

# Review Article

## Undesired behaviour in horses: A review of their development, prevention, management and association with welfare

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**Keywords:** horse; behaviour; avoidance; stereotypy; welfare

### Summary

Undesired behaviours are a common problem amongst leisure and sporting horses in the UK and have a significant impact on the work of equine practitioners. In most cases, behaviours considered aberrant by owners are normal responses for their horses. Behaviours perceived as 'naughtiness' may in fact signify direct actions to avoid pain- or fear-inducing stimuli. Examples that practitioners might deal with include trailer loading problems, avoidance of having saddlery equipment applied or reluctance to leave the yard. Even where no evidence of physical problems or pain can be detected, avoidance behaviours may reflect learnt responses that previously led to success in evading unpleasant consequences. Because owners often misunderstand the reason for such behaviours to develop in their horses, attempts at resolution often involve suppression or punishment based approaches. Although repeated subjugation of undesirable responses may ultimately appear to resolve the overt behavioural problem in some cases, in many others it can lead to a worsening of the problem, the development of alternative avoidance strategies or the horse learning that escaping the source of its pain or anxiety is impossible and ceasing to respond. Some horses develop abnormal or repetitive behaviours, which are not in the 'normal' behavioural repertoire. These stereotypic behaviours, sometimes termed 'vices', can indicate strategies to cope with a suboptimal environment. Indeed, their performance may serve to improve the situation for the animal. Attempts to suppress or prevent horses showing stereotypies, therefore, will generally exacerbate the underlying welfare problem. When dealing with either stereotypies or avoidance behaviours, it is important to recognise the role of learning in their development and

maintenance. Resolution involves both understanding the underlying motivation for showing the behaviour and how it has become reinforced and established over time, for each individual case. The use of environmental change and/or behavioural modification techniques that are both successful and welfare compatible, are important in dealing with undesired behaviour in horses and selection of suitable professionals for referral an important responsibility for the equine practitioner.

### Introduction

Equine practitioners are often faced with the practicalities of handling or examining horses with difficult behaviour (Haupt and Mills 2006). Practitioners are also commonly asked by clients for professional advice in resolving undesired behaviours in their horses, as these can have significant, and sometimes dangerous, consequences for owners (Haupt and Mills 2006). The evaluation of soundness and suitability for purpose examinations conducted prior to sale also require practitioners to make some evaluation of behaviour. Investigations of 'poor performance' cases are also often complicated by individual horses avoiding specific aspects of training because of learning about previous aversive or painful experiences. However, equine behaviour makes up a very small component of undergraduate veterinary training. Furthermore, domestic animal behaviour is an area in which evidence, knowledge and literature has expanded rapidly over the past decade. The aim of this article, therefore, is to introduce some of the current approaches to interpreting and managing undesired behaviour in equines for the practicing equine clinician.

The majority of 'problem' behaviours occurring in horses are actually normal responses for the species but that may be undesired by owners or riders or problematic when they occur in certain circumstances. In addition,

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some horses show behaviours that are not in the normal behavioural repertoire for the species. These behaviours, which include repetitive behaviours such as weaving or box-walking, and oral behaviours such as wind sucking, are often called stereotypies, compulsive behaviours or 'vices'. The development of these behaviours is generally associated with horses being managed in suboptimal environments either currently or in the past. This article will briefly consider the development of both undesired but normal behaviours and stereotypic behaviours, introduce current approaches to management and treatment, and consider how their performance may relate to existing or potential welfare problems. The article will also give a guide to finding help from a qualified animal behaviour practitioner.

### Equine ethology and learning

The majority of behaviours that owners find problematic are seen in the behavioural repertoire of free-living horses and are adaptive behaviours for horses in natural circumstances. In order to understand such behaviours, it is important to consider the normal behavioural repertoire of the species (Goodwin 1999). An understanding of the environment in which their ancestors evolved and observations of horses in their feral state enable us to ascertain what is likely to motivate their behaviour. For example, adaptation as a plains-living prey species means that horses will react to uncertainty, novelty or possible danger by avoidance where possible. They are also a highly social species, as this enabled the detection of, and escape from, predators. Finally, a diet of poor quality roughage led to the need to graze for a large proportion of their time budget. These 3 characteristics underlying much of the behaviour of modern horses arise from these evolutionarily determined characteristics: maintaining social contact, avoiding potential dangers and eating for approximately two-thirds of the time. Many of the behaviours that owners regard as problematic often first develop from these basic equine motivations.

