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Understanding and Preventing Canine Aggression Mini Series

Session One: Triggers and Influences for Canine Aggression

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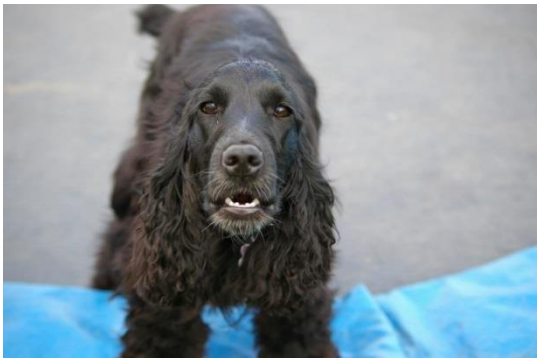


Understanding and preventing Canine aggression

Study notes

Aggression is the principle reason for the majority of canine behaviour referrals and is a frequent problem in veterinary practice. However a great deal of canine aggression is caused or aggravated by misinterpretation of how dogs behave in situations of threat or conflict. A better understanding of canine communication, what influences a dog's use of aggression and how it can be prevented can therefore substantially reduce aggressive incidents. The key areas this webinar series will cover are as follows:-

Session 1

- Why it is important practice staff understand aggression
- What is meant by aggression
- The evolutionary purpose of aggression
- Types of aggression
- The factors that influence aggressive behaviour
- An update on dominance theory

Session 2

- Using communication to prevent or diffuse aggression
- How effective socialisation, habituation and early development can prevent aggression in later life
- Using commands to communicate with and control pets, to prevent aggression due to frustration or miscommunication
- The risks associated with using punishments and how these may trigger aggression in dogs

Session 3

- How to prevent and manage aggression in the practice
- Teaching dogs to accept interventions and to accept wearing a muzzle
- The legal implications of owning or being in charge of an aggressive dog
- Assessing and managing risk
- Appropriate first aid advice whilst a client is awaiting referral
- Where to refer

Session 1: Triggers and influences for canine aggression

Why is it important practice staff understand aggression?

If a dog is behaving aggressively this primarily affects the target, which may be a family member, visitor to the house, professional involved with caring for the dog or member of the public. In 2014 Casey et. al. found that 3% of owners reported that their dog had shown aggression to a family member, 7% reported aggression to unfamiliar visitors and 5% reported aggression to unfamiliar people outside of the house. In most cases this behaviour will have been limited to growling, snarling, lunging or snapping. However in some cases this will have escalated to biting, and hospital admissions suggest injuries can sometimes be severe. In 2014/15 7227 people required hospitalisation for 'bites and strikes' from dogs (Health and Social Care Information Centre, 2015), although it must be kept in mind that these figures include accidental as well as deliberate injury.

Other dogs are also at risk from an aggressive dog. 22% of owners reported that their dog shows aggression to other dogs outside of the household and 8% were said to show aggression to another dog within the household (Casey et. al., 2013). Again, this often won't involve injury but dogs do sometimes inflict harm on other dogs and have rarely killed them.

It must also be kept in mind that, even if the owner is not the target of the aggression, they are still invariably indirectly affected by their dog's behaviour. They may find themselves the subject of criminal or civil litigation and even where this is avoided most owners find their dog's aggressive behaviour distressing, especially where there is a risk they may lose them.

Perhaps at greatest risk is the dog itself. Most aggressive behaviour is a sign of emotional distress. 4% of all canine euthanasias are carried out on behavioural grounds, on dogs with a median age of just 4.2 years, and problem behaviour is the number one reason for euthanasia in dogs under three years of age (O' Neill et al., 2013). Euthanasia by rescue shelters is also predominantly on behavioural grounds (Bollen and Horowitz, 2008).

As such canine aggression is a serious public health and canine welfare concern. Therefore, even where a dog is not showing aggression is the practice, veterinary staff have a responsibility to ensure clients are given the best possible advice on how to prevent, manage and address aggression as part of a holistic approach to patient care. These webinars aim to prepare practice staff to fulfil this essential aspect of their everyday role.

How do we define aggression?

The definition of aggression varies according to species and context. When talking about the domestic dog, everyday use of the term usually refers to any behaviour that threatens or causes actual injury, such as growling, snarling, snapping and biting. Such behaviour is generally seen as the dog's way of trying to control the target and although it may sometimes be recognised as defensive, it is also often interpreted as offensive or an attempt to assert power or dominance.

