



Module 7

Behavioural Measures of Animal Welfare

Lecture Notes

Slide 1:

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.

Slide 2:

In this lecture we will cover which behavioural measures of animal welfare you can use, both:

- a. behaviours indicating that an animal is functioning well (healthy), feeling well, and able to perform important behaviours; and
- b. behaviours indicating that an animal is NOT functioning well (healthy), feeling well, and able to perform important behaviours.

Slide 3:

As discussed in Module 3, having a good understanding of animal behaviour and how it links with welfare is essential for us to be able to use animal behaviour to measure welfare.

To recap, we need to have a good understanding of an animal's behavioural repertoire. To obtain this we need to refer to what we know about the full behavioural repertoire of the species as they exist in the wild. As many domestic species do not have relevant wild counterparts any longer we can place domestic animals in extensive, naturalistic conditions and study the behaviours there.

Having a good understanding of an animal's behavioural repertoire provides us with the basis for understanding which specific behaviours are important for the animal to perform. An animal having the opportunity to perform certain behaviours that are important to the animal (also referred to as 'behavioural needs') is an essential requirement for good welfare. As described in Module 3, carefully designed research has helped us to understand which behaviours are important for specific species to perform. In practice, it is important to keep using this knowledge as a basis in order to consider if an animal is able to fulfil his/her behavioural needs. For example, when hens are ready to lay, they will squeeze through narrow gaps or push open heavily weighted doors in order to gain access to a nesting area. Therefore, nesting behaviour seems to be important for hens when they are getting ready to lay.

Finally, an adequate level of familiarity with the normal behaviour of the individual animal is important. Different members of the same species can vary in their behaviour. This may depend in part on their breeding and previous experience. In practice, you may carry out a routine health check examination on two perfectly healthy dogs. However one dog (Dog 1) may generally be calm in nature, while the other dog (Dog 2) is highly excitable and alert. In each case, if the owners of Dog 1 and Dog 2 can confirm this is normal behaviour for their dog when they visit the vet, then you could in turn conclude with some confidence that the behaviour you saw is normal for each dog. Over repeated consultations you would become increasingly familiar with each dog's normal behaviour.

If on the next occasion you see Dog 2 you notice that he or she is behaving in a subdued manner, you would know this is out of character and this would signal a possible welfare issue in terms of physical functioning, mental state or naturalness. Normal animals who are functioning well, feeling well and able to perform behaviours that are important to them typically show a range of behaviour if their environment gives them the space and facility to do that.

Slide 4:

This slide summarises some general types of behaviour in the normal animal. Looking down the list, as vets we may find that some of these behaviours are inhibited in our patients because they are afraid of us, e.g. they may be extremely alert but not show exploratory behaviour, and they may show aversion to us by pulling away when we examine them.

Overall, we can quantify how often an animal shows normal behaviours (or any behaviour) and how long each bout of the behaviour lasts, in order to provide an indirect, numeric measure of the animal's experience. This is a quantitative approach. However, there is a different approach, which is qualitative.

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In evolutionary terms, alertness is essential. Prey species evolved constantly to monitor their environment for signs of danger, so that they could react swiftly to avoid it. Although sheep have been domesticated for hundreds of years, they remain watchful and alert for any change in the environment.

Equally, the survival of hunting species depends upon active and watchful monitoring of the environment. A dog who has a good state of welfare and is sleeping will usually respond at once to an unusual sound.

Slide 6:

Animals who are introduced to a new environment will explore it. Often a lag phase precedes the exploration phase, while the animals assess whether there may be dangers associated with their new environment. The level of curiosity shown varies with age. Adult cattle or horses, for example, quickly settle down to graze, while young animals may spend a longer time exploring. Individual responses may vary with experience – animals who have been badly

treated or have never experienced novelty may take a very long time before they show signs of curiosity about their environment.

Again, this is probably a result of evolutionary change – wild animals evolved to explore new environments while looking for food, water and habitats for nesting or breeding.

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Many factors affect the range of activities seen:

- species (for example, a dog has very different activities from a chicken)
- breed
- age – young animals are more active, more likely to play, and spend more time sleeping
- environment – may be limited to what is available within a pen. Animals in the wild may have adapted to new urban environments
- group size and interaction (e.g. the presence of dominant male and young males)
- season (e.g. breeding, migration).