In addition to understanding the ethology of horses, understanding behaviour also requires an appreciation of how horses modify their behaviour through experience (Nicol 2005). Throughout life, horses associate events together through learning and recent studies suggest that this can have both immediate and long-term effects on their interactions with man (Sankey *et al.* 2010a,b). Simplistically, associative learning is divided into 2 types: the association between important events for the horse and any cues that reliably predict the occurrence of these events (classical conditioning) and the association between a horse's own actions and the consequences of those actions (operant conditioning). Classical conditioning enables them to chain together events that predict something important, whether this is perceived as positive or negative. For example, they may start to show

signs of excitement or frustration as soon as someone enters the feed room in the morning or start to show behavioural signs of anxiety when travelling boots are brought out if they are averse to loading into a trailer. Operant conditioning means that if a behaviour is successful at achieving something good or avoiding something aversive, then they are more likely to show the behaviour again the next time they are in the same situation. For example, if a horse learns that by stopping, it avoids the pain of a poorly fitted saddle jarring into the back when jumping, it is more likely to do so again next time it is approaching the same fence. Equally, if it regains contact with its social group by managing to open its stable door then it is likely to try this again when next separated.

### Avoidance behaviours

Owners often tend to apply anthropocentric reasons to the behaviour of their horses, for example considering that undesired behaviours occur because their horse is being 'naughty', 'bolshie', 'stubborn', even 'dominant' or 'getting back at them'. However, horses do not show undesired behaviour to be wilful or difficult but because they are responding with species typical responses to situations which cause anxiety. Problems loading into a horsebox, reluctance to move forwards ('napping'), avoiding unfamiliar or unexpected items ('spooking') or refusing to jump fences are all common examples. These types of behaviour usually start through horses' natural motivation to maintain social contact and/or avoid situations that are unfamiliar, unexpected or pain inducing, but develop into real 'problems' for owners through learning. It is normal, for example, for a young horse to be initially reluctant to leave its social group. Where a careful trainer ensures that separation is done gradually and calmly such that the young horse does not become anxious, it will generally learn over time that it is acceptable to move away from its social group and can progress to going out of sight. However, where separation is sudden or prolonged in the first instance, the associated anxiety will often result in the horse making behavioural attempts to regain contact, such as spinning around, pulling back or refusing to move forward. On the first occasion, the horse is likely to try a range of different behaviours to get back to its friends but, should one behaviour be successful at escaping the handler and regaining contact with the social group, this behaviour will become reinforced. On the next attempt to remove the horse, it will be more likely to try this behaviour and, if successful again, this response will become more established. Over time, the horse will identify the events that are predictive of being separated and start to show the 'successful' avoidance strategy as soon as it identifies these cues (Waran and Casey 2005), perhaps starting to rear up as soon as it leaves the area of the stable. It is at this

point that many owners perceive there to be a 'problem', misunderstand the origin of the behaviour and commonly try to address the problem by trying to force the horse to move away from the stable using punitive methods. This type of approach often leads to increased anxiety and is often dangerous for the owner as the horse may persist in trying to show the avoidance response that has previously been successful. However, it is important to note that behavioural signs do not necessarily arise from a single motivation: for example, reluctance to leave the yard may also arise as a consequence of ill-fitting tack or poor riding skills.

Undesired behaviours also frequently start when horses avoid situations that they learn will be painful (Casey 1999), so it is important to investigate possible sources of pain or discomfort when investigating such cases (Casey 2002). For example, a horse that finds walking on hard ground painful may start to show behaviours to avoid going out onto the road for a hack, or a horse that is caught in the mouth by a poorly balanced rider may subsequently try to avoid jumping. When established, these types of behaviour will commonly persist despite the resolution of pain (Casey 1999). This is because the horse has successfully learnt to avoid the situation in which it anticipates pain and hence does not learn that it is no longer uncomfortable. With established avoidance responses, therefore, investigation of the medical history or previously used equipment for sources of discomfort is also important.

