Module 15

Environment Enrichment

This lecture was first developed for **World Animal Protection** by Dr David Main (University of Bristol) in 2003. It was revised by **World Animal Protection** scientific advisors in 2012 using updates provided by Dr Caroline Hewson.

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This module will teach you

What environmental enrichment (EE) is

- Development in response to stress of captivity
- Benefits and limitations

How to provide effective EE

- The principles
- Farmed species
- Zoo species
- Laboratory species
- Companion animals

Typical confinement 1

Environment is impoverished stressful

(Morgan & Tromborg, 2007; Mason et al., 2007)

- **Lack of sensory stimuli relevant to the species**
- **Restricted movement, feeding and other behavioural opportunities**
- **Abnormal social groups and lack of area to retreat to**
- **Forced proximity to humans**
- **Too little environmental control**
- **Too much predictability, eg owned vs. feral cats (Dybdall et al., 2007)**

Typical confinement 2 (Mason et al., 2007)

Causes negative emotions

- Boredom: absence of more general behavioural opportunities (eg nonovelty / diversity, nothing to explore)
- Frustration: thwarting of motivations that are important to the animals (e.g. nesting, hens)

Lack of positive emotions (Boissy et al., 2007)

- No novelty no pleasure from new sensory experiences
- Lack of space no pleasure from playing

Reduced behavioural repertoire

- Abnormal repetitive behaviours (stereotypies)
- Aggression
- Passivity

Review: stereotypies (Mason, 2006; Mason & Burn, 2011)

Stereotypies

Repetitive behaviour

Constant in form

No obvious purpose in the context

Indicate past or present frustration

Restrictive environment

May persist despite enrichment, or take a very long time to change

Stereotypies: examples

Horses: crib-biting (Wickens & Heleski, 2010)

- Genetics and lack of opportunities to forage

Captive carnivores: pacing (Clubb & Mason, 2007)

- Lack of space to roam (not lack of predation opportunities)

Hamsters and gerbils (Sorenson et al., 2005)

- Bar-biting

What is EE?
(Young, 2003)

Alteration of environment of captive animals in order to increase their behavioural diversity and thus improve their welfare

- Show important species-typical behaviours
- Increased ability to cope with challenges
- Reduced frequency of abnormal behaviours ⇨ fewer negative emotional states
- Increased positive interaction with the environment ⇨ positive emotional states (Boissy et al., 2007)

The benefits of EE (Young, 2003)

Improved physical functioning, eg

- Exercise ⇨ sows less likely to crush piglets (Arey & Brooke, 2006)
- Variety in diet ⇨ faster, more cost-efficient growth rate in calves and other species (Manteca et al., 2008)
- Complexity ⇨ improved learning ability and increased brain weight and size in rats
- Stable social grouping or presence of familiar conspecifics ⇨ improved immunity ⇨ faster recovery from disease (Proudfoot et al., 2012; Rault, 2012)
- Breeding success – some zoo animals
- Reduced gastric ulceration (horses) (Wickens & Heleski, 2010)

More benefits of EE (Young, 2003)

More positive feelings, eg

- Chains ⁞ less aggression in pigs
- Company ⁞ horses travel better (Kay & Hall, 2009)
- Familiar company ⇨ animals better able to cope with novelty (Rault, 2012)

Improved opportunities to perform important behaviours, eg

Space and complexity ⁞ wider range of species-typical behaviours, eg sows (Stolba & Wood Gush, 1989)

Benefits to people

Public

Care-givers

The limitations of EE

Variable success (Mason et al., 2007)

- Negative early experiences; there may be brain dysfunction (autism, etc.): hard to change
- Endorphins
- Individual variation
- Visitors to zoos
- Allow plenty of time

Cost? labour materials

Increases variability of laboratory animal data?

EE & laboratory data
(Simpson & Kelly, 2011; Patterson-Kane, 2004; Sherwin, 2004)

Effect of barren housing on research data eg for antidepressant drugs

- **Effect of rearing on cognitive processes and visual acuity: behavioural tests, eg swimming, maze**
- **Routine handling vs. additional friendly handling**

How to provide effective EE

Naturalistic approach

Behavioural approach

Principles

- Based on primary behaviours of the species in free-living conditions
- Maximal utilisable space
- Environmental control
- Safe
- Used
- Economical and practical

The principles of effective EE 1

As much utilisable space as possible

- Cannot meet some zoo species ' need for space (Clubb & Mason, 2003, 2007)
- Horses: stabling not stressful if other needs can be met (Normando et al., 2011)

Quality of space: environmental control

- Contains features that enable species-typical behaviours

Safe

Animal uses it

- Preferences?