Slide 8:

Positive social interactions within a group indicate that animals generally have good welfare.

Behaviours that indicate social bonding are called 'affiliative behaviours'. One example is when animals groom each other. This is called 'allogrooming', and it is thought to indicate positive emotions. Many species engage in allogrooming; for example, horses typically bond in pairs, partly for the purpose of grooming each other.

A number of factors can influence interactions between members of the group under domestic husbandry conditions. This slide lists some of them:

- Species: some species are typically solitary or form small family groups. Other species such as wild dogs, sheep and cattle, live in groups.
- Breed may affect sociability. For example, Siamese cats are typically very sociable compared to most other breeds of cat.
- Range in age and size: for important practical reasons, we may keep animals in groups according to age or weight. However, this may not permit normal social structures to be formed, and animals may require a period of adaptation. There may be competition between animals of the same or different ages in a group. For example, older cows may bully heifers when they join a dairy herd, and prevent them from feeding.
- Size of group: animals get to know individuals in small groups, but not in very large groups. Hierarchy can be established much more easily in small groups. On the farm, group size may be very large (e.g. broiler chickens, dairy herds). This may modify the social behaviour that you would normally expect to see in animals who enjoy good welfare.

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The behaviour of a 'normal' animal varies with the animal's previous experience.

- If never handled or wild, the animal is likely to be fearful and may show aggression when cornered.
- If his/her previous experience with humans has been positive, the animal is likely to be friendly and curious, and will approach a stationary human after a period.
- If his/her previous experience with humans has been negative, the animal may be fearful, restless and/or aggressive.

You can assess whether an animal is 'normal' in regard to human contact using measures of flight zone and measures of approach.

The 'flight zone' is an animal's personal space with regard to how close they wish to come to humans. This can vary from 0 to about 50 metres. You can see that the pony in the picture is used to being handled and has allowed the boy to come right up to him. If the pony were feral, not used to people, or afraid of them, he or she might have moved away when the boy got much closer than about 50 metres.

Another way to measure how comfortable an animal is with humans is to calculate how long it takes the animal to approach the person. The greater the time taken to interact, the more fearful or, at least, cautious the animal is of humans.

Slide 10:

Play is another behavioural measure of welfare. Play is thought to indicate positive emotional states in animals, and research is being carried out on this topic (Held & Spinka, 2011).

Young animals tend to play more than adults. Potential reasons for play include:

- to develop activities they will need when older, e.g. young cats learn to hunt by stalking other members of the group, or their mother's tail
- to develop and strengthen muscles (needed for flight, hunting, fighting, etc.)
- to strengthen bonds with other members of the group.

Slide 11:

As we can see from this slide, when we look for behavioural indicators of poor welfare, we look for the absence of behavioural signs that indicate normality. The behavioural signs listed here are examples that you may see frequently.

Slide 12:

Many domestic conditions include marked behavioural restriction. This often means a relative lack of environmental stimulation, which can result in animals showing a much more limited range of activity. This may be partly because animals are confined in a very small area, and because they do not have enough variety in external cues.

For example, pigs are naturally very curious. A barren environment may cause frustration because they cannot perform rooting behaviour, or they may feel more non-specific boredom. Frustration may be manifested as the repeated expression of abnormal behaviour, sometimes for long periods of time. An example of this is bar-biting in sows confined to stalls.

More non-specific boredom may arise because of the monotony of an animal's environment. This may result in passive or depressed behaviour, whereby the animal is very still and does not respond to his/her surroundings. Some sows who are confined in single stalls assume a posture like a dog sitting, and are very inactive. In other cases, non-specific boredom may cause animals to develop stereotypies which may be complex but may not be clearly related to one frustration; for example, tail-chasing in dogs.

Another reason why animals may show a limited range of activity is because of illness. These behaviours are the clinical signs that we use to diagnose and treat disease. However, they also serve a purpose for animal welfare, and we shall now look at them more closely.