### Redirected oral behaviours

The next class of behaviours can be considered normal but are often indicative of a problem with the environment. As such, they do reflect an existing or potential welfare problem if not resolved or if resolved by treating symptoms rather than underlying causes. Examples include bed eating, wood chewing (**Fig 1**) and coprophagy. The latter is normal in foals and thought to be one way of learning about food sources from the dam and possibly of



**Fig 1:** Horse wood chewing.

establishing appropriate gut flora. In general, the behaviours mentioned above are likely to reflect a diet low in fibre or other specific nutrients. Wood chewing and coprophagy were more common in horses fed concentrate-only diets compared with those fed entirely on hay (Willard *et al.* 1977; Zeyner *et al.* 2004), while Redbo *et al.* (1998) found that roughage availability was negatively correlated with the risk of developing wood chewing.

Wood eating is observed to a lesser extent in horses at pasture but tends to be most commonly seen on fences and trees during spring, when the sugar content of grasses is higher and the fibre content lower. For animals stabled permanently or with restricted turnout, the environment limits their behavioural options considerably. Oral behaviours may therefore become redirected through persistent motivation to forage that is not met through provision of energetic needs by large and infrequent meals of concentrate feeds. Mares fed on a complete pelleted feed would work (press a panel with their noses) for access to hay, whereas when already fed *ad libitum* hay, they would not (Elia *et al.* 2010). In the same study, mares searched through the wood shavings bedding more when fed pellets. It was not clear whether they ingested the bedding, but Mills *et al.* (2000) reported bed eating to be most common in horses provided with straw bedding and those without access to fibrous feeds. Recent findings suggest that low fibre diets may be linked with other undesirable behaviour: Hockenull and Creighton (2010a) reported that restricted access to forage was associated with an increased risk of frustration behaviour, and aggression just prior to feeding was less likely in horses fed *ad libitum* forage.

### Stereotypic behaviours

Wood chewing behaviour may be of additional concern because there is some indication that it may be a behavioural precursor to crib-biting (for a detailed review of crib-biting (**Fig 2**), see Wickens and Heleski 2010). In a study examining the development of stereotypy in foals and young horses, just over 10% of all subjects developed crib-biting (**Fig 2**) but the majority of these were animals that had previously shown wood chewing (Waters *et al.* 2002). Like wood chewing, crib-biting (**Fig 2**) is associated with low forage or high-starch diets (McGreevy *et al.* 1995; Redbo *et al.* 1998; Waters *et al.* 2002; Bachmann *et al.* 2003a). It is also decreased by the use of straw bedding (McGreevy *et al.* 1995; Christie *et al.* 2006), possibly because this provides an opportunity to ingest extra fibre.

Increased fibre intake or chewing during redirected and abnormal oral behaviours may serve to buffer the effects of stomach acid by generating more saliva, which is produced only during chewing in horses (Alexander 1966). Certainly, Elia *et al.* (2010) reported that horses chewed over 4 times as often per day when fed a hay



**Fig 2: Horse crib-biting on feeder surface.**

rather than a pelleted diet. Moeller *et al.* (2008) found that crib-biting horses produced smaller quantities of saliva than nonstereotypic horses, with the difference being negated by crib-biting, and McGreevy and Nicol (1998) reported that horses prevented from crib-biting increased their ingestion of hay.

Crib-biting horses have been found to have altered gut-transit time (McGreevy and Nicol 1998; McGreevy *et al.* 2001), and to suffer an increased risk of gastric ulceration (Nicol *et al.* 2002) and some types of colic (Hillyer *et al.* 2002; Archer *et al.* 2004, 2008; Malamed *et al.* 2010). Not only does this support a digestive function for the stereotypy but it also demonstrates a potential welfare risk to the animal.

It is useful to think of stereotypic behaviours as behavioural pathologies that develop as a consequence of attempting to cope with a problem (Broom and Kennedy 1993). However, conflicting results surround physiological measures of stress profiles, making it difficult to conclude whether crib-biting functions as a coping strategy to relieve stress (Lebelt *et al.* 1998; McGreevy and Nicol 1998; McBride and Cuddeford 2001; Bachmann *et al.* 2003b; Nagy *et al.* 2009), particularly as longitudinal studies providing baseline data prior to stereotypy onset are lacking. Neurological explanations for stereotypy have also been proposed that implicate stress-induced and/or genetic predisposition to changes in central nervous system dopamine physiology. The environment of the modern domesticated horse could act as a stressor by restricting ability to perform normal species-specific behaviour, restricting feeding or locomotion and imposing social isolation (McBride and Hemmings 2005a). In support of this theory, McBride and Hemmings (2005b) found evidence of increased mesoaccumbens dopamine pathway activity in crib-biters.

