The use of shock collars and their impact on the welfare of dogs:

A review of the current literature

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There is a wide range of different methods currently in use in dog training. The techniques are based upon operant conditioning, which is the process of learning whereby the animal forms an association between an action and the consequence to it of doing that action. Reinforcement of a behaviour means that the likelihood of the target behaviour being shown again is increased. Reinforcement can be positive or negative - positive reinforcement is where the behaviour increases due to the addition of a pleasant stimulus, and negative reinforcement is where a behaviour increases due to the removal of an aversive stimulus. Similarly, positive and negative punishment decrease the likelihood that a behaviour will be shown in the future.

Hence, aversive stimuli are used to suppress specific behaviour in both positive punishment and negative reinforcement. In negative reinforcement the aversive stimuli is presented until the desired response is performed, thereby reinforcing the target behaviour i.e. the dog learns that the unpleasant experience will end when it shows the correct behaviour. This is termed an escape or avoidance response. An example of this is training a dog to walk to heel using a choke chain. When the dog pulls on the lead, the chain tightens around the dog's neck causing pain, but if the dog walks to heel on a loose lead the chain is slack and the dog avoids pain. In positive punishment the aversive stimulus is presented when the target behaviour is performed, thereby suppressing the behaviour (e.g: smacking a dog when it jumps up).

Traditionally dog training relied heavily upon techniques involving negative reinforcement or punishment, however, in more recent years increasing emphasis has been placed upon the use of positive reinforcement. This is the rewarding of a target behaviour in order to increase the likelihood that the dog will do the same thing again. An example of this is clicker training, where the sound of the click, which is associated with a reward, is used to reinforce a desirable behaviour

In order for any form of training to be successful, it is important that the reinforcer or punisher is applied very quickly after the animal's action, in order for the animal to make an association between its own behaviour and the consequence of it. In addition, the reinforcer or punisher must be applied at such a level that it either increases or decreases subsequent displays of the behaviour. In the case of positive reinforcement, this requires the reward to be something that the animal values, and which creates a positive emotional response. Where punishment is used, it must be aversive enough to create a negative emotional response.

What are "shock" collars?

Electrical stimulation or shock collars are devices through which a trainer can remotely deliver a shock, using pain as a positive punisher in order to suppress a target behaviour. Shock collars are also recommended for use as a negative reinforcer i.e. the pain ceases when the dog shows the correct behaviour. These devices are available to the general public and are marketed for general obedience training as well as a wide range of specific behaviour problems, including aggression, predatory behaviour, toilet training, separation-related behaviour and compulsive behaviours (Lindsay, 2005)

There are three types of electronic training device available to the general public: those that are operated manually via a remote-controlled transmitter; those that operate automatically in response to a dog barking; and those that are activated at a boundary line to keep dogs within a defined area. The manually operated device has also been modified for use in horses, and the boundary training device is also marketed for use in cats. The intensity and duration of the shock can be varied and some collars, though not all, produce a warning beeping sound, prior to the shock. The shock lasts between 1/1000 of 1 – 30 seconds and the intensity uses a current of a few thousand volts (Schilder et al, 2004).

The introduction of electronic, or 'shock' collars for the training of dogs has been very controversial. Those in favour of the use of such devices value their benefits for a number of reasons. For example, they are useful in terms of being aversive enough to suppress target behaviours; they can be applied at a specific time that the animal will associate with a specific activity; their intensity can be precisely controlled such that sufficient punishment is used to stop a behaviour; the punishment can be administered from a distance; they can be a cheaper alternative, for example in removing the need to provide solid fencing; they avoid the need for direct punishment from the owner; and they can facilitate a different behavioural response (Polsky 1994). Advocates of electronic training claim that the use of these devices presents a smaller risk of long term welfare problems than alternative methods of punishment in general use, whilst opponents of the use of electronic collars point to the possible welfare implications resulting from incorrect use and the potential for abuse.

Training using punishment or negative reinforcement

There is a great deal of literature from experimental psychology concerning the effect of punishment and negative reinforcement on the behaviour of various species, many involving the use of electric shocks as an aversive stimulus. Avoidance learning has also been widely utilised in research examining models of anxiety and the efficacy of anxiolytic drugs. However, when using aversive shocks to manipulate behaviour outside of a controlled laboratory situation, a number of confounding factors need to be considered.

