

ENVIRONMENTAL ENRICHMENT

Practical strategies for improving feline welfare

Sarah Ellis



What constitutes environmental enrichment?

Definitions of environmental enrichment (EE) in the context of promoting animal welfare commonly describe the addition of one or more 'factors' to a relatively impoverished environment in order to improve the physical/psychological welfare of the animal(s) involved.^{1–4} These factors frequently refer to physical, social, design or management/husbandry interventions that may improve the behavioural environment of captive animals.^{3–5} They can be as simple as the addition of substrate to an enclosure floor, or as complex as the introduction of a device that dispenses food in response to certain learned behaviours.

Many authors have reverted to using the 'goals' of EE as a means of definition. Using quantifiable goals allows outcome(s) of enrichment strategies to be scientifically evaluated, which is of critical importance when measuring the success of application. The most commonly reported goals of EE are to:^{4,6,7}

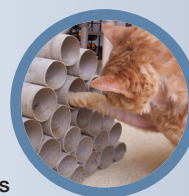
- ❖ Increase behavioural diversity;
- ❖ Reduce the frequency of abnormal behaviour;
- ❖ Increase the range or number of 'normal' (ie, species-typical) behaviour patterns;
- ❖ Increase positive utilisation of the environment;
- ❖ Increase the ability to cope with challenges in a more 'normal' way.

For an environmental intervention to be considered enriching, the changes it produces (whether behavioural, psychological, physical or physiological) must be linked to an improvement in the welfare of the animal. Currently, scientific studies investigating potential EE strategies often assume a link between a change in behaviour and improved welfare, which often may not be the case. For example, allowing an animal additional space by increasing the size of its cage may cause an increase in exploration but, from this information alone, the animal cannot be considered to exhibit better welfare. A distinction should therefore be made between an environmental intervention that causes change, which may be welfare-neutral (or in some cases negative), versus an EE strategy where empirical evidence exists to suggest an improvement in welfare. The use of behavioural measures known to be linked to welfare, in addition to physiological and cognitive welfare indicators, will aid identification of environmental interventions that improve animal welfare and can subsequently be considered EE strategies.

Practical relevance The clinical application of evidence-based enrichment strategies for the domestic cat housed in a variety of confined environments, ranging from the veterinary cage to the domestic home, is of particular importance – both in relation to providing opportunity for appropriate feline behaviour, and in the prevention and treatment of behavioural and associated health problems (eg, feline lower urinary tract disease associated with negative emotional states such as generalised anxiety). Environmental enrichment has gained particular relevance in the light of current animal welfare legislation. For example, in the UK, the Animal Welfare Act 2006 stipulates that owners/keepers have a duty of care to their animal(s) that includes allowing the animal to exhibit normal behaviour patterns.

Evidence base Research into environmental enrichment as a means of improving animal welfare is still very much in its infancy, particularly in relation to the domestic cat. Thus, evidence-based studies are somewhat sparse and more are needed to validate current recommended enrichment practices.

Audience This article aims to assist general veterinary practitioners to recognise how cats respond to confinement, and to understand what constitutes environmental enrichment, to help them implement or advise on appropriate enrichment strategies for cats confined in a hospital cage, home environment (particularly an indoor-only home), or cattery or rescue shelter, based on published evidence to date.



MULTIMEDIA

Three video recordings showing enrichment strategies being applied with the use of drinking and feeding devices, and play sessions with toys, are included in the online version of this article
doi:10.1016/j.jfms.2009.09.011



Sarah LH Ellis BSc(Hons)
PgDip(CABC) PhD
Department of Biological Sciences
University of Lincoln, Riseholme Park,
Lincoln LN2 2LG
Email: sellis@lincoln.ac.uk



TABLE 1 Classification of environmental enrichment strategies

Category	Subcategories		Examples of potential enrichment strategies for the domestic cat
ANIMATE	Intraspecific		Feline companion(s)
	Interspecific	Human	Structured play, handling, training and/or grooming sessions
		Non-human	Appropriately introduced and socialised companion, such as a dog
INANIMATE	Use of toys		Fishing rod toys, wire-based toys, balls
	Feeding		Food balls, hiding food
	Physical	Floor space/substrate	Polyester fleece, shredded paper
		Vertical	Cat tree, shelving
		Structures	Hiding boxes, play tunnels
	Sensory	Visual	Species-appropriate material presented on television, window with busy outlook
		Auditory	Human voice
		Olfactory	Catnip
		Pheromone	Feliway, Felifriend (CEVA)

How are environmental enrichment strategies classified?

Environmental enrichment strategies can be categorised as summarised in Table 1 and described in the following sections. Where empirical scientific research is available, the findings and recommendations arising from the work are discussed.

Animate (social) strategies

Animate enrichment comprises social stimulation, which can arise from a variety of sources; for example, same species (intraspecific), different species (interspecific) or, in some cases, both. Social stimulation can be either temporary or permanent, and may or may not involve direct physical contact with another individual.

Intraspecific social interaction

Cats exhibit the ability to live in social groups under certain conditions that concern food abundance, distribution and relatedness.^{8–10} Within such social groups affiliative behaviours are observed only between certain individuals, suggesting that preferred associates exist.⁹ Such behaviours include allo-grooming, allo-rubbing, allo-play, nose touching and maintaining physical contact while resting and sleeping.^{8,10} Thus, opportunity for intraspecific contact within a restricted environment has the potential to be beneficial to a cat's welfare under specific circumstances including where there is no competition for

food and other resources including toileting sites, water sources and outside access.

Social groups in free-roaming cats are most often related females, and so it is thought that related individuals, especially females, are most likely to form amicable relationships within the domestic environment. Research on domestic cat relatedness does, indeed, suggest that those individuals that are related to one another have more affiliative relationships than those that are not.^{11,12} However, such studies are confounded by the fact that related cats residing together have also experienced early socialisation with one another; a factor known to positively influence interactions with conspecifics.¹³ Thus, it is very difficult to determine whether it is relatedness, early socialisation, or the interaction of the two, that leads to a successful intercat relationship.