Other stereotypic horse behaviours include weaving (a stereotyped lateral movement of the head and neck), repetitive head nodding and box walking, in which the horse paces around the perimeter of the stable. The best

studied of these locomotor stereotypies is weaving, which occurs most frequently just before feeding (Ninomiya 2007; Clegg *et al.* 2008) and seems to represent anticipation of an exciting or stressful event combined with frustration at being unable to leave the confined area. Providing increased visual access to other horses via windows has been found to reduce weaving (Cooper *et al.* 2000) and even the addition of mirrors (McAfee *et al.* 2002) or an image of another horse's face (Mills and Riezebos 2005) had a similar effect, at least over the short periods studied.

McBride and Long (2001) reported that stereotypy is widely thought to be detrimental to the animal: around half of racing yard or riding school owners and a third of competition yard owners thought that stereotypic behaviour reduced the economic value of a horse and over 50% of respondents also perceived it as detrimental to the animal itself. Other than the links between crib-biting and colic discussed above, evidence that stereotypic behaviour causes or increases the risk of specific health problems is sparse. However, welfare problems may stem from various sources. As well as the original cause (known or unknown) of the stereotypy, many owners believe that stereotypic behaviour is learnt by observation, and McBride and Long (2001) also reported that commercial owners commonly isolate 'offenders', potentially making their environment more aversive and increasing the risk of further behaviour problems.

### **Management and resolution of undesired behaviours**

For any equine 'behaviour problem', the main challenge in treatment is accurate diagnosis. As each case develops through the horse's unique experiences and learning opportunities, the ability to gather sufficient historical evidence and map out how the behaviour has developed is an important first stage to resolution. This is because it is only through identifying the horse's motivation to show the behaviour, and how it has been subsequently reinforced, that an appropriate behaviour modification programme can be established.

Behavioural modification may involve environmental changes to enable the animal to show normal behaviours, such as social interaction and increased time spent ingesting forage (**Fig 3**). For example, a recent internet survey suggested that problematic behaviours associated with frustration were more likely to be seen in horses where full social contact was thwarted, while time spent stabled was associated with increased risk of handling problems, aggression and oral/ingestive problems (Hockenull and Creighton 2010b).

Particularly for avoidance behaviours, it is also often necessary to teach the horse an alternative response to the perceived threat through gradual desensitisation and counter-conditioning. This essentially involves initially exposing the horse to a very low level of the stimulus and



**Fig 3: Housing that allows social contact may help to minimise frustration-related behaviour problems. Ad libitum access to forage is associated with decreased risk of redirected or stereotypic oral behaviour.**

rewarding the horse for remaining calm. The level of the stimulus is then gradually increased over multiple training sessions. For a horse that is fearful of cars passing, for example, this type of programme might start by walking the horse past a small stationary quiet car at sufficient distance for the animal to remain calm. The distance might then be gradually reduced over subsequent training sessions and ultimately the process repeated with the car's engine on and finally with it moving. Once calm with this vehicle, the horse could be similarly introduced to larger/louder vehicles.

Where behaviours originate in a painful experience, the source of the pain needs to first be treated or removed before behaviour therapy is started. The horse then needs to be re-introduced gradually to the context in which the pain occurred, using a process of desensitisation and counter-conditioning.

### Management and resolution of stereotypic behaviours

Prevention of stereotypic or redirected behaviours should not be advised without examining underlying causes. While it is not clear whether any stereotypic behaviours act as a coping mechanism, there are signs that some may serve a purpose (e.g. in assisting digestive function). In either case, prevention of the behaviour would be likely to exacerbate the underlying problem and so further decrease the welfare of the animal (Cooper and McGreevy 2002). Measures to reduce or eliminate stereotypies are unlikely to be successful if they do not remove the underlying causes of the behaviour; in some cases the treatment can itself cause distress, discomfort or even lasting pain.

Weaving is not easily controlled; the usual method of applying a grille across the stable door can result in horses

performing the behaviour within the stable. Crib-biting, on the other hand, is often thwarted through use of a hinged collar that prevents the horse from arching its neck by applying pressure to the throat, oesophagus and/or poll. Grasping a cribbing surface is thus made very aversive. Case studies suggest that collars must often be fastened very tightly to be effective and are often unsuccessful in preventing the behaviour in the long term (Kennedy *et al.* 1993). Alternatives such as treating surfaces with bitter tasting substances, muzzling the horse or removing or electrifying cribbing surfaces will similarly result in frustration or unpleasant consequences to performing the behaviour without providing an alternative. Longer-term prevention of crib-biting involves surgical excision of nerves and/or muscles from the ventral side of the neck. This is not successful in preventing crib-biting in all horses (Schofield and Mulville 1998) and, as with any surgery, carries a risk of complications, post surgical pain or infection. Subsequent frustration at being physically incapable of carrying out the stereotypic behaviour may again represent a further welfare problem for the horse.