One of the main differences between learning observed in a laboratory setting and that which occurs in real life situations is the presence of other, random, stimuli. Any stimuli present when the aversive stimulus (shock) is presented may serve as a discriminative stimulus for punishment (Polsky, 1994). In other words there is a real

danger of an unwanted association being made between the shock and some coincidental stimuli (eg: the presence of the trainer, or context in which the shock occurs), other than the performance of the targeted unwanted behaviour, even when the two are temporally contiguous. In addition inappropriate levels of shock may result in an intense fear and avoidance of the location eg: owner's back garden. In a recent case, a dog was trained to an electronic containment device by the owner walking the dog up to the boundary on the lead. Rather than learning to avoid that particular location, the dog learned to avoid the owner putting the lead on in the garden, through the display of aggression. This is particularly problematic where the use of boundary shocks can become associated with the approach of people or other dogs towards the property. Another reason for failure to achieve the desired change in behaviour is that dogs may learn that shocks are only applied when the collar is worn, leading to the unwanted behaviour returning after the collar is removed (Polsky 1994).

Schilder and colleagues (2004) compared the behaviour of dogs trained using shock collars with a control group of dogs, during both free walking in a park and training sessions. They found that in both situations the dogs previously trained using shock collars showed more behaviours associated with stress than dogs trained in similar way, but without shock collars. They concluded that the dogs associated the presence of the handler with the aversive shock, as they were showing fearful behaviour even when free walked in a different context.

To facilitate an association being made between the behaviour to be suppressed and the punishment, the timing of the punishment is vital. Anxious and fearful responses particularly occur where the punishment is poorly synchronised with the action of the animal (Schalke et al., 2005). In such cases, the recipient does not learn to associate the punishment with their own behaviour, but may associate it with other stimuli present at the time, or the general context in which the punishment occurred. This problem of inappropriate timing of punishment is exacerbated by the tendency for owners to not be objective in their use of punishment techniques: often such techniques are used when they themselves are angry or frustrated, and unrelated to specific behaviours in their dog. Owners can be seen, for example, repeatedly shocking a dog for running off *after* it has come back into sight.

Schilder observed that shocks were frequently given by trainers immediately after the command was given, not giving the dog the opportunity to react to the command and avoid the shock, but instead teaching the dog that the command was a predictor of the shock. If such undesirable associations were made when the device was used by experienced trainers, then it is very likely that this would happen even more frequently where training is carried out by members of the general public.

Some authors also recommend the use of shock collars in conjunction with radio microphones on the dog's collar, to enable remote punishment of unwanted behaviours such as chewing, destruction or urination (Tortora, 1982c). With such use, there is clearly significant scope for error where the owner is reliant upon audible evidence that the dog is performing the unwanted behaviour.

Unintended associations due to poor trainer timing, or the chance association with another, random, stimulus, occurs as frequently with reward based training as it does

with punishment techniques. However, with all avoidance learning, responses are likely to be long lasting and resistant to extinction and counter conditioning compared to positive reinforcement methods (Brush, 1957; Solomon et al., 1953). The difficulty in correcting errors when using aversive methods is significant considering the opportunities for unintended associations, and the potential development of fears for the reasons mentioned above.

A further problem with the use of aversive stimuli, and shock collars in particular, is achieving the optimum level of pain/discomfort to suppress the target behaviour. Starting with a low intensity shock and gradually increasing to find the level required is not effective as animals can habituate to aversive stimuli. To effectively suppress a behaviour, the initial level of punishment needs to be sufficient to suppress the behaviour and avoid immediate reappearance. There are ethical concerns with this approach as there is no way of knowing in advance how intense the initial punishment should be for each individual animal. Given that there is some indication that high levels of stress may influence a dog's ability to learn (Bodariou, 2005; Walker et al., 1997; Mendl, 1999), any punishment that is too severe may also result in a stress response that impedes learning.

Other drawbacks of the use of punishment or negative reinforcement in training dogs include the risk of eliciting aggression, or reinforcing a fearful or phobic response. Although some authors have advocated the use of shock collars in the treatment of certain types of aggression in dogs (Borchelt and Voith, 1996, Tortora, 1982d), as pain is a primary eliciting stimulus for aggression (Johson, 1972) and given that pain caused by an electric shock is a well documented stimulus for aggression in a wide variety of species (Heacock et al., 1975; Hutchinson, 1973), it is clear that the potential exists for a dog to respond aggressively to a nearby person (Polsky, 1983).
Indeed when electrical stimulation has been used for 'snake proofing' (teaching a dog to leave snakes alone), some dogs have been found to attack the snake rather than withdraw (Tortora, 1982c). The suggestion that shock collars are used to kidnap-proof dogs, by training them to avoid strangers offering treats if their owner is not present (Tortora, 1982c) must surely carry the same risk of defensive aggression towards people. In cases of inter-dog aggression, shock collars will potentiate aggression if used when the dogs are fighting (Tortora, 1982c), and case histories suggest that aggression is enhanced if used on dogs showing signs of fear or defensive aggression at the sight of other dogs.

Richard Polsky (1994) examined whether aggression in dogs can be elicited through the use of electronic pet containment systems. He collected data relating to incidents where dogs that were trained, or in the process of being trained, with an electronic pet containment system and had shown aggression towards people. Polsky concluded that due to the lack of prior development, the nature and intensity and context of the attacks, the incidents recorded could quite plausibly have involved shock-induced aggression.