It is easier to investigate the effect of gender; however, results are mixed. For example, one study reported that gender does not have an influence on the likelihood of intercat aggression,¹⁴ while another reported observing males initiating aggression in more cases than females (although such aggression was equally likely to be directed to same or opposite sex).¹⁵

For those cats that do form successful affiliative social relationships with one other, the opportunity for social interaction can increase play opportunities (play being known to be a behaviour directly related to positive welfare)¹⁶ and behaviours such as allo-grooming

and allo-rubbing. The influence of such amicable behaviour on domestic cat welfare is not yet fully understood.

Interspecific social interaction

For the cat, interspecific enrichment strategies usually comprise of interaction with humans, such strategies being recommended for confined cats by several authors.^{17–20} A subjective study suggested that laboratory-housed cats may prefer human interaction over toys as a source of stimulation.²¹ However, early socialisation to humans will greatly influence how a cat perceives humans and, subsequently, how beneficial human–cat interactions are.²²

The type and style of human interaction is also known to influence the potential enriching effects of such social stimulation. Soennichsen and Chamove (2002)²³ found that cats elicited more positive and fewer negative responses to petting by their owners when it was directed towards the temporal region. The reverse was reported for petting in the caudal region. In contrast, however, many owners report that their cats respond positively to being stroked over the caudal region. Sensitive areas such as the belly should be avoided as they can elicit aggressive type responses (Fig 1).

Consistency and predictability of the type of handling also play a role in interaction success. Gourkow and Fraser (2006),²⁴ for example, found that significantly more rescue shelter cats that received consistent positive handling by the same people over 21 days were adopted than those animals that were handled inconsistently by various people. Stress levels (as measured on the Cat-Stress-Score)²⁵ were also lower for those cats receiving consistent and positive handling, suggesting that these animals were more relaxed and less fearful.

Interspecific interaction with non-human species also holds enrichment potential provided that all animals are adequately socialised with one another (Fig 2). For example, Feuerstein and Terkel (2008)²⁶ investigated the interrelationships of dogs and cats living under the same roof, both through observations of dog–cat interactions carried out within the home and a questionnaire survey completed by the owners. They found that in addition to the importance of early socialisa-



FIG 1 Inappropriate interaction can lead to injury and encourage injurious types of behaviour to become established

tion (animals were more likely to have an amicable relationship if their first encounter occurred before 6 months in the cat and before 1 year in the dog), the adoption of the cat prior to the dog appeared to encourage the establishment of an amicable relationship.

Inanimate strategies

Inanimate enrichment involves the addition of non-living factor(s) to an animal's environment – for example, toys, novel feeding methods, physical structures and sensory stimulation.

Use of toys

Toys are commonly employed in attempts to enrich a cat's environment. So far, only a small number of studies have explored the influence of toys on the behaviour and welfare of domestic cats. De Monte and Le Pape (1997)²⁷ investigated the effects of introducing a suspended ball and a log to the cages of adult male cats housed singly in a laboratory facility. The two objects substantially reduced the amount of time cats were inactive; the results were highly significant for the ball, which was also found to initiate increased amounts of play. However, whether this effect would be seen in cats residing in more complex environments such as the home, where other factors may be more salient (eg, garden access, human interaction), has yet to be established. In addition, it is known that cats rapidly habituate to object play,²⁸ and regular rotation of toys used in play sessions will enhance success.

In a study involving 10 types of toys, cats were found to show significant preference for a used hair band (cotton and rubber) attached to thread that moved the band in front of the cat.²⁹ The success of this and other such toys (Fig 3) is most likely to be due to their movement triggering behaviours similar in expression to the final parts of the cat's hunting sequence – that is, the chase and/or pounce.^{17,30–32} Denenberg (2003)²⁹ found that a cat track toy (a ball contained within an enclosed track, which the cat can make move) elicited the least interest from the cats studied, perhaps due to the fact that while the toy provided opportunity for object movement, it did not allow the cat to pounce or capture the ball. Such movement-orientated toys (eg, balls, cat track toys) additionally provide no opportunity for the consummatory phase of the hunting sequence. The associated welfare implications of this require further investigation.

FIG 2 Providing both animals have been socialised early with the other species, cats and dogs can often reside amicably within the same household. Courtesy of Hans Blancke





FIG 3 (a,b) Wire toys that mimic air-borne prey (eg, insects) can be very successful at initiating play sequences

- ❖ Feeding at short regular intervals – to mimic the cat's natural feeding schedule;
- ❖ The provision of puzzle feeders (Fig 4) from which dried food has to be extracted – to promote locomotion associated with prey localisation, and to provide the cognitive stimulation associated with prey capture.

While the success of such feeding strategies has been scientifically reported in terms of improving physical welfare (eg, weight loss in obese cats through feeding enrichment),³⁶ the psychological and behavioural benefits as anecdotally reported by clinical animal behaviourists, cat owners and those working in cattery environments (eg, V Halls personal communication) are yet to be scientifically investigated. Finally, the impact of altering the nature of the food that is presented to captive domestic cats (ie, the feeding of whole versus partial carcasses) is not commonly reported.

Feeding strategies

Within the domestic environment, food is commonly presented to cats in a bowl and in an unnatural prepared form, such as concentrated pellets or prepared meat, both of which take very little time to consume. Such feeding methods do not encourage natural feeding behaviours such as locating, capturing, killing and processing food items; nor, potentially, do they facilitate some of the psychological aspects of feeding (Bond and Lindburgh 1990 [in McCune 1995]).³³ The prevention of such activities over the long term has yet to be scientifically investigated in the domestic cat, although is thought to contribute to a lack of behavioural diversity and the presentation of abnormal behaviours often observed in captive wild feline species.³⁴ This unnatural feeding regime does, however, alter a cat's natural daily time budget and feeding behavioural sequence; particularly in the case of cats residing in an environment that prevents or limits hunting opportunities.