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When an animal is sick or injured, his/her body's inflammatory response includes chemical messengers which are detected by the brain, and result in changes in behaviour. For example, a sick animal may sleep more and tends to withdraw or to reduce his/her social interactions and exploratory behaviour. He or she will also reduce his/her food intake and may even stop eating.

These behaviours have adaptive value, and can help the animal to recover: for example, resting conserves energy for use by the immune system.

We are very familiar with these signs clinically, but what can be overlooked is how the motivation to rest, withdraw and so on means that sick animals have new behavioural needs. For example, they need a comfortable, safe place where they can withdraw to, and where they are not at risk of aggression from other members of the social group.

Therefore, it is important that farms and other facilities that keep animals in groups have appropriate hospital pens that give sick animals the comfort and space they need while they recover, but which do not induce other welfare problems (such as the stress of complete social isolation in the member of a social species such as a sheep).

Slide 14:

When animals show a limited range of behaviour, this may be because of pain caused by injury or disease, neither of which may be apparent externally. As vets it is important to recognise pain behaviours. However, this is not always easy, and we do not yet have valid measures of pain for most domestic species.

Detecting pain takes practice, as some species do not demonstrate pain obviously. For example, some herbivores tend to become still and passive when in pain, probably so as not to attract predators.

Generally, you can assess pain using the behavioural indicators outlined on this slide. For example, acute pain normally causes some combination of:

- altered posture, e.g. hunching over
- altered gait (such as lameness, e.g. sheep with infected feet may graze while kneeling on their front legs)
- altered demeanour: animals may seem depressed and unresponsive to their surroundings
- inappetence
- increased respiratory and heart rate
- grinding teeth (this is common in ruminants with visceral pain)
- response to palpation or manipulation of the affected area: this may make the animal tense up or show aggression
- vocalisations (these may be common in acute pain, e.g. during and immediately after castration without analgesia).

If the behaviours above resolve when you provide analgesia, this strongly indicates that pain was the cause.

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Chronic pain may be difficult to detect and, in older animals, is often mistaken for ageing so owners may not report the above changes to you. Some of the signs of chronic pain include:

- altered demeanour (irritability, social withdrawal, aggression)
- animals may not tend to move much, and they may sleep a lot
- altered grooming and toileting behaviours, e.g. cats may stop grooming because it is painful to move in the necessary ways. He or she may therefore have an unkempt coat
- altered gait (lameness)
- weight loss
- response to palpation or manipulation

- response to analgesia: this again is a very useful way to discover if pain is present. 'Blocking' the nerves of a horse's foot with local anaesthetic is a diagnostic method to help a vet locate the source of lameness.

Slide 16:

The next behavioural sign that an animal may not be enjoying good welfare is the presence of abnormal fear or aggression towards people.

It is normal for animals who have had little contact with humans to show signs of fear. Aggression may be displayed if the animal feels that he/she is cornered. Also, certain individuals or breeds may be particularly prone to showing aggression.

However, domestic animals and pets who have plenty of contact with humans should not show fear or aggression in normal circumstances. For example, the water buffalo in this picture is alert, friendly and curious.

Slide 17:

This slide illustrates the findings of a study on the effect of positive or negative handling on the time pigs took to approach humans.

The grey bar indicates the time taken by pigs who had been slapped and hit by the stockpeople. The black bar shows the time taken for pigs to react to stockpeople when they have been subjected to neither positive nor negative experiences. The orange bar indicates the time taken by pigs who had been stroked in a positive manner.

The diagram shows that pigs who were hit (grey bars) took much longer to come forward and interact with the stockperson than pigs who had had no interaction with stockpeople (black bars) and those who had been stroked in a positive way (orange bars).

Slide 18:

Fighting can occur when animals are mixed with new animals, such as after weaning, at markets, and during transport to slaughter.

Often the underlying cause of aggression is fear, but there can be other motivations as well (e.g. sexual, territorial). In turn, there are many different triggers for aggression, including group size, age at weaning, and space.

If you see signs of aggression, either when you are observing animals or in reports from an abattoir that indicate bites or wounds on the skin, this can indicate conditions of poor welfare and it is a signal that you should investigate.