However this definition misinterprets the key reasons for such behaviour and overlooks the many other communicatory signals dogs use around threat or conflict. We therefore need to reconsider how we view a dog that would – in everyday terms – be described as aggressive.

Why do dogs use aggression?

There are three principle recognised drives behind aggression.

Predatory aggression

Predatory aggression describes the capture, killing and consumption of prey. Physiologically it is primarily associated with activation of the lateral hypothalamus. It triggers similar sensations of pleasure as eating and involves little emotional or 'fight or flight' arousal.

Behaviourally, predatory aggression is often described as 'quiet-biting' aggression. This reflects the lack of communication, especially vocalisation, used during execution. The aim is for the dog to get as close to the prey as possible without alerting it to his presence. The dog is therefore invariably silent and will observe and stalk the target until it gives flight, at which point the dog will be triggered to chase. The chase will typically continue until the target is captured or escapes and is unresponsive to communication signals.

Predatory aggression is generally directed at small prey animals that the dog hasn't been familiarised to. It may rarely be directed to other, usually smaller, dogs or towards babies and very young children.

Affective aggression

Affective aggression, also referred to as emotional aggression, occurs in response to some kind of threat. This may be a real or perceived threat to something of value to the dog such as food, toys, a territory or a person the dog relies on for resources or protection. Alternatively it may occur in response to a real or perceived threat to the dog's own safety, or the safety of a member of the dog's social group, especially offspring.

Physiologically affective aggression is primarily associated with activation of the ventromedial hypothalamus and the acute stress 'fight or flight' response. There is also substantial activation of the amygdala, which is responsible for moderation of sensations of fear, and the periaqueductal gray matter which is linked to anxiety, distress, panic and terror. As such affective aggression is emotionally distressing for the dog.

Behaviourally, affective aggression involves a great deal of communication and is substantially affected by the behaviour of the target. In fact the majority of the behaviour described as aggression using the everyday definition is in fact communication, intended to avoid the risk of injury. This is the most likely form of aggression to be seen in the veterinary practice.

Hostile aggression

Hostile aggression describes a form of aggression, typically seen in humans and other primates, that involves the use of affective aggression with no clear immediate goal. Examples include aggression used to extract revenge or in spite. Although there is no immediate goal it is thought there may be a less direct social purpose to such aggression in humans. For example fear of revenge may inhibit certain behaviour.

Humans tend to interpret other's behaviour by comparing it to their own and assuming similarities: we can never truly know what another is feeling but we can assume that it is similar to how we feel in the same situation. It is therefore natural for humans to interpret the behaviour of other species in the same way. The result of this is that many people will see their dog's aggressive behaviour as hostile. For example they may feel their dog has bitten them because they dislike them or because they would not allow the dog to have their own way the day before. There is no evidence to suggest dogs are capable of hostile aggression. As such, this belief is misguided. However it is important to be aware of it as it may often affect the owner's relationship with and response to their dog's behaviour.

The evolutionary purpose for aggression

When considering a dog's use of aggression we need to keep in mind the evolutionary purpose behind it. All behaviour, including aggression, is primarily driven by the core drives of survival and procreation. Predatory aggression provides food. Affective aggression keeps possession of food and other resources, competes for the best mate and protects both the dog itself and those important to passing on its genes into the next generation such as social affiliates and offspring.

However, most dogs depend on humans for survival and domesticated species don't tend to endure if they don't fulfil the niche they are designed to fill. As such, can aggression to humans, especially household members, ever be evolutionarily advantageous to dogs? To answer this we need to consider the complex interplay of influences over a dog's behaviour, and so use of aggression.

The key influences over a dog's use of aggression

Dogs use affective aggression when they feel that either they, a member of their social group or something they value is under threat. However there is a great deal of individual variation in how dogs perceive threat and choose to respond to it. The influences over this can be loosely broken into three categories: physiology, experience and the current situation.

Physiology

A dog's use of aggression is physiologically controlled by the joint influences of the nervous and endocrine systems, and the physical control of the musculo-skeletal system. These are in turn affected by a number of physiological states.

Genetics

Demonstration of the genetic traits controlling both physical appearance and biological control of behaviour depends on a complex interplay of individual gene combinations. At its simplest one gene may be dominant over the other and so may be expressed. However, genes are not always completely dominant and gene expression may reflect the effects of a number of genes interacting with each other. Some genes are 'linked' and so are always shown together, whether to express a single trait or two related traits. Others act singly to affect a number of different traits. Recessive genes can be demonstrated where there is no dominant gene to supress them, and genetic variation can always arise due to genetic mutation. Certain genes are also only 'switched on' by environmental factors such as experience or diet and so may not always are demonstrated.