Attempts have recently been made to improve the feeding methods of cats through the introduction of feeding strategies that alter feeding time budgets and promote opportunity to express some of their hunting behavioural repertoire. Authors variously recommend:^{10,17,31,33,35}

- ❖ Hiding small amounts of dried food in multiple locations – to encourage search and locomotory behaviours;

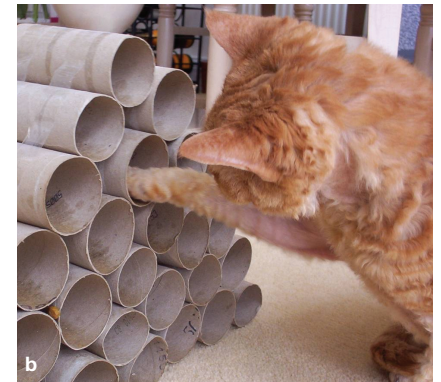
FIG 4 A range of feeding enrichment devices, both available commercially and home-made



(a) A Bengal cat actively gains his dried food from a 'Pipolino' – a feeding device that dispenses dried food through holes, which can be changed in size to increase the difficulty of accessing food. The device is either pushed with the head or batted with a paw, causing it to roll and dispense food



(c) 'MultiVet Slim Cat' – one of several food balls available. When rolled (either by batting with a paw or pushing with the head), food falls from the holes. The size of the holes can be altered to vary the difficulty of obtaining food



(b) A pyramid structure constructed from cardboard tubes provides a cat opportunity to use cognitive ability to extract cat biscuits from the network of holes and tubes using its paw. Courtesy of Vicky Halls



(d) The 'Cat Activity Fun Board' combines five different areas for hiding food, encouraging the cat to employ a range of behaviours, using both the tongue and the paw, to obtain food

Attempts have recently been made to improve the feeding methods of cats through the introduction of feeding strategies that alter feeding time budgets and promote opportunity to express some of their hunting behavioural repertoire.

Alterations to the physical environment

The quality of a cat's physical environment can be enhanced in a number of ways.

Floor space and substrate

The importance of easy cleaning of enclosed environments such as veterinary cages or cattery pens often means that floor space is ill designed in terms of welfare requirements and/or neglected in terms of enrichment opportunity. For the caged cat, floor materials usually comprise metal, concrete and plastic. However, cats have been shown to prefer materials that maintain a constant temperature, such as straw, shredded paper, shavings, sacks, clothes, wood and polyester fleece (Roy 1992 [in McCune 1995]).^{31,37}

Floor space is often limited, making provision for distinct areas for sleeping, feeding and elimination, as occurs in nature, difficult. In addition, some cats prefer separate areas for urination and defecation. Lack of discrete functional areas with appropriate space between them can lead to behaviour problems such as elimination outside the litter tray.³⁸

Vertical space

The cat's natural behavioural repertoire includes climbing and jumping, and it seeks comfort and



FIG 5 The addition of cat trees to a cattery enclosure provides vantage points as well as opportunity for active behaviour by utilising vertical space



Shelves, ropes, cat trees and climbing poles offer cats vantage points, environmental complexity and the opportunity for active behaviour, as well as the chance to rest and retreat at different heights.



FIG 6 The 'Hide, Perch & Go' box, developed by the BC SPCA, provides a cat opportunity for hiding and, when feeling more confident within the environment, perching at a raised vantage point to survey the surroundings. The 'lip' of the perch is thought to give additional security to the cat while perching. Courtesy of Wood Green Animal Shelters



security from being off the ground.²⁰ The opportunity to utilise vertical space in the confined environment can, therefore, prove beneficial. By providing features such as shelves, ropes, cat trees (Fig 5) and climbing poles,^{18,19} vertical space can be enhanced, offering cats vantage points, environmental complexity and the opportunity for active behaviour, as well as the chance to rest and retreat at different heights.^{31,35}

Addition of structures

The provision of structures may be a useful method of increasing opportunity for species-typical behaviour as well as giving an animal more control over its surroundings. One type of structure, the hiding place, has been well utilised and researched in the domestic cat and has been shown to aid adaptation to a novel environment.^{39,40} Cats newly admitted to a rescue shelter have been shown to exhibit lower stress levels (as measured on the Cat-Stress-Score) when provided with an open-sided box that can be used as a hiding place.⁴⁰

The British Columbia Society for the Prevention of Cruelty to Animals (BC SPCA) has developed the so-called 'Hide, Perch & Go' box (Fig 6) based on these principles. This comprises a hiding box with arched holes, via which the cat can control its exposure to the public, and an upper lipped tray that allows the cat to perch on top of the box, providing a raised vantage point while still having the security of being partially concealed. In addition, the box is designed to be used as a cat carrier. The transportation of a cat in a carrier that is not novel to the cat and already contains its scent profile is believed to ease transition to a new environment.

Sensory enrichment

A variety of scientific studies have investigated the application of sensory stimulations (visual, olfactory, auditory and pheromonal) in the cat.

Visual enrichment

A number of authors have highlighted the importance of visual stimulation in the captive environment and suggested how, practically, it might be incorporated; for example, providing access to windows overlooking stimulating behavioural environments, including humans and other cats,³⁵ creating enclosures that overlook areas of human and animal activity,⁴¹ and/or providing access to an external run. Supporting these recommendations is work which found that laboratory cats housed in a free-roaming room spent the majority of the day sitting on a window perch, watching the activity in the hallway.²¹

Due to the structure and location of many enclosed environments, the opportunity to have access to a window with a stimulating outlook is often limited. In an attempt to alleviate this problem, there has been interest in the use of video image playback in animal behaviour studies as a means of providing visual stimulation. A recent study that the author was involved in examined the use of such stimulation in the domestic cat and found that attention to the televisions was greatest when prey items (eg, small rodents, birds) and conspecifics (in amicable situations) were presented.⁴² Which was most appealing (prey or amicable conspecific) is unknown, as they were not presented separately within the study. However, in a study investigating the activities of indoor pet cats, cat owners reported that the most common items watched from windows were birds and small forms of wildlife.⁴³ While cats were found to watch the television, it is difficult to conclude that this behaviour improved the welfare of the individuals.