Shock collars have been widely recommended for use to modify behaviours associated with anxiety or fear, such as separation-related behaviours and compulsive behaviours. In the case of behaviours that have developed as a result of fear, there is a risk that aversive stimuli may exacerbate the dog's fear (Tortora, 1982c). Tortora,

(1982d) further states that almost all phobic dogs that he has trained using painful electrical stimulation have attempted to bite during the initial stages of training.

As accurately determining the aetiology of any behaviour requires detailed history taking and expertise, it is unlikely that pet dog owners will be equipped to assess the risk that an aversive experience might actually reinforce their dog's problem behaviour, or create new problems. For this reason, many professional behavioural clinicians do not advocate the use of any form of aversive stimuli by dog owners, where it is likely to cause the dog to become fearful.

With the use of increasingly complex equipment there comes an increased potential for malfunction. Whilst a solid fence guarantees containment and the exclusion of people, a boundary system using a shock collar may fail to function due to damage to the boundary wire, worn out batteries, improper fitting of the collar, problems with the receiver collar or transmitter or extraneous radio signals (Polsky, 1994). Some bark activated electronic collars have been affected by ambient noise, resulting in eventual habituation (Wells 2001).

The relative effectiveness of different training techniques applied in real life situations has not been widely researched, however, in a recent questionnaire survey (Hiby et al., 2004) owners ratings for their dogs obedience during 8 specified tasks was positively correlated to the number of tasks that were trained using rewards, but not using punishment. This suggests that training using positive reinforcement based methods is more likely to be successful than those based on punishment. The study also found that the use of punishment techniques in the training of dogs was associated with an increase in the incidence of problem behaviours. This is likely to be because the use of punishment increases anxiety in the recipient

Is the application of a shock stressful to the dog?

There is little doubt that high intensity electrical stimulation causes a physiological stress response in dogs (Schalke, 2005). Application of initial high intensity shocks has also been found to elicit behavioural responses associated with fear and distress in the dog, including yelping, struggling, biting, freezing, withdrawal, hiding, running to the owner, cowering, trembling, defecation and urination (Tortora, 1982a). Whilst the stress response is a normal/adaptive physiological response that allows an animal to cope with changes in its environment, this can be detrimental where the animal cannot predict and control the situation, for example if the dog being trained is unable to learn how to avoid the shock. Where cortisol levels in dogs exposed to predictable/unpredictable and controllable/uncontrollable exposure to shocks have been measured, they have shown an increased cortisol response in dogs that were unable to avoid the shock (Dess et al, 1983).

These findings were supported by a recent study carried out at Hannover Veterinary School. Beagles that had displayed hunting behaviour towards a mechanical prey device were trained not to chase the prey using shock collars in 3 different treatment groups. Shocks were administered to dogs in the first group when they touched the prey, in the second group shocks were administered if the dog did not obey a recall command when the prey was presented, and dogs in the final group received shocks at

random time points. Salivary cortisol measures showed an increase in cortisol (stress response) in all three groups, but this was significantly greater in the group of dogs that were shocked at random (punishment was unpredictable and uncontrollable). (Schalke et al., 2005).

Whilst studying the effects of inescapable shock on active avoidance learning in dogs, Martin Seligman discovered that if dogs were repeatedly unable to control/avoid shocks, they exhibited learned helplessness and were subsequently unable to learn an avoidance response (passively accepted shock), even when given the opportunity to escape. In addition to the conditioned dogs, 5% of naïve dogs, that had never been exposed to inescapable shocks, exhibited learned helplessness (lay motionless on the floor) from the first exposure, even though escape was possible (Seligman and Maier, 1967). This phenomena has been repeated in numerous studies (Overmier and Wiekiewicz, 1983; Seligman and Groves, 1970; Overmier and Seligman, 1967; Seligman, 1975). High intensities of shock tend to be applied when owners or trainers are angry or frustrated, or in situations where the intensity is gradually increased, due to the animal learning to tolerate the shock when in a situation where it is highly aroused and motivated to perform a behaviour (e.g. livestock chasing).

One of the main concerns about the use of shock collars is that they may cause the recipient to become fearful and/or anxious, resulting in a long term threat to the dog's welfare. Schilder and van der Borg (2004), for example, looked at body posture indicators of emotional state in a group of guarding dogs trained with an electronic collar in comparison with the same measure in a group trained without such a device. The dogs trained with the electronic device were found to show behavioural signs associated with fear and pain (Beerda, 1997), both during training and some time afterwards, both within the training context and outside of the training situation with the trainer. The dogs appear to become anxious in those situations which might predict a shock, with reports of reactions shown over a year after training took place (Schilder, 2004). These findings suggest possible implications for the long-term welfare of the dog.

