal is impractical, then there may be some justification in directly curbing the behaviour itself. This is most likely when the behaviour causes harm. In these circumstances the benefits to the animals should outweigh the costs of the treatment. Nevertheless, attempts to reduce the undesirable of the animal’s behaviour should primarily focus on animal friendly techniques such as increasing behavioural competition by allowing alternative activities, or by redirecting the undesirable response to more appropriate substrates. Where the behaviour causes no harm to the animal and there is a risk of reducing its welfare using preventative measures, it is preferable to educate the owner as to the costs and benefits of intervention. This is, in itself, a valuable treatment of “the problem”.

References