A note of caution is warranted regarding situations where an animal cannot reach and/or interact with the source of stimulation (eg, items shown on a television screen or viewed out of a window), as such interventions may potentially induce frustration and related behaviours in some animals. Further investigation is needed over the longer term, combined with other measures of welfare (eg, physiological measures such as cortisol), to ensure such methods of stimulation do not negatively impact on welfare.

Olfactory enrichment

The olfactory environment is known to exert a significant impact on the welfare of several species of confined animals, with certain odours



FIG 7 The catnip response initiated by a catnip toy

resulting in enhanced physiological and psychological wellbeing. For the domestic cat, olfactory stimulation is very often provided in the form of catnip. Laboratory cats have been found to prefer toys containing catnip,²¹ and scientific investigation has recently been directed towards the value of odours as a form of enrichment for the captive domestic cat. In a study by the author,⁴⁴ the effects of three scents (catnip, lavender and rabbit odour) on the behaviour of cats residing in a rescue shelter were investigated. Catnip was found to elicit most interest from the cats, which spent significantly more time interacting in a positive manner (eg, sniffing, pawing, playing; Fig 7) with catnip-impregnated cloths in comparison with all other cloths (ie, control cloths with no impregnated scent and those impregnated with lavender or rabbit odour).

Thus, the use of certain olfactory stimulations in the confined environment may produce enriching effects. However, it must be noted that the behavioural response associated with catnip is only exhibited by 50–70% of the cat population; its sensitivity having a genetic basis.⁴⁵

Thus, the use of certain olfactory stimulations in the confined environment may produce enriching effects. However, it must be noted that the behavioural response associated with catnip is only exhibited by 50–70% of the cat population; its sensitivity having a genetic basis.⁴⁵

Auditory enrichment

The presentation of auditory material to animals kept in restrictive environments has become relatively commonplace in recent years and has been used in many capacities. Attempts, for example, have been made to:

- ❖ Promote behavioural change associated with positive welfare (eg, playing classical music to domestic dogs);⁴⁶
- ❖ Mask sudden noise (eg, use of radio in guinea pigs);⁴⁷
- ❖ Mimic the natural environment of captive zoo animals (eg, rainforest recordings presented to captive lowland gorillas).⁴⁸

Such studies have yielded mixed results. To date, no published studies have reported the effects of auditory stimulation on the domestic cat and so its potential as a means of enrichment is currently unknown.

Pheromone enrichment

The intervention of providing synthetic pheromone product(s) within the environment as a means of improving feline welfare is an area where empirical research has been conducted. Feliway (CEVA) is known to reduce anxiety and associated behaviours, while Felifriend (CEVA) has successfully been used to aid positive interactions, both intra- and interspecifically (ie, human and cat). Thus the correct application of synthetic pheromones can be a useful enrichment strategy when dealing with anxious or fearful cats.^{49,50}

What might induce a negative emotional state?

- ❖ Restricted or no outdoor access within the home
- ❖ Introduction to a new home
- ❖ Change within the home environment, such as introduction of a baby, new cat or other animal (eg, dog)
- ❖ Lack of stimulation and/or resources (eg, limited litter trays, feeding stations, toys)
- ❖ Confinement in a restricted environment (eg, veterinary cage or cattery enclosure)

How can the success of enrichment strategies be evaluated?

An environmental intervention is considered enriching when it improves the welfare of the animal. However, care must be taken not to fall into the trap of interpreting any behavioural change as automatically indicating enrichment. The example of the use of a laser pointer with cats (see right) illustrates the importance of fully assessing the welfare implications of an intervention with longer duration studies and utilising other welfare measures, such as physiological indicators, in providing a valid welfare assessment.

The success of enrichment strategies may also be dependent on a number of other factors, which require further scientific investigation, such as gender, neutering status (including age at neutering), ownership history (eg, number and type of owners), housing experience (eg, indoor/outdoor access) and social history (eg, lived with other animals including cats). It was found, for example, that social isolation from conspecifics was more distressing than separation from a familiar environment for captive-bred

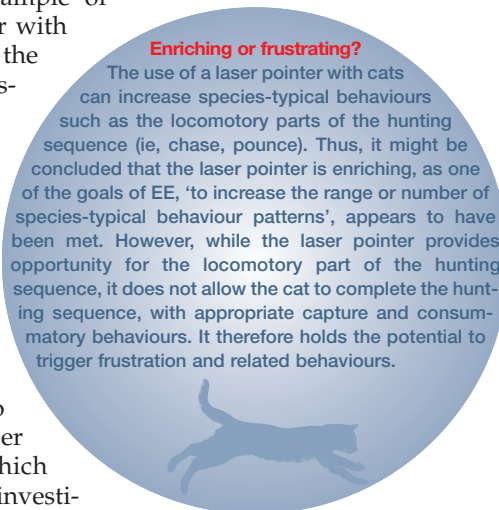


FIG 8 Typical behavioural presentation of an anxious/fearful cat



kittens.⁵¹ Such findings suggest that, for social enrichment, both age and relatedness may play an important part in the success of intraspecific EE.

Finally, habituation is also an important factor when considering the long-term enriching properties of a strategy/object. While novelty may have some value in terms of EE (regular rotation and change of objects/strategies can maintain such value), it is unknown to what degree, and may differ between individuals and EE strategies.

Implementing environmental enrichment

Cats can experience several negative emotional states (eg, frustration, anxiety and fear) that can be induced by a number of common practices, examples of which are listed above.

A cat's facial expressions, body postures, behaviour and vocalisations can convey useful information about its underlying emotional state. For example, a cat displaying a flattened posture and dilated pupils, which attempts to hide, cower, hiss, growl or spit when approached, is highly likely to be anxious or fearful (Fig 8). Therefore, when in situ observations are not possible, detailed questioning of the cat's caretaker to decipher the frequently exhibited facial expressions, body postures, behaviours and vocalisations is imperative for correct identification of the cat's emotional state. The use of pictorial representations may aid successful identification and communication of such states between caretaker and veterinarian and/or clinical animal behaviourist.^{39,52,53}

It is proposed that cats behaviourally express their negative emotional states (whether frustration, anxiety or fear) in one of two ways depending on the cat's temperament: actively or passively.⁵² The box on page 908 summarises the behaviours typically exhibited by active and passive (inactive) responders in response to confinement, a restrictive practice that can induce frustration, anxiety or fear, depending on the cat, its history and the type of confinement.