Proponents of the collars argue that the level of intensity of shock rarely needs to be at a level that would cause such reactions, however a difficulty arises when deciding on an appropriate level, due to large individual differences between dogs. Even within a single breed, dogs have been shown to have a variable capacity for coping with aversive stimulation (Vincent & Mitchell, 1996; Tortora,1982b; Fisher, and Houser & Pare, 1974). This leads to the problem of determining and administering an appropriate level of shock (high enough to suppress the behaviour, but not so high that it causes a prolonged fear or anxiety response) for each individual dog. Although these devices are presented as a highly controllable method of modifying behaviour, via the controlled administering of pain/discomfort (the collars are designed to allow operator to set the duration and intensity of shock), an individual animal's experience when a shock is applied will be influenced by numerous factors. In addition to individual temperament, the experience will be affected by the dog's previous experiences, frequency of application, location of shock, thickness of hair and level of moisture on skin (Lindsay, 2005). Given that many of these factors are not easily determinable by the operator, this makes the device far less precise than suggested.

In addition to this, even if the operator was able to reliably set the level of punishment that the dog would experience, deciding upon what level of punishment is appropriate for an individual dog is not something that can be prescribed. The operator would only be able to assess the level of fear/stress experienced by the dog using behavioural indicators, which would be extremely difficult. This makes it very hard for the operator to assess the dogs response and set the level of stimulation according to the individual's requirements, as recommended in the literature supporting the use of electronic training collars. Indeed given that many of the electronic collars available produce a high-end shock that far exceeds that required by the average dog and owner, and given that stimulation at high levels can produce significant distress and emotional harm to the dog (Lindsey, 2005), there is clearly considerable potential for accidental high level shocks or deliberate abuse, causing suffering to the animal.

There have also been reports of physical lesions on the neck caused by high intensities of shock (Seksel, 1999), especially in wet weather, although these have been contended by proponents of the collars. However, when used in boundary systems the close fitting collars are frequently worn for long periods, leading to the possibility of skin irritation or contact necrosis (Polsky, 1994)

Are shock collars effective training devices?

There has been very little scientific research examining the effectiveness of using electrical stimulation in the training of pet dogs. Shock collars have reportedly been used to suppress predatory behaviour with some success. In a study of hunting dogs, for example, aversive conditioning with a shock collar was found to reduce the probability of dogs chasing or attacking domestic sheep, without any apparent adverse effects (Christiansen et al. 2001). However whether this effect was generalised to all contexts in which sheep were encountered is unclear.

In a comparative study of the use of an electronic anti-barking collar with a citronella collar, the latter was found to be both more effective, and also more readily accepted by the owners of the dogs (Juarbe Diaz and Houpt 1996).

A further study found that the use of shock collars was effective in treating acral lick dermatitis, when used in conjunction with an Elizabethan collar (Ekstein and Hart, 1996) However this study was limited to 5 cases, there was no evidence as to the occurrence of other anxiety related behaviours, nor to the value of the shock collar alone without the Elizabethan collar.

Some authors have also suggested that intense aversive stimuli may not be effective when training behaviours that are incompatible with the animals species specific defense reactions ie; behaviours that the dog would not normally show if it was fearful, such as retrieving an object. (Reid, 1996; Tortora, 1982c; Bolles, 1970).

Given the lack of scientific evidence for the efficacy of behavioural modification using shock collars, particularly in the long term, in addition to the potential for mistakes or deliberate abuse and the difficulty in correcting such errors, the widespread use of these devices must be carefully considered.

Some authors argue that alternative training methods and devices in common use as punishment are as bad or indeed worse that the administration of a shock from an electronic collar (Lindsay, 2005), however Schilder's study suggested that use of shock collar produced an increased frequency of behaviours associated with fear/stress than other "harsh" methods such as the use of prong collars or physical punishment. Regardless of the relative drawbacks of individual punishment methods, there are alternatives to training using any form of aversive stimuli. Indeed, alternative methods are available and effective. Tortora (1982c) argues that the use of electrical stimulation is virtually essential to achieve the high levels of proficiency required for success in competitive dog training, however assistance dogs in the UK are trained very effectively to a high level using only positive reinforcement.

Animal trainers and clinical behaviourists have an obligation to use the least aversive means necessary to produce behavioural change. Individuals vary as to whether this allows for the use of shock collars as last resort, when positive methods have been unsuccessful and failure to modify the dog's behaviour would result in compromised welfare in the long term.

Shock collars are freely available to the general public and are sold with minimal instruction. As their humane use requires a highly skilled user, some authors argue for a licensing system, to restrict the use of electronic collars to experienced trainers and thereby minimise the potential for incorrect use (Schalke et al., 2005, Tortora, 1982d; Christiansen et al., 2001).

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