If a gene combination is not adaptive – i.e. it results in the dog not surviving and procreating – it won't be passed into the next generation and so won't become established. In domesticated species what is adaptive is usually determined by humans and how well the dog fits their needs or expectations. However there can be a fine line between those behaviours humans consider acceptable and those they don't. For example how much territoriality would an average owner want their German shepherd dog to show before they – or the law – considered it unacceptable and so not 'adaptive'? As such even a minor variation can mean the dog is no longer suited to being a human pet. We must also keep in mind that even if the dog's genetic makeup is not adaptive and so won't be passed into the next generation, that gene combination still exists in that individual at that time.

Dogs as a species share many genetically driven behaviour patterns and physical abilities. However, the dog is genetically very diverse with substantial variation in the genetic influences on both appearance and behaviour between breeds. Each breed was created through artificial selection to fulfil a particular need for mankind. Although appearance played a part in some breeds the original basis for breed selection was usually behavioural. Therefore, a dog's use of aggression will be affected to a greater or lesser degree by its breed. Some breeds were originally selected for heightened aggressive responses such as those used for guarding or fighting. However, it must always be kept in mind that genetics is only one of many influences over dog behaviour and to what degree those traits are seen in the individual dog depends on their unique combination of genetics, other physical influences, experience and handling. Breed therefore isn't a reliable predictor of a dog's likely use of aggression alone.

Congenital factors

Development in utero can have a marked effect on a dog's behaviour in later life. For example it may be born with abnormalities that impact on physical ability or normal development. Maternal stress, nutrition, illness and veterinary interventions can also result in congenital influences. For example it is know that if the dam is distressed during pregnancy this can impair normal stress responses in offspring as they mature which can in turn affect their response to (perceived) threat.

Illness and medication

Illness, especially where it affects neural and endocrine function, the senses or physical ability can have a marked effect on the animals choice of or ability to perform a behaviour. Digestive disorders can also impact on a dog's use of aggression due to increased value placed on food, or to weakness or lethargy which may in turn cause irritability. Pain will increase the likelihood of defensive behaviour and may trigger 'fight' due to animal's inability to 'flight'.

Diet

Even in the healthy dog diet can impact on behaviour and the likely use of aggression. For example if a dog is given more protein that he needs for growth and repair this can elevate energy levels and interfere with serotonin production, which can in turn increase aggression. Some dogs are also anecdotally said to be adversely affected by the artificial colours in some commercial dog foods or table scraps. Blood sugar fluctuations, such as in dogs fed once a day or fed high sugar diets, can also result in irritability and so increased reactivity.

Reproductive hormones

Testosterone, oestrogen, progesterone and other reproductive hormones start exerting an influence on a dog's behaviour in utero. Dogs therefore already have the hard wiring for some male and female patterns of behaviour by birth. These are unaffected by neutering.

As puberty approaches elevated testosterone levels in entire male dogs will drive sexually competitive behaviour towards other entire male dogs, and increase confidence and risk taking behaviour. The latter can affect the dog's choice of 'fight' over 'flight' and increase the speed, intensity and duration of aggressive incidents. However, other than where there is competition between entire males for a bitch, testosterone does not drive the aggressive behaviour and so castration is unlikely to entirely resolve it. A reduction in testosterone due to castration can also lead to a reduction in confidence and associated increase in perceived threat and so, in some cases, increase the likelihood of an aggressive response.

The female dog is also affected by hormones as puberty gets nearer. As the first season approaches oestrogen levels rise, triggering increased competitiveness with other females. After ovulation the principal reproductive hormone changes to progesterone and this heightened aggression passes. However, if gravid she may become protective of young once they are born. The hormone triggering this, prolactin, is also present in pseudopregnant bitches, and may trigger protective behaviour towards surrogates such as fluffy toys.

Medications

Various medications can impact on behaviour. Any drug that interacts with the nervous or endocrine systems may impact on the dog's behaviour and therefore use of aggression, whether intentionally or not. Other medications thought to possible affect behaviour are as follows: -

- Early research suggests that corticosteroids may intensify stress responses or increase the use of aggression.
- Antihistamines may cause drowsiness, blurred vision, confusion, excitation and irritability all of which may increase the likelihood the dog will use aggression.
- Acepromazine reduces arousal and reward, induces lethargy, slows reactions and blunts decision-making. This may result in defensive or inappropriate aggression.
- Phenylpropanolamine, used for urethral sphincter incompetence in the bitch, may increase restlessness, irritability and aggression.