It is vitally important to be able to recognise both types of cat. It has been reported that staff working with cats often indicate, when questioned, that the active responders are those

Cats behaviourally express their negative emotional states (whether frustration, anxiety or fear) in one of two ways: actively or passively, depending on the cat's temperament.

with the worst problems. However, when these cats were observed for 36 h, it was the passive responders that were described as being more distressed and inhibited, and took longer to habituate in comparison with the active responders.¹³ Further investigation is required to support these findings. Regardless, it is vitally important that passive cats are not presumed to be coping due to their lack of activity. For both active and passive responders, if the emotional states underpinning their behavioural responses are severe and/or prolonged, they can manifest as behavioural problems such as inappropriate toileting, spraying, aggression, over-grooming and, in extreme cases, self-mutilation, with consequent welfare implications. In some cases, associated medical problems are also exhibited; for example, feline lower urinary tract disease and feline idiopathic cystitis are often linked to anxiety in the cat.^{54,55}



Determination of an individual cat's emotional state (through observations of behaviours, facial expressions, body postures and vocalisations), the type of responder it is (active or passive), and its clinical history (medical and behavioural), can inform the most suitable choice and application of EE strategy. Unfortunately, the limited scientific investigation into feline EE strategies has concentrated mainly on whole populations of cats (which are likely to contain individuals of varying emotional states and temperament) and thus results are often extremely variable, mirroring individual differences among the population studied. Investigations into the success of EE on particular subsets of cats (eg, only those identified as frustrated or anxious, or as an active responder or passive responder) are required to provide an evidence base to aid practical implementation. While scientific evidence is lacking, individual case studies are not and it is this information that currently needs to be drawn on to gain an understanding of how suitable enrichment strategies may be applied on a case-by-case basis.

It is vitally important to be able to recognise both types of cat . . . and not to presume that passive cats are coping, due to their lack of activity.

Active versus passive responders

Behaviours commonly exhibited in response to confinement (cage/restricted enclosure and domestic home)

Active responder

- ❖ Often at front of cage/enclosure
- ❖ Rears on hind legs, attempts to climb cage/enclosure
- ❖ Attempts to escape by pawing at exit point to cage/enclosure
- ❖ Paws anyone passing cage/enclosure
- ❖ Paces at front of enclosure/exit points in home
- ❖ Attention-seeking vocalisations (eg, yowling/constant miaowing)
- ❖ Follows owner(s) in home
- ❖ Displays aggressive behaviour towards people/other animals in the home
- ❖ May be destructive or house soil if left alone in the home

Passive (inactive) responder

- ❖ Behavioural depression, including inhibition of maintenance behaviours such as feeding, drinking, grooming, elimination
- ❖ Immobility, often attempting to hide (head and/or body may be hidden under bedding/structure)
- ❖ No vocalisations (although may exhibit defensive vocalisations, such as hissing or growling, if approached)
- ❖ Lack of interest in the environment (both social and physical)

Strategies for active and passive responders

❖ **Active responders** As a general rule, cats that are identified as being active responders frequently benefit from stimulatory forms of enrichment (eg, feeding, sensory, use of toys). Such cats can be destructive (eg, ripping up newspapers in a veterinary cage in an attempt to escape), and so it is important to provide appropriate forms of EE such as opportunities for self-play and/or feeding enrichment to redirect such behaviour onto more appropriate substances and/or alleviate the need for such behaviour.

❖ **Passive responders** Passive responders benefit more from those types of enrichment that potentially increase security (eg, physical enrichment). Passive responders may also be destructive but are more likely to be so at night when no one is around and in an attempt to make a place to hide rather than in an attempt to escape or to gain attention. For such cats, providing EE structures such as a hiding place will increase security and help to alleviate any destructive tendencies.

For both active and passive responders, only those animals that are well socialised (to cat/human/other animal) will benefit from animate stimulation (from cat/human/other animal, respectively).



below. Both passive and active responders have the ability to show each emotional state and thus the responder type should also be taken into consideration when considering the suitability of an EE strategy.

Scope of environmental enrichment

For short-term stressors, such as a stay in a veterinary cage/cattery enclosure, EE can be implemented as a 'first aid' measure to reduce the negative emotional states associated with such stressors. However, in more complex cases of clinical behavioural problems, EE is likely to have greatest success when used as part of a tailor-made behaviour modification plan implemented by a qualified clinical animal behaviourist who may implement other tools such as training and/or pharmacology (if necessary, under veterinary prescription). Several registers of qualified clinical animal behaviourists are now available (see useful contacts on page 911).

Strategies for frustrated and anxious/fearful cats

Suggestions for cats identified as frustrated or anxious/fearful are provided in the boxes

The frustrated cat

Cats that exhibit frustration (whether in the home or the more confined environment of a veterinary cage or cattery enclosure) often need enhanced opportunity for active behaviours and mental stimulation. Such opportunities include:

❖ **Providing appropriate sensory stimulation** For example, greater outdoor access or, for indoor-only cats, increased complex visual outlooks through use of vantage points at windows onto busy scenes of enhanced activity in the garden (Loveridge 1994, and Loveridge and others 1995, give details on creating sensory gardens).^{18,19} However, caution is required if the outdoor environment contains many neighbouring cats.

❖ **Social stimulation** For example, if the cat is well socialised to humans, it is likely to benefit from hands-on interactions such as grooming and handling.

❖ **Introducing feeding enrichment strategies**

For example, hiding food, using puzzle feeders.

❖ **Introduction of structured play sessions** For example, interactive games, such as the use of fishing rod toys, wire toys ('cat dancer'), etc. These toys should be removed after play sessions to maintain their EE value. Toys such as play mice and ping pong balls can remain in cages/enclosures/home environment for self-play.