Practical and economic

The principles of effective EE 2

Efficacy (Mason et al., 2007; van de Weerd & Day, 2009)

- **Reduction in abnormal repetitive behaviours**
- **Increase in positive species-typical behaviours such as exploration and play**
- **Improve health and productivity**

The main types of EE

Physical – housing

- Size
- Complexity, e.g. furniture and accessories

Occupational

- Exercise
- ‘Toys’, furniture

Nutritional

Social – human and animal

Sensory

Credit: Dr Nicola Rooney, University of Bristol

Physical enrichment: housing design (Young, 2003)

1

Depends on the substrate that the animal lives in – air, land, water, etc.

- Start with the floor and work up
- How often to clean – may remove pheromones ⇨ stress
- Safety of substrates, eg dust, moulds

Physical enrichment: housing design (Young, 2003)

The space between the floor and the ceiling should stimulate exercise and help maintain fitness

- Outdoor run
- Resources scattered throughout

Environment

- Noise: radio?
- Light

Physical enrichment: housing design (Young, 2003)

Toys

- **Not random objects: must elicit specific behaviours**
- **Reduce fear of novelty**
- **Importance of variety**
  - Vary toys with novel objects ⇨ exploration
- **Exercise**

Credit: Colin Seddon

Physical enrichment: housing design (Young, 2003)

Furniture

- Relevant to the species
  facilitate species-typical behaviours

Prioritise the furniture needs

- Life-sustaining
- Health-sustaining
- Comfort-sustaining

Nutritional EE (Young, 2003)

Relates to how food is provided

Carnivores (eat to remove hunger)

Chasers vs. ambushers; solitary vs. pack

Other animal-eaters

Insectivores; piscivores

Herbivores (eat to prevent hunger) (fruits; nectar; grasses; gums)

How does species feed / forage in the wild?

Importance of choice? (Manteca et al., 2008)

Social enrichment (Young, 2003)

Asocial species

Most are territorial

Best not to house in groups

Social species

Housed individually

Group-housed

Opportunities to get away from the others and from humans

Opportunities to get away from humans

Sensory enrichment (Young, 2003; Wells, 2009)

Stimuli occurring in natural habitat vs. those that do not

Focus on the main sense of the species concerned

- **Auditory**
- **Olfactory**
- **Gustatory**
- **Visual**
- **Tactile**

EE and captive wildlife

Short-term residents

- Reproduce all salient features of natural habitat (permitted by law)

Long-term captivity

- Behavioural and naturalistic EE – provide salient positive features of natural habitat
- Reduce or eliminate those features that would cause poor welfare

EE and farm animals: laying hens (Appleby et al., 2004; Duncan, 2010)

EE and dairy cows

Scratching / rubbing

Exercise yard

Feeding space

EE and pigs
(Arey & Brooke, 2006; van de Weerd & Day, 2009)

Rooting / exploring

Social contact

Nesting to farrow

Enriched housing

- **Alternative systems**
- **Straw-based**
- **Point enrichment**

Enriched housing – pigs
(van de Weerd & Day, 2009)

EE and horses

(Cooper & McGreevy, 2007; Wickens & Heleski, 2010; Normando et al., 2011)

Companionship: animal or mirror

Visual and tactile contact with other horses / animals

Access to variety of forage

Access to pasture for at least six hours per day

EE and psittacine birds
(Engbretson, 2006)

Credit: British Columbia Society for the Protection of Animals, Vancouver, Canada

Credit: British Columbia Society for the Protection of Animals, Vancouver, Canada

EE and rabbits
(Lidfors, 1997; Dalle Zotte 2009; Dixon et al., 2010)

Credit: British Columbia Society for the Protection of Animals, Vancouver, Canada

Credit: British Columbia Society for the Protection of Animals, Vancouver, Canada

EE and hamsters and gerbils
(Sorenson et al., 2005; Hauzenberger et al., 2006)

Hamsters

Social or solitary?