Old age

As dogs age their ability to respond proportionately to the environment tends to reduce. This can be due to reduced sensory function, the inability to perform behaviours due to physical degeneration or interference with normal neural processing due to ageing of the brain. In some cases this can lead to increased anxiety and/or defensive aggression due to the inability to read and respond normally to the environment.

Experience

Genetics and other physiological influences provide a framework for the dog's behaviour. This is then modified through experience.

Early development

As a puppy reaches 3-4 weeks of age he enters his sensitive period of socialisation and habituation. During this period the puppy forms familial and sexual bonds with the species most like him and social bonds to any others he encounters. He also learns to accept everyday stimuli as harmless and how to cope with stress. The puppy's heightened ability to do this continues to about 8 weeks, after which it starts to taper. By the age of around 12-13 weeks this sensitive period closes. How the puppy responds to unfamiliar or potentially threatening situations after this depends on his ability to properly balance curiosity with caution and whether he learnt to cope with stressors during this sensitive period. His experiences during this period will therefore have a substantial influence on his likely use of aggression in later life.

Although the puppy's heightened sensitivity to accepting and learning to cope with new things closes at 13 weeks, learning is lifelong. Learning involves repeated firing of one neuron by another, strengthening the connection and so increasing the likelihood the same synapse will fire again in the same situation next time. Strengthening is permanent but can be outweighed by an even stronger link between different neurons that trigger a different emotional response or behaviour. Learning tends to fall into a number of categories as follows.

Habituation

Habituation is the process by which the level of neurotransmitter produced at a synapse reduces following repeated exposure to a stimulus that is seen to have no relevance to the dog's safety. Dogs are particularly sensitive to this during their sensitive periods discussed above. However it occurs lifelong. Habituation can reduce the likelihood of an aggressive response to a trigger.

Sensitisation

Sensitisation is the process by which a sudden or very strong stimulus causes a rapid increase the amount of neurotransmitter produced at a synapse. This has the effect of making the animal very sensitive to the stimulus that triggered it, often causing heightened awareness of it or over reaction to it. This can increase the likelihood of an aggressive response.to it in the future.

Classical conditioning

Classical conditioning is the process by which a naturally occurring stimulus becomes paired with another – previously irrelevant – stimulus, enabling the previously irrelevant stimulus to trigger the same involuntary response as the naturally occurring stimulus. For example Pavlov found that if he rang a bell (the irrelevant stimulus) at the same time as he brought some smelly food into the room (the naturally occurring stimulus) then the dogs would not only salivate at the smell of the food (the involuntary response) but also – after sufficient repetitions – at the sound of the bell on its own.

The relevance of classical conditioning in a dog's use of aggression is that fear is an involuntary response and drives a great deal of aggression. As such anything that naturally triggers fear has the potential to become classically conditioned to other, otherwise irrelevant, stimuli. They can then trigger the fear, and possibly aggression, on their own. For example if a dog is handled when it has a painful injury the natural stimulus of pain will not only trigger fear at the time but also carries the risk of inadvertently becoming classically conditioned to other stimuli in the environment e.g. a vets green coat. The vets green coat can then be enough to trigger fear – and so potentially aggression - even when the dog is no longer in pain.

Operant conditioning

Operant conditioning is the process by which a dog learns the effects of his behaviour. If a dog does something that results in a good outcome they are more likely to repeat that behaviour. If the dog does something that they learn results in an undesirable outcome they are less likely to perform that behaviour. This type of learning can occur accidentally, can happen through a process of trial and error in which the dog tries different things to find out what the outcome will be and then chooses the most favourable one, or can be manipulated in the form of training. The latter will be discussed more in session 2. The relevance of operant conditioning in aggression is that if a dog learns that aggression works to keep control of a resource or repel a threat he is then more likely to use it again in the future.

Complex learning

Complex learning involves processing of information. It is how dogs categorise and develop relationships between things in their environment, and incorporate them into existing knowledge. They can also make deductions based on information that they already have.

Cultural learning

Cultural learning is the process by which animals learn from each other. Dogs will learn through observation of others, both human and canine, and can also learn through routes such as scent.