The strategies suggested here should be considered purely as guidelines. Each cat should be treated on an individual basis with EE strategies tailored to its particular behavioural, emotional, physical and medical needs. For example, an anxious cat in need of enhanced security within the home may not benefit from a network of cat trees, high shelves and walkways if the cat is arthritic and experiences pain on jumping. Ground-level hiding places and the utilisation of gentle sloping ramps to lower vantage points may be more appropriate. Thus, a full medical examination and clinical history is of critical importance before recommending enrichment strategies.

The anxious/fearful cat

Cats experiencing anxiety or fear would be likely to find the types of enrichment strategies advised for a frustrated cat potentially stressful. For these individuals, enrichment should instead be targeted around:

❖ **Providing anxiety-reducing structures and utilising vertical space** For example, making hiding places available; and increasing vantage points through the use of shelves, perches and cat trees to increase security by providing the opportunity to survey the environment from a safe distance from perceived potential threats.

❖ **Increasing security of floor space** For example, in the caged environment, providing designated areas for resting, elimination and feeding. Physical or visual barriers between such areas may help to define space. However, in multicat settings, separate entry and exit points should always be available; single entry/exit points can lead to conflict as cats can prevent others access to a resource such as a litter tray. In larger spaces, such as the home environment, increase floor space security by minimising wide open space through

the positioning of furniture and addition of structures to ensure 'bolt holes'. The use of baby gates can increase floor security by minimising ingress of potential stressors such as dogs or small children.

❖ **Social stimulation** Providing the cat is well socialised to humans, appropriate handling sessions can be beneficial in some cases.

❖ **Pheromone therapy** For example, using a plug-in Feliway diffuser in the room/enclosure the cat spends most time in.

Since moving house, Harry, a 3-year-old male neutered domestic shorthair cat, has begun vocalising (yowling) excessively. His yowls reach their greatest intensity at night. By day, he follows his owners around the house or stands at the back door miaowing. Scratch marks have appeared on the back door and door frame.

Medical history Harry has an unremarkable medical history. He is regularly vaccinated, wormed and treated for fleas. His only previous veterinary visits were for neutering at 6 months of age and a visit at 12 months when he fell out a tree in the garden and dislocated the lateral metacarpophalangeal joint of his right forefoot. This was treated and he made an uneventful recovery.

Behavioural history Approximately 4 months ago Harry's elderly retired owners downsized from a large house in the country with a 1 acre garden to a small ground-floor flat with a communal green in the city, to be closer to their family. Due to the small size of their new accommodation, much of their furniture and belongings has been sold. The block of flats is set on a busy road and, for this reason, Harry's owners feel they can't risk letting him outside any more. He now resides as an indoor-only cat with the exception of a 15–20 minute walk on a harness in the small communal green approximately 3–4 times a week. His owners believe they have been making up for the lack of outdoor access by giving him more of their attention within the home. Harry's body language does not indicate he is experiencing anxiety or fear in his new surroundings. He has always lived in a single-cat household with no other pets and has never to his owners' knowledge been involved in any fights with neighbouring cats. Neighbouring cats have not been sighted since moving to the new home.

Physical examination and laboratory findings On presentation, Harry is bright, alert, confident and friendly. A full examination reveals no abnormalities. However, his weight has increased by 0.5 kg since his previous veterinary examination (6 months ago for booster vaccination); he currently weighs 7.2 kg.

Veterinary assessment The consulting veterinarian refers Harry to a clinical animal behaviourist for his presenting behavioural problems. However, on the basis of the behavioural history gathered, the vet recommends some EE strategies for the owners to implement in the 3-week interim period before the behavioural consultation is due to take place.

❖ ON THE LIMITED BEHAVIOUR HISTORY AVAILABLE:
1 What do you consider to be the most likely emotional state underlying Harry's behavioural problems?

- (a) Fear
- (b) Anxiety
- (c) Frustration

2 Which factor(s) was/were most likely to have led to this emotional state?

- (a) Lack of stimulation
- (b) Increase in weight
- (c) Prevention of free access outdoors
- (d) Lack of control over the environment
- (e) Lack of human attention

3 Which one or more of the following EE strategies would be most appropriate, and which not?

- (a) Provision of a hiding box
- (b) Provision of puzzle and timed feeders
- (c) Introduction of purpose-built cat shelving and cat trees
- (d) Increased human contact (ie, handling and petting)
- (e) Interactive games between owners and cat (eg, cat dancer toys, fishing rod toys)

Answers and discussion

1 (c) Neither Harry's clinical examination nor his behavioural assessment suggest he is fearful or anxious. The onset of scratching and excessive vocalisation coincided with a significant decrease in outdoor access. Additionally, the scratch marks are concentrated on and around the back door, and the vocalisations are at their worst during the night when stimulation for Harry is at its lowest. Their onset, timing and location, along with Harry's behavioural history and presenting behavioural state, are suggestive of a cat this is experiencing frustration (in Harry's case related to a sudden lack of outdoor access and a lack of stimulation within the home). This is an example of where an accurate diagnosis based on specialist advice is so important. Without this behavioural insight several other explanations for Harry's behaviour may have been considered. For example, it might have been hypothesised that Harry is anxious due to neighbouring cats visiting the garden during the night, increasing his need for indoor marking (ie, scratching at the door as a means of marking a core territory boundary) and leading to anxiety-related vocalisations. 2 (a), (c) and (d) Harry's weight increase is a consequence of a lack of outdoor access and exercise, rather than a causal factor. Quite probably (although not noted in his history) he may have increased his intake of food due to lack of stimulation. The lack of outdoor access greatly reduced the control Harry has over his environment (ie, he no longer can choose when to go outside). In addition, his indoor environment is less stimulating in comparison with his old one, due to a reduction in size and complexity. Since the onset of his behavioural problems, Harry has received greater human contact, so lack of contact is unlikely to be a causal factor. 3 (b), (c) and (e) While a hiding box would not disadvantage Harry in any way, it is not a vital EE strategy for him. It is more important to provide him with stimulation that promotes behavioural opportunities he would usually gain from the outdoor environment (eg, active behaviour including hunting-related behaviour). Harry already receives a great deal of handling and attention from his owners. It is important not to increase this handling and attention too much, as a frustrated cat has the potential to become over-aroused and exhibit uncharacteristic aggression during handling. In addition, it is important that Harry has stimulation away from his owners so that he does become over-bonded to them.