Tunnel

Chewing the bars

Running wheel or ball

Gerbils

Social

Digging

EE & Rats and mice
(Patterson-Kane, 2004; Würbel, 2006; Donnelly, 2007; Gross et al., 2011)

Social animals

- Rats: group size 3 to 6 (their preference is 6)
- Mice: pairs (or more)

Environmental complexity

- Mice: nesting material is essential for shelter, thermoregulation & nest-building. Provide cotton wool, tissue, wood shavings.
- Rats: opaque tunnels; soft bedding (wood shavings); nesting material (shredded paper); climbing – platforms, ladders.
- Running wheels? (Sherwin, 1998; Gattermann et al., 2004)

EE and cats 1
(Turner & Bateson, 2000; Overall & Dyer, 2005)

Cats may be naturally solitary

- ‘Friendly’ vs. ‘unfriendly’ (Mendl et al., 2000)
- ‘Petting aggression’

Hide and perch
(Gourkow & Fraser, 2006; Kry & Casey, 2007)

Scratching areas

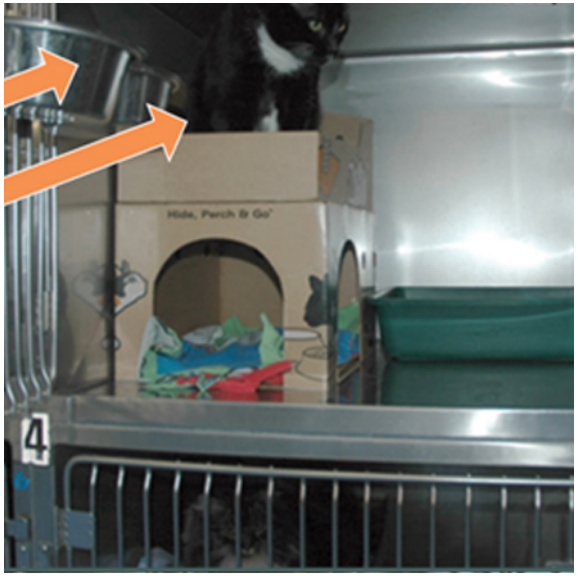
Litter tray

EE and cats 2

(Gourkow & Fraser, 2006)

‘Hide, perch and go’

box for kennelled cats



Credit: British Columbia Society for the Protection of Animals, Vancouver, Canada

EE and kennelled dogs

(Wells, 2004a,b; Overall & Dyer, 2005; Rooney et al., 2009)

- Play
- Exercise
- Social contact
- Toys
- Importance of training
- Sleep

Credit: British Columbia Society for the Protection of Animals, Vancouver, Canada

EE and dogs
(Wells, 2004b; Overall & Dyer, 2005)

Human contact: play, exercise, company

Other dogs: social contact, play

Credit: Di Nicola Rooney, University of Bristol

Credit: Dr Nicola Rooney, University of Bristol

EE and hospitalised cats and dogs
(Overall & Dyer, 2005)

Stressful for many because

- Acute hearing and smell, but poor vision
- Novelty
- Impoverished cages ⇨ lack of predictability and control

EE for cats

- Areas to hide and perch
- Keep away from sight, sound and smell of dogs

EE for dogs

- Hiding areas
- Kong toys / chew toys
- Classical music?

No evidence that pheromone preparations help reduce stress in hospital (Hewson, 2012)

Summary

Definition of environmental enrichment (EE)

- development in response to stress of captivity
- benefits and limitations

How to provide effective EE

- the principles
- farmed species
- zoo species
- laboratory species
- companion animals

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References

Appleby, M. C., Mench, J. A., & Hughes, B. O. (2004). *Poultry behaviour and welfare*. Wallingford, UK: CABI.

Arey,D,. & Brooke, P. (2006). *Animal welfare aspects of good agricultural practice: pig production*. Petersfield, UK: Compassion in World Farming.

Boissy, A., Manteuffel, G., Jensen, M. B. Gerhard Manteuffel, Moe, R. O., Spruijt, B., Keeling, L.J., Winckler, C., Forkman, B., Dimitrov, I., Langbein, J., Bakken, M., Veissier, I., & Aubert, A. (2007). Assessment of positive emotions in animals to improve their welfare. *Physiology & Behavior*, *92*, 375-397.