Interaction

All these forms of learning have the potential to impact on a dog's use of aggression in combination. For example a dog that has previously been a stray may have operantly learnt to use threat to acquire food from other dogs, classically learnt to be fearful of people due to punishment for stealing, and may have learnt how to open a door to steal food from a closed storeroom through trial and error, complex learning or observation. He may have habituated to the sound of traffic but become sensitised to the sound of people approaching. He may or may not have socialised to people during his sensitive period and so may or may not ever be able to live comfortably alongside them.

The current situation

Although physiology and experience play a big part in determining how a dog will respond in a situation of conflict, the greatest influence is reserved for factors in the dog's current environment.
The principle environmental triggers for aggression are things the dog has an established fear of, such as certain types of people or other dogs. Dogs that didn't learn to cope with new things during their sensitive period may also react defensively to anything unfamiliar. Aggression may also be triggered by a genuine threat to safety or a threat to a possession of value such as a bone or a mate. The dog's perception of the triggers will be coloured by all kinds of environmental influences. For example a dog's willingness to protect a bone may be affected by the current availability of food. Competition with another entire male will be increased when there is an entire bitch in the area. The emotional state of others can also impact on the dog's response. For example if another dog is releasing stress pheromones or a person is behaving anxiously the dog will take this as a sign there is something to be worried by. Fluctuations in their own emotional state, perhaps due to an upheaval or recent stressful event, can also be relevant.

However, the biggest effect on the dog's use of aggression is the behaviour of the target. If faced with the potential loss of something of value the dog will normally start by using low level threat. How this then progresses depends on a combination of the target's response and the value of the item. If the target backs off the dog is unlikely to escalate further. If the target doesn't back off the dog then has to choose whether or not he is willing to risk injury to protect the resource. If he is he may then use a higher level of threat or possibly true aggression. If he isn't he will appease and withdraw.

If the dog feels his safety is being threatened he will normally start by using appeasing signals. However if he tries this and it doesn't work some dogs may then try using threat instead. Some dogs may also bypass appeasing signals and opt straight for low level threat, especially if they have learnt in the past that appeasing doesn't work. If low level threat doesn't work the dog is again faced with the decision to withdraw and appease, or to try higher level threat or true aggression.

Trigger stacking

It is sometimes suggested that a dog may seem to react out of the blue to something that hasn't concerned him in the past, or that he may use aggression erratically, making him seem unpredictable. This may arise because the owner didn't notice appeasing or lower level threat signals on previous occasions. They therefore feel that the dog's use of higher threat or aggression is the first time he has shown any signs of concern, when in fact he has always done so.

Dogs can also show different levels of aggression in similar situations due to a principle called trigger stacking. Trigger stacking is a way to explain how dogs react to triggers in combination that they may not react to individually. For example a dog that is worried by noise and needles may have coped with an injection at a quiet time in the practice without any obvious signs of concern in the past (see fig. 1). However if the same dog is in a waiting room with a very noisy dog giving off lots of stress pheromones these may push him much closer to his threshold, and the injection may then be the final straw that causes him to react aggressively (see fig 2).

Fig 1

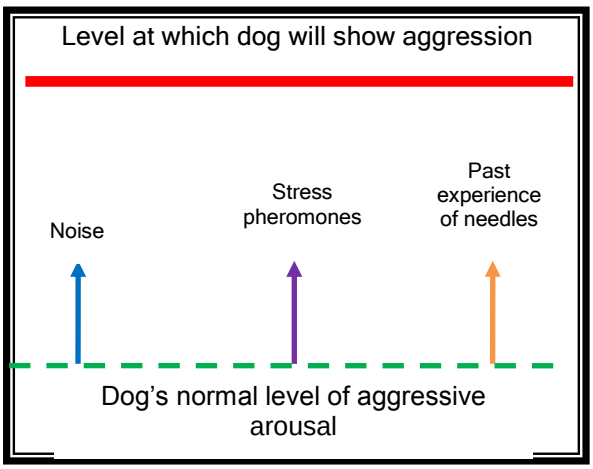
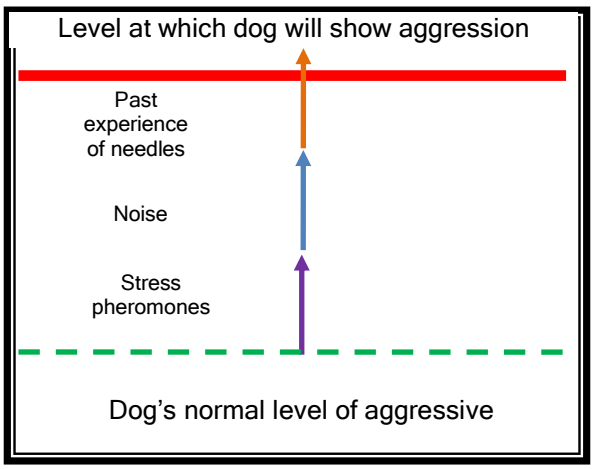


Fig 2



Frustrated aggression

Occasionally aggression may arise due to frustration. Frustration and aggression are very closely linked emotions and so dogs that are unable to do what they want to do or that are confined may often show threat type behaviour without any desire to harm or repel the target. They are simply relieving frustration. Frustrated or fearful dogs may also relieve these emotions by showing aggression to the nearest target, such as another dog or person.