Because stereotypies and redirected behaviours are strongly linked with environmental deficit, efforts directed at improving the environment are preferable to attempts simply to prevent undesirable behaviours. Management of redirected behaviours could include feeding little and often – where possible – with maximal forage, to reduce risks associated with concentrate feeding and to fulfil foraging motivation. More gradual and prolonged feeding might also minimise the cues associated with highly palatable food that are thought to 'set off' stereotypic behaviour under the dopamine pathway activation theory of stereotypy (McBride and Hemmings 2005a).

Where possible, additional turnout will best fulfil needs for locomotion and foraging. Where this is not possible, provision of foraging enrichment, either by providing multiple forages (Goodwin *et al.* 2002; Thorne *et al.* 2005), flavours (Goodwin *et al.* 2005) or a foraging device (Winskill *et al.* 1996; Goodwin *et al.* 2007), appears to result in increased time spent foraging and less time standing inactive, at least over the course of a few days. A recent study of enrichment during turnout reported that horses kept alone interacted with edible enrichment items more at the beginning than the end of a 5 h period. In contrast, it was noted that horses kept in groups maintained interest in the items after 4 days but in neither case was enrichment associated with a reduction in passive behaviours (Jørgensen *et al.* 2011). Studies of longer-term effects are so far lacking. Furthermore, it is important to identify the specific frustration in an individual animal and provide specific enrichment appropriate to that case. Horses are social animals and increasing social contact appears to act as an enrichment that reduces the aversiveness of the confined environment. Stable designs that reduced opportunities for contact with neighbouring horses were reported as a risk factor for stereotypic and redirected behaviour in Thoroughbred horses (McGreevy *et al.* 1995).

In some cases, even improvement of the environment may fail because established stereotypies can become emancipated: the activity becomes increasingly habitual and detached from its original cause after an extended period. Where a problem is not resolved by minimising risk factors associated with the behaviour, it can be difficult to assess if stereotypy indicates an extant welfare problem or if it represents a behavioural 'scar' caused by previous conditions. In the latter case, enrichment of the environment will still be more beneficial to welfare than any behavioural restriction aimed at preventing the behaviour. It may also be useful to identify the main trigger(s) for the stereotypy (Casey 2003) and desensitise the horse to their occurrence, which will help to reduce the occasions in which the behaviour is shown. It is also important to explain to owners that such behaviours are not 'vices' in that they are not deliberate acts on the part of the horse and that attempts to prevent their occurrence is likely to compromise the welfare of their horse.

### Referral for equine behaviour problems

Whilst there are many horse trainers with excellent skills with horses, there is a general lack of understanding about the fundamental principles underlying behavioural development and modification in equine training. Few trainers or owners have sufficient knowledge of learning to be able to understand how their horse alters its behaviour in response to its environment, even if they have a natural intuition that makes them successful horse people.

Although deriving from a range of different traditions and approaches, clinical animal behaviour is gradually developing into a more professional field. Organisations such as the European College of Veterinary Behavioural Medicine (Companion Animals), the Association of Pet Behaviour Counsellors (APBC), the American College of Veterinary Behaviorists and Certified Applied Animal Behaviorists (Animal Behavior Society), and the Association for the Study of Animal Behaviour (ASAB) Accreditation Scheme recognise individuals who have achieved both academic qualification at a suitable standard and had sufficient amount and quality of supervised clinical experience. Whilst there is currently a paucity of qualified practitioners in equine behaviour, the standards being developed by these organisations and brought together under the umbrella organisation establishing agreed standards of practice in animal behaviour and training (the Animal Behaviour and Training Council, ABTCouncil.org.uk) are gradually leading to an increase in behaviourists to whom veterinary surgeons can safely refer. It is important for the equine practitioner to have an understanding of the range of postnominals used by 'behaviourists' and be able to discriminate individuals who have an approach based on current knowledge and using a welfare compatible approach.

### Authors' declaration of interests

No conflicts of interest have been declared.

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