Clubb, R., & Mason, G. (2003). Captivity effects on wide-ranging carnivores. *Nature,* 425, 473-474.

Clubb, R,. & Mason, G. (2007). Natural behavioural biology as a risk factor in carnivore welfare: How analysing species differences could help zoos improve enclosures. *Applied Animal Behaviour Science, 102*, 303-328.

Cooper, J., McGreevy P. (2007). Stereotypic behaviour in the stabled horse. In: Waran, N. (ed) The Welfare of Horses. Dordrecht: Kluwer Academic Publishers pp 99-124.

Dalle Zotte, A., Princz, Z., Matics, Z., Gerencsér, Z., Metzger, S., & Szendrő, Z. (2009). Rabbit preferences for cages and pens with or without mirrors. *Applied Animal Behaviour Science*, *116*, 273-278.

Dixon, L., Hardiman, J. R., & Cooper, J. J. (2010). The effects of spatial restriction on the behavior of rabbits. *Journal of Veterinary Behavior*, *5*, 302-308.

Donnelly, T. (2007). Veterinary Partner Client Information Sheets : Rodent Husbandry and Care. Available at: www.veterinarypartner.com/Content.plx?P=PRINT&A=2497

Duncan, I. J. H. (2010). Cracking the egg. In J. D'Silva & J. Webster (Eds.), *The meat crisis. Developing more sustainable production and consumption* (pp. 117-132). London: Earthscan.

Dybdall, K., Strasser, R., & Katz, T. (2007). Behavioral differences between owner surrender and stray domestic cats after entering an animal shelter. *Applied Animal Behaviour Science,* 104, 85-94.

Engbretson, M. (2006). The welfare and suitability of parrots as companion animals: a review. *Animal Welfare, 15*, 263-276.

EU. (2009). Council Directive 2008/120/EC of 18 December 2008 Laying Down Minimum Standards for the Protection of Pigs (Codified version). Official Journal of the European Union 18.2.2009 L47/5 – L 47/13. Available at: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32008L0120:EN:NOT

Gattermann, R., Weinandy, R., & Fritsche, P. (2004). Running activity and body composition in golden hamsters (Mesocricitus auratus) *Physiology & Behavior,* 82, 541-544.

References

Gourkow, N.. & Fraser, D. (2006). 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. *Animal Welfare, 15*, 371-377.

Gross, A., N. M., Engel, A. K. J., & Würbel, H. (2011). Simply a nest? Effects of different enrichments on stereotypic and anxiety-related behaviour in mice. *Applied Animal Behaviour Science*, 134, 239-245.

Hauzenberger, A. R., Gebhardt-Henrich, S. G., & Steiger, A. (2006). Influence of bedding depth on behaviour in golden hamsters (*Mesocricetus auratus*). *Applied Animal Behaviour Science, 100*, 280-294.

Hewson, C. J. (2012). Why are(n't) you using pheromones in your hospital ward? There's more to reducing patient stress. *Veterinary Ireland Journal, 2,* 84-90.

Kay, R., & Hall, C. (2009). The use of a mirror reduces isolation stress in horses being transported by trailer. *Applied Animal Behaviour Science*, *116*, 237-243.

Kry, K. , & Casey, R. (2007). The effect of hiding enrichment on stress levels and behaviour of domestic cats (*Felis sylvestris catus*) in a shelter setting and the implications for adoption potential. *Animal Welfare, 16*, 375-383.

Lidfors, L. (1997). Behavioural effects of environmental enrichment for individually caged rabbits. *Applied Animal Behaviour Science, 52,*157-169.

Manteca, X., Villalba, J. J. J., Atwood, S. B. Dziba, L., & Provenza, F. D. (2008). Is dietary choice important to welfare? *Journal of Veterinary Behavior, 3*, 229-239.

Mason, G. J. (2006). Stereotypic behaviour in captive animals: Fundamentals and implications for animal welfare and beyond. In J. Rushen & G. Mason (Eds.), *Stereotypic animal behaviour: Fundamentals and applications to welfare* (2nd ed., pp. 325-356). Wallingford, UK: CABI.