Acknowledgements

I wish to thank Helen Zulch and Professor Daniel Mills (both of the University of Lincoln) for reading early drafts of this article, their very helpful comments and criticisms and for providing expert veterinary behaviour insight. In addition, I would like to thank Vicky Halls and the Wood Green Animal Shelters for generously providing photographic material.

Useful contacts

To find a qualified clinical animal behaviourist, contact:

- ❖ The Association for the Study of Animal Behaviour (<http://asab.nottingham.ac.uk/accred/reg.php>) for UK-based practitioners;
- ❖ The Animal Behaviour Society (<http://www.certifiedanimalbehaviorist.com/>) and the American College of Veterinary Behaviourists (<http://www.veterinarybehaviorists.org/>) for practitioners based in the USA and Canada;
- ❖ The European College of Veterinary Behavioural Medicine-Companion Animals (ECVBM-CA, <http://www.ecvbm.org>) for practitioners based in Europe.

KEY POINTS

- ❖ Environmental enrichment is the process of adding one or more factors to an animal's environment in order to improve the physical/psychological welfare of the animal.
- ❖ Environmental enrichment strategies for the cat can include social stimulation, altered feeding practices, the addition of structures, altered enclosure design and/or sensory stimulations.
- ❖ It is important to identify whether a cat expresses its negative emotions actively or passively, as the recommended enrichment strategies for each type of cat differ.
- ❖ The importance of a full medical examination before environmental enrichment advice is given should not be overlooked.
- ❖ Environmental enrichment can be implemented as a 'first aid' measure for cats experiencing short-term stressors, such as a stay in a hospital cage or cattery enclosure.
- ❖ More complex clinical behavioural problems should prompt referral to a qualified animal behaviour counsellor for implementation of a tailor-made behaviour modification plan.



References

- 1 Chamove AS. Environmental enrichment: a review. *Anim Technol* 1989; **40**: 155–78.
- 2 Newberry RC. Environmental enrichment: increasing the biological relevance of captive environments. *Appl Anim Behav Sci* 1995; **44**: 229–43.
- 3 Shepherdson DJ. Tracing the path of environmental enrichment in zoos. In: Shepherdson DJ, Mellen JD, Hutchins M, eds. Second nature: environmental enrichment for captive animals. Washington DC: Smithsonian Institution Press, 1998: 1–12.
- 4 Young R. Environmental enrichment for captive animals. Universities Federation for Animal Welfare (UFAW) Series, Oxford: Blackwell Publishing, 2003.
- 5 Smith AL, Corrow DJ. Modifications to husbandry and housing conditions of laboratory rodents for improved well-being. *ILAR J* 2005; **46**: 140–47.
- 6 Shepherdson DJ, Bemment N, Carman N, Reynolds S. Auditory enrichment for Lar gibbons *Hylobates lar* at London Zoo. *International Zoo Yearbook*, 1989; **28**: 256–60.
- 7 Chamove AS, Moodie EM. Are alarming events good for captive monkeys? *Appl Anim Behav Sci* 1990; **27**: 169–76.
- 8 Bradshaw JWS. The behaviour of the domestic cat. Wallington: CAB International, 1992.
- 9 Crowell-Davis SL, Curtis TM, Knowles RJ. Social organization in the cat: a modern understanding. *J Feline Med Surg* 2004; **6**: 19–28.
- 10 Casey R. Welfare of shelter cats: measurement and enhancement. Proceedings of the BSAVA Congress; 2005 April 6–10; 256–57.
- 11 Bradshaw JWS, Hall SL. Affiliative behaviour of related and unrelated pairs of cats in catteries: a preliminary report. *Appl Anim Behav Sci* 1999; **63**: 251–55.
- 12 Curtis TM. Effect of familiarity and relatedness on proximity and allogrooming in the domestic cat. Scientific proceedings of the BSAVA congress: nursing programme; 2008 April 3–6, 249–50.
- 13 McCune S. Caged cats: avoiding problems and providing solutions. Newsletter of the Companion Animal Behaviour Therapy Study Group, 1994; **7**: 33–40.
- 14 Levine E, Perry P, Scarlett J, Houpt KA. Intercat aggression in households following the introduction of a new cat. *Appl Anim Behav Sci* 2005; **90**: 325–36.
- 15 Lindell EM, Erb HN, Houpt KA. Intercat aggression: a retrospective study examining types of aggression, sexes of fighting pairs, and effectiveness of treatment. *Appl Anim Behav Sci* 1995; **55**: 153–62.
- 16 Friend TH. Symposium: Response of animals to stress. *J Dairy Sci* 1991; **74**: 292–303.
- 17 Holmes RJ. Environmental enrichment for confined dogs and cats. The TG Hungerford refresher course for veterinarians. Proceedings from the Postgraduate Committee in Veterinary Science, University of Sydney, Australia, 1993; **214**: 191–97.
- 18 Loveridge GG. Provision of environmentally enriched housing for cats. *Anim Technol* 1994; **45**: 69–87.
- 19 Loveridge GG, Horrocks LJ, Hawthorne AJ. Environmentally enriched housing for cats when housed singly. *Anim Welf* 1995; **4**: 135–41.