Slide 19:

Our next example of behaviours that indicate poor welfare concerns stereotypies and other abnormal behaviours.

Stereotypies are repetitive behaviours which are constant in form and which serve no obvious purpose in the context in which they are performed. The sow in the picture is repeatedly chewing the bar in front of her. This is an example of a stereotypy.

Stereotypies may have complex motivations, but they can often be linked to some normal activity (such as foraging) that is frustrated in a particular environment, or that was in an earlier one. For example, the sow in the picture has probably developed the behaviour because she has no substrate to root in, and no room to move round, explore, or experience novelty.

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Stereotypies are common in animals who are housed in very restrictive environments. However, it is not clear that animals who perform stereotypies are suffering more than animals who have not developed these behaviours. In fact, performing stereotypies may be some animals' way of adapting to their environment.

Research indicates that when animals perform stereotypies, this typically releases endorphins in their brain. Endorphins are associated with pleasurable feelings. Therefore these animals may gain some relief from frustration and some pleasure by performing the stereotypy. They may be better adapted to a restrictive environment than animals who do not show stereotypies.

Stereotypies may continue to be shown when animals are moved from a restrictive environment to a more complex one that provides the space and substrates needed for them to perform important behaviours. For example, zoo elephants may continue to rock even when offered access to plenty of space and a stimulating environment.

It is not clear why this is so.

- It may be because of some earlier neurobiological change whereby the stereotypy has become the animal's non-specific response to any degree of arousal.
- It may also be due to the endorphin release, i.e. performing the stereotypy has become a rewarding experience.

Slide 21:

We still do not completely understand stereotypies. However, a review of research on signs of poor welfare and stereotypies indicates that the presence of stereotypies is strongly associated with known measures of poor welfare. Therefore, there is now general agreement that the presence of stereotypies is a sign that an animal has lived, or is living, under conditions of poor welfare.

Slide 22:

This slide shows some examples of stereotypies in captive animals and their probable causes.

- Horses develop a characteristic behaviour called crib-biting, where they rest their top teeth on a solid horizontal surface and perform swallowing movements. This can lead to weight loss and the marked over-development of neck muscle. It is likely that this behaviour results from a combination of the animals' genetic predisposition and lack of opportunities to forage. The behaviour is not seen in horses living wild, and seems to develop when horses are kept in stalls where they cannot move around or select from various forages.
- Many captive carnivores, such as bears, develop locomotory stereotypies, e.g. pacing. It seems likely that these behaviours develop because their enclosures are too small to permit the normal ranging behaviour that the animals perform as part of food-seeking.
- Laying hens kept in cages may start feather-pecking, where they peck at the plumage and limbs of other birds in the cage, removing their feathers and injuring them. This stereotypic behaviour has a strong genetic component and is also associated with high stocking density and activity levels.
- Dogs may also develop repetitive behaviours such as barking, pacing and chewing. These behaviours may be misunderstood as seizures or other physical pathologies. As a clinician, you need to understand motivation and other aspects of behaviour in order to correctly identify when the behaviour may be a sign of underlying frustration, rather than physical illness.

Slide 23:

To review: we have been looking at behavioural indicators of poor welfare. We have already talked about limited range of activity, sickness behaviours, abnormal fear and aggression towards people, and stereotypies.

We shall now look at other behaviours that may reflect poor welfare.

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This last group consists of other behaviours that are not usually seen or expected in the context. They may be classified as redirected behaviours: these are normal behaviours that are directed towards inappropriate substrates. Examples include:

- cross-sucking in calves who do not have access to their mother or an artificial teat to suck on
- tail-biting in pigs: this is a common problem, and its causes are not entirely clear. However, it is thought to be triggered by the lack of opportunity to root and forage for food, and therefore it is a redirected foraging behaviour.

Slide 25:

Another category of behaviour is self-injurious behaviour. Examples are:

- lick granuloma in dogs, which occurs when dogs lick the same part of their body repeatedly, sometimes even exposing the bone. The cause of this is not clear, but it may be related to neural pathology or to anxiety/boredom
- self-mutilation in horses who lunge at objects or bite themselves. Sometimes, these behaviours may be caused by local pain. In other cases, they may reflect frustration with the animal's environment.