Mason, G. J., & Burn, C. C. (2011). Behavioural restriction. In M. C. Appleby, J. A. Mench, I. A. S. Olsson, & B. O. Hughes (Eds.), *Animal welfare* (2nd ed., pp. 98-119). Wallingford, UK: CABI.

Mason, G., Clubb, R., Latham, N., & Vickery, S. (2007). Why and how should we use environmental enrichment to tackle stereotypic behaviour? *Applied Animal Behaviour Science, 102*, 163-188.

Mendl, M.,& Harcourt, R. (2000). Individuality in the domestic cat. In D. Turner & P. Bateson (Eds.), *The domestic cat. The biology of its behaviour* (2nd ed.). Cambridge: Cambridge University Press.

Morgan, K. N., & Tromborg, C. T. (2007). Sources of stress in captivity. *Applied Animal Behaviour Science, 102*, 262-302.

Normando, S., Meers, L., Samuels, W. E., Faustini, M., & Ödberg, F.O. (2011). Variables affecting the prevalence of behavioural problems in horses. Can riding style and other management factors be significant? *Applied Animal Behaviour Science, 133*, 186-198.

References

Patterson-Kane, E. G. (2004). Enrichment of laboratory caging for rats: a review. *Animal Welfare,13*: S209-214

Proudfoot, K. L., Weary, D. M., & von Keyserlingk, M. A. G. (2012). Linking the social environment to illness in farm animals. *Applied Animal Behaviour Science, 138*, 203- 215.

Rault, J. L. (2012). Friends with benefits: Social support and its relevance to farm animal welfare. *Applied Animal Behaviour Science, 136*, 1-14.

Rooney, N., Gaines, S., & Hiby, E. (2009) A practitioner's guide to working dog welfare. *Journal of Veterinary Behavior, 4*, 127-134.

Sherwin, C. (1998). Voluntary wheel running: a review and novel interpretation*. Animal Behaviour, 56*: 11-27.

Sherwin, C. (2004) The influences of standard laboratory cages on rodents and the validity of research data. *Animal Welfare, 13*: S9-15

Simpson J, Kelly JP 2011 The impact of environmental enrichment in laboratory rats—Behavioural and neurochemical aspects Behavioural Brain Research 222: 246–264

Sørensen, D. B., Krohn, T., Hansen, H. N., Ottesen, J. L., & Hansen, A. K. (2005). An ethological approach to housing requirements of golden hamsters, Mongolian gerbils and fat sand rats in the laboratory: a review. *Applied Animal Behaviour Science, 94*, 181-195.

Stolba, A., & Wood Gush, D. G. M. (1989). The behaviour of pigs in a semi-natural environment. *Animal Production, 48*, 419-425.

Turner, D., & Bateson, P. (Eds.) (2000). *The domestic cat .The biology of its behaviour* (2nd ed.). Cambridge: Cambridge University Press.

van de Weerd, H. A., & Day, J. E. L. (2009). A review of environmental enrichment for pigs housed in intensive housing systems. *Applied Animal Behaviour Science, 116*, 1-20.

Wells, D. L. (2004a). A review of environmental enrichment for kennelled dogs, *Canis familiaris. Applied Animal Behaviour Science, 85*, 307-317.

Overall, K. L., & Dyer, D. (2005). Enrichment strategies for laboratory animals from the viewpoint of clinical veterinary behavioral medicine: Emphasis on cats and dogs. *ILAR Journal, 46*, 202-216.

Wells, D. L. (2004b). The influence of toys on the behaviour and welfare of kennelled dogs. *Animal Welfare, 13,* 367-373.

Wells, D. L. (2009). Sensory stimulation as environmental enrichment for captive animals: A review. *Applied Animal Behaviour Science, 118*, 1-11.

Wickens, C. L., & Heleski, C. R. (2010). Crib-biting behavior in horses: A review. *Applied Animal Behaviour Science, 128*, 1-9.

Würbel, H. (2006) The motivational basis of caged rodents' stereotypies. In G. Mason & J. Rushen (Eds.) *Stereotypic Animal Behaviour (*2nd ed., pp.86-120). Wallingford: CABI.

Young, R. J. (2003). *Environmental enrichment for captive animals*. Oxford: Blackwell.