- 20 Rochlitz I. Recommendations for the housing and care of domestic cats in laboratories. *Lab Anim* 2000; **34**: 1–9.
- 21 DeLuca AM, Kranda KC. Environmental enrichment. *Lab Anim* 1992; **21**: 38–44.
- 22 Casey RAC, Bradshaw JWS. The effects of additional socialisation for kittens in a rescue centre on their behaviour and suitability as a pet. *Appl Anim Behav Sci* 2008; **114**: 196–205.
- 23 Soennichsen S, Chamove AS. Responses of cats to petting by humans. *Anthrozoos* 2002; **15**: 258–65.
- 24 Gourkow N, Fraser D. The effect of housing and handling practices on the welfare, behaviour and selection of domestic cats (*Felis sylvestris catus*) by adopters in an animal shelter. *Anim Welf* 2006; **15**: 371–77.
- 25 Kessler MR, Turner DC. Stress and adaptation of cats (*Felis silvestris catus*) housed singly, in pairs and in groups in boarding catteries. *Anim Welf* 1997; **6**: 243–54.
- 26 Feuerstein N, Terkel J. Interrelationships of dogs (*Canis familiaris*) and cats (*Felis catus* L.) living under the same roof. *Appl Anim Behav Sci* 2008; **113**: 150–65.
- 27 De Monte M, Le Pape G. Behavioural effects of cage enrichment in single-caged adult cats. *Anim Welf* 1997; **6**: 53–66.
- 28 Hall SL, Bradshaw JWS, Robinson IH. Object play in adult domestic cats: the roles of habituation and disinhibition. *Appl Anim Behav Sci* 2002; **79**: 263–71.
- 29 Denenberg S. Cat toy play trial: A comparison of different toys. Proceedings of the Annual Scientific Symposium of Animal Behaviour, American Veterinary Society of Animal Behaviour; 2003 July 20–21; Denver, Colorado.
- 30 Case LP. The cat: its nutrition and health. Iowa: Iowa State Press, 2003.
- 31 McCune S. Enriching the environment of the laboratory cat – a review. Proceedings of the 2nd International Conference on Environmental Enrichment; 1995 Aug 21–25; Copenhagen: 103–117.
- 32 Hall SL, Bradshaw JWS. The influence of hunger on object play by adult domestic cats. *Appl Anim Behav Sci* 1998; **58**: 143–50.
- 33 McCune S. The impact of paternity and early socialisation on the development of cats' behaviour to people and novel objects. *Appl Anim Behav Sci* 1995; **45**: 109–24.
- 34 Powell DM. Preliminary evaluation of environmental enrichment techniques for African lions (*Panthera leo*). *Anim Welf* 1995; **4**: 361–70.
- 35 Overall KL, Dyer D. Enrichment strategies for laboratory animals from the viewpoint of clinical veterinary behavioural medicine: emphasis on cats and dogs. *ILAR J* 2005; **46**: 202–16.
- 36 Clarke DL, Wrigglesworth D, Holmes K, Hackett R, Michel K. Using environmental and feeding enrichment to facilitate feline weight loss. *J Anim Physiol Anim Nutr* 2005; **89**: 427.
- 37 Hawthorne AJ, Loveridge GG, Horrocks LJ. The behaviour of domestic cats in response to a variety of surface-textures. Proceedings of the 2nd International Conference of Environmental Enrichment; 1995 Aug 21–25; Copenhagen: 84–94.
- 38 O'Farrell V, Neville P. BSAVA manual of feline behaviour. Cheltenham, UK: British Small Animal Veterinary Association, 1994.
- 39 Gourkow N. The emotional life of cats: a manual for improving the psychological well-being of shelter cats. British Columbia Society for the Prevention of Cruelty to Animals, Canada, 2003.
- 40 Hawkins KR. Stress, enrichment and welfare of domestic cats in rescue shelters. PhD Thesis; University of Bristol, UK, 2005.
- 41 Rochlitz I. Recommendations for the housing of cats in the home, in catteries and animal shelters, in laboratories and in veterinary surgeries. *J Feline Med Surg* 1999; **1**: 181–91.
- 42 Ellis SLH, Wells DL. The influence of visual stimulation on the behaviour of cats housed in a rescue shelter. *Appl Anim Behav Sci* 2008; **113**: 166–74.
- 43 Shyan-Norwalt MR. Caregiver perceptions of what indoor cats do 'for fun'. *J Appl Anim Welf Sci* 2005; **8**: 199–209.
- 44 Ellis SLH. Sensory enrichment for cats (*Felis silvestris catus*) housed in an animal rescue shelter. PhD Thesis; Queen's University Belfast, UK, 2007.
- 45 Hart BL. Feline behaviour: olfaction and feline behaviour. *Feline Practice* 1977; **7**: 8–10.
- 46 Wells DL, Graham L, Hepper PG. The influence of auditory stimulation on the behaviour of dogs housed in a rescue shelter. *Anim Welf* 2002; **11**: 385–93.
- 47 van de Weerd HA, Baumans V. Environmental enrichment in rodents. In: Smith CP, Taylor V, eds. Environmental enrichment information resources for laboratory animals: 1965–1995: Birds, cats, dogs, farm animals, ferrets, rabbits and rodents. AWIC Resource Series, 2, Department of Agriculture, Beltsville, MD and Universities Federation of Animal Welfare, Herts, UK, 1995: 145–212.
- 48 Wells DL, Coleman D, Challis MG. A note on the effect of auditory stimulation on the behaviour and welfare of zoo-housed gorillas. *Appl Anim Behav Sci* 2006; **100**: 327–32.
- 49 Mills D. Pheromonotherapy: theory and applications. In *Pract* 2005; **27**: 368–73.
- 50 Pageat P, Gaultier E. Current research in canine and feline pheromones. *Vet Clin North Am Small Anim Pract* 2003; **33**: 187–211.
- 51 Rheingold HL, Eckerman CO. Familiar social and non-social stimuli and the kitten's response to a strange environment. *Dev Psychobiol* 1971; **4**: 71–89.
- 52 McCune S. Temperament and the welfare of caged cats. PhD Thesis; University of Cambridge, Cambridge, UK, 1992.
- 53 Bowen J, Heath S. Behaviour problems in small animals: practical advice for the veterinary team. Elsevier Saunders, 2005.
- 54 Buffington CAT, Westropp JL, Chew DJ, Bolus RR. Risk factors associated with clinical signs of lower urinary tract disease in indoor-housed cats. *J Am Vet Med Assoc* 2006; **228**: 722–25.
- 55 Cameron ME, Casey RA, Bradshaw JWS, Waran NK, Gunn-Moore DA. A study of environmental and behavioural factors that may be associated with feline idiopathic cystitis. *J Small Anim Pract* 2004; **45**: 144–47.

Available online at www.sciencedirect.com