Compulsions

Rarely dogs may show aggressive behaviour due to a compulsion. Compulsions tend to occur where a dog is subject to some kind of adversity and so performs a behaviour to help them cope with it. Aggressive compulsions usually develop where the dog's initial response to the adversity is to use aggression and it then becomes a ritual. It may then persist even after the initial trigger has gone.

Dominance hierarchies and the domestic dog

It is commonly thought that dogs show aggression in order to assert their dominance over the target, or to try and elevate themselves to the position of alpha or pack leader. However, although this explanation was widely accepted for many years, we now know that dogs do not show aggression to compete for status.

The original theory behind this premise suggested that dogs live in a linear hierarchy in which all members of the dog's pack, including any humans, have a place in order of seniority. The individual at the top of the 'pecking order' was said to have preference over all others for anything of value, including the right to breed, and to maintain this by ensuring he was always the first to eat, slept in the highest position, walked ahead of all others and controlled their behaviour at all times. Lower ranking members were expected to automatically defer to this and any failure to do so was seen as a challenge for the position of alpha. It therefore needed to be corrected, using aggression if necessary.

This theory has its roots in research into the behaviour of a pack of ten or so unfamiliar wolves of two different species kept in a 10m by 20m enclosure in the 1930-40s. The researcher observed a great deal of tension between the wolves. The stronger wolves would control the behaviour of the weaker wolves using sometimes fatal aggression, especially around the breeding season. The weaker wolves would try to avoid such aggression by routinely deferring to them.

More recent studies have looked at the behaviour of groups of feral dogs and of domestic dogs living in rescue compounds. Although there were incidents of occasional conflict, and some individuals were more assertive than others, no clear hierarchy was found and there was no evidence of the dogs controlling each other to maintain the position of 'alpha'. Research into wild wolves has also shown that wolf packs are normally formed from family groups who live co-operatively without excessively controlling behaviour or aggression.

It is therefore now recognised that the behaviour seen in the captive wolves was not typical, and was very likely to have been caused by unfamiliar wolves being forced to live together in close captivity. We also now recognise how much dogs have changed from their wolf ancestor. They are now scavengers rather than pack hunters. They are promiscuous breeders that do not form pair bonds. They have evolved to live comfortably alongside, communicate with and seek care from humans. As such it is no longer useful to look at the behaviour of wolves to understand the behaviour of dogs.

As it is now known that dogs do not live in linear hierarchies accredited behaviourists no longer advise owners to manage their dog's behaviour by asserting themselves as pack leader. They are still advised to teach their dogs manners and to ensure their dog obeys their commands through calm, consistent and force free training. However they are not advised to follow pack hierarchy rules such as eating first, preventing access to sofas or beds and walking ahead through doorways as dogs won't understand them. They are also no longer advised to assert their dominance through use of pain, force or intimidation such as dominance stares or alpha rolls. The credentials of any behaviourist still using these methods should therefore be checked very carefully.

Rage syndrome

Rage syndrome, which is also perhaps less provocatively referred to as 'sudden onset aggression', describes sudden, high-level and apparently unprovoked aggression. It is typically given as an explanation for aggressive outbursts in cocker and Springer spaniels, although has also been suggested in other breeds. However care must be taken before considering such an explanation for apparently unprovoked aggression. The vast majority of cases of aggression in cocker and Springer spaniels can be explained using the normal influences discussed above. Aggression that can seem unprovoked and to escalate rapidly has often been preceded by threat signals that the client did not see or understand, and this tendency is aggravated in spaniels due to conformation that can interfere with normal communication. For example spaniels are unable to control their ears to signal fear and their soft loose skin can make reading facial expressions difficult. Most cases of suspected 'rage' can therefore be explained and treated in the same way as most other cases of aggression. Those rare cases for which there isn't a more parsimonious explanation are thought to be due to a form of seizure activity.