Slide 26:

We have now considered a range of behaviours that may result when one or more of the three aspects of welfare (physical functioning; mental state; performance of behaviours that are important to the animal) are compromised.

We finally need to consider how you might measure these behaviours in order to make a judgment about welfare.

- As vets working with individual animals in practice, we do not typically quantify the different behavioural signs of illness or good welfare. We simply note if they are present and use those observations, together with quantitative measures such as heart rate and blood tests, to reach a conclusion about how the animal seems to be faring overall.
- A technique that can be used to judge an animal's welfare is known as qualitative behavioural assessment (QBA). Its use in veterinary clinical assessment has not been assessed; however, QBA has been developed and used more formally in research.
- Briefly, different observers have used spontaneous descriptive terms to summarise a live animal's emotional state and the animal's manner of interacting with his/her environment. For example, an observer might rate the sow in the picture as 'content' or 'passive'. The researchers then use statistical processes to summarise those terms into an overall assessment of the animal's welfare. The assessments are then compared with known quantitative indicators of the animal's welfare.
- The approach is subjective and there is a concern that it emphasises anthropomorphism; however, research into its validity indicates that sometimes descriptive terms correlate well with quantitative measures of welfare.
- For example, some qualitative measures are included in some of the Welfare Quality® project assessment tools for assessing the welfare of farm animals in studies in the European Union (EU) and Latin America. However, it is unlikely that qualitative assessment on its own will ever be sufficient to assess the welfare of animals. You also need to consider quantitative behavioural (and physiological) measures.

Slide 27:

When you are assessing the welfare of an animal using behavioural measures, you should find out how often the animal performs the behaviour of interest, and how long each episode lasts for.

In a group of animals, you will also want to know how many animals show the behaviours.

For example, if you notice fighting as you walk through a barn of pigs, you would want to find out how often fighting occurs, how long each bout of fighting lasts, how many animals are involved and any high risk factors such as age. By gathering this information, along with the farmer, you can then make a judgment about the cause of the fighting you saw and whether it indicated a bigger welfare concern, or was only a very infrequent occurrence.

When auditing the welfare of animals at slaughter, one of the welfare measures is the percentage of animals who vocalise during handling and stunning.

Slide 28:

To finish, we shall put together what we have covered today with the first lecture on behavioural measures of welfare, and with the two earlier lectures on physiological measures of animal welfare. We shall do this using the picture on the slide.

We have talked about physiological and behavioural measures of welfare, because they can tell us something about an animal's experience. That experience is a reflection of the animal's physical functioning, mental state/feelings and the opportunity to perform important behaviours. It is complex, but we can understand it as a sequence, as shown in the picture.

- Starting on the left, we see that sensory input is created by internal and external cues.
- These cues come from all the environmental and inner resources of the animal in that moment. Examples in the picture include housing (which you see provides external sensory input) and the animal's genetics (which influence the animal's internal sensory input).
- Nerves transmit all this sensory information to the animal's brain, which then evaluates it.
- This evaluation is possible because the brain has cognition: it can perceive the incoming sensory information, store it and process it. On the top right of the diagram you can see that memory is involved in the evaluation. You can also see, just below, that the emotion the animal was feeling as it evaluates the sensory information may affect that evaluation – this is cognitive bias.
- The end result of the brain's evaluation is the generation of emotions and the urge, or motivation, to perform a particular behaviour. These are on the right-hand side. Emotions can modify and cause motivation.
- Emotion gives rise to physiological responses such as the stress response, which is below.
- Motivation gives rise to behavioural responses which are at the bottom on the far right. As we have seen today, the behaviours may reflect positive emotions and good welfare, or they may reflect poor conditions and possibly reduced welfare (e.g. stereotypes).

- Finally, these behavioural and physiological responses create further sensory input, as you can see by the arrows going across to our starting point on the left.

The diagram shows that the brain is constantly evaluating ongoing sensory input. This results in the physiological and behavioural responses that we measure and use to make judgments about whether animal welfare is acceptable or not, i.e. whether the animal is having a good life experience or a bad life experience.

