

University of Veterinary Medicine, Budapest

Department of Animal Hygiene, Herd Health and Mobile Clinic



Stress Free Handling Methods of Dogs in the Veterinary Practice

(Literature review)

By: Sally Sofia Rosengren

Supervisors: Dr. Jurkovich Viktor and Dr. Laura Hänninen

Internal supervisor: Senior research fellow, Dr. Jurkovich Viktor, DVM, PhD, Dip ECAWBM-AWSEL, University of Veterinary Medicine, Budapest, Hungary

External supervisor: Senior clinical instructor, docent Laura Hänninen, DVM, PhD, Dip ECAWBM-AWSEL, Faculty of Veterinary Medicine, University of Helsinki, Finland

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Abstract

While there is existing research on stress and risk factors for stress of dogs in a clinical setting, gaps still exist in understanding how to mitigate this stress effectively. This literature review aimed to explore methods for reducing stress in dogs at the veterinary clinic.

The review emphasizes that the prevention of negative emotions is key in reducing fear in veterinary practice. However, tailoring stress-reduction tools to individual dogs can be difficult in a busy clinic with limited time and resources. Identifying behavioural signs of stress in dogs during a veterinary visit is crucial but challenging to interpret accurately. Both owners and veterinarians can identify major signs of stress, but minor signs are often missed or misinterpreted.

Additionally, results of studies on behavioural modification techniques and training have not shown consistent effectiveness in reducing fear in dogs at a veterinary clinic, especially for already fearful or aggressive dogs. Training, often conducted by owners outside the clinic, may have low compliance rates and difficulty translating into the clinic environment. Negative reinforcement training methods used by owners can lead to more aggressive behaviour in dogs at the veterinary clinic.

There is a need for more specific research to test and evaluate various recommendations for reducing fear in dogs at veterinary clinics. Research on factors that protect dogs from stress in a veterinary setting is scarce. Existing studies are often conducted outside the veterinary setting or rely on research from other species. Furthermore, many guidelines and reviews on stress of dogs in a veterinary clinic, rely heavily on expert opinions and experiences. I emphasize the need for carefully designed studies to assess the efficacy of handling techniques and training methods. Finally, the complexity and evolving terminology in the field of behaviour modification techniques for dogs is highlighted.

Absztrakt

Bár a kutyák stresszével és a stressz kockázati tényezőivel kapcsolatban klinikai környezetben már vannak kutatások, még mindig vannak hiányosságok annak megértésében, hogyan lehet ezt a stresszt hatékonyan csökkenteni. Ez az irodalmi áttekintés az állatorvosi klinikán a kutyák stresszének csökkentésére szolgáló módszerek feltárását tűzte ki célul.

Az áttekintés hangsúlyozza, hogy a negatív érzelmek megelőzése kulcsfontosságú a félelem csökkentésében az állatorvosi gyakorlatban. A stresszcsökkentő eszközök egyéni kutyákra szabása azonban nehéz lehet egy elfoglalt klinikán, ahol az idő és az erőforrások korlátozottak. A stressz viselkedéses jeleinek azonosítása a kutyáknál az állatorvosi látogatás során kulcsfontosságú, de kihívást jelent a pontos értelmezése. Mind a tulajdonosok, mind az állatorvosok képesek azonosítani a stressz főbb jeleit, de a kisebb jeleket gyakran nem veszik észre vagy félreértelmezik.

Emellett a viselkedésmódosító technikákkal és tréningekkel kapcsolatos tanulmányok eredményei nem mutattak következetes hatékonyságot a kutyák félelmének csökkentésében az állatorvosi klinikán, különösen a már félős vagy agresszív kutyák esetében. A gyakran a klinikán kívül, a tulajdonosok által végzett képzésnek alacsony a megfelelési aránya, és nehezen ültethető át a klinikai környezetbe. A tulajdonosok által alkalmazott negatív megerősítéses képzési módszerek az állatorvosi klinikán a kutyák agresszívebb viselkedéséhez vezethetnek.

Konkrétabb kutatásra van szükség az állatorvosi klinikákon a kutyák félelmének csökkentésére vonatkozó különböző ajánlások tesztelésére és értékelésére. Kevés a kutatás azokról a tényezőkről, amelyek megvédik a kutyákat az állatorvosi környezetben fellépő stressztől. A meglévő tanulmányokat gyakran az állatorvosi környezeten kívül végezték, vagy más állatfajokon végzett kutatásokra támaszkodnak. Ezen túlmenően a kutyák állatorvosi klinikán történő stresszel kapcsolatos számos iránymutatás és áttekintés nagymértékben támaszkodik szakértői véleményekre és tapasztalatokra. Hangsúlyozom, hogy gondosan megtervezett tanulmányokra van szükség a kezelési technikák és a kiképzési módszerek hatékonyságának értékelésére. Végül kiemelem a kutyák viselkedésmódosító technikáinak összetettségét és fejlődő terminológiáját.

Table of contents

1. Introduction.....	5
2. Methods	7
3. Addressing Stress at the Veterinary Clinic	8
3.1. <i>Stress, Anxiety and Fear</i>	9
3.1.1. Behavioural Signs.....	10
3.1.2. Physiological Measurements of Stress	11
3.2. <i>Factors Affecting Fear, Anxiety and Stress of Dogs in a Veterinary Setting</i>	13
3.2.1. Dog-related Factors	13
3.2.2. Previous Experience	14
3.2.3. Handling.....	15
3.2.4. Physical Environment	16
3.3. <i>Learning Techniques and Stress Reduction at the Clinic</i>	18
3.3.1. Introduction to Classical and Operant Conditioning	19
3.3.2. Habituation.....	22
3.3.3. Counterconditioning	23
3.3.4. Cooperative Care and Collaborative Care Training	23
4. Discussion and Conclusion.....	25
5. Bibliography	29
6. Acknowledgements.....	34
7. Thesis Progress Report and Acceptance Letter	35

1. Introduction

Many dogs have shown to be fearful at the veterinary clinic, eliciting a stress response. Thus the importance of addressing this issue has emerged especially in recent years [1–5]. Several factors are identified that affect the experience of the dog at the veterinarian: the routine care, investigations as well as medical procedures by veterinary staff, the cooperation between patient, owner and staff, the attitude and education of veterinary staff, and the communication between the owner and the veterinarian [2, 6].

The stress of dogs is a very broad subject that could be reviewed as its own entity. It will only be addressed briefly in this review, especially when it relates to understanding and recognising the signs of stress at the veterinary visit. Stress can be either acute or chronic. A short-term exposure to a stressor triggers an acute stress response, whereas chronic stress ensues when the stress is prolonged, if it is excessive, or if it occurs frequently [7].

The low-stress experience of the dog during a veterinary visit is increasingly identified as important, not only for the welfare of the dog but also for the owners and, therefore, for the veterinary clinic and its staff. A dog that is fearful is a safety issue for staff, as an anxious and fearful dog might act aggressively [8]. The stress of a dog at a veterinary clinic is affected by both the workflow as well as the environment, and these will either lower or enhance the stress of a dog [7]. The distress of animals during a veterinary visit should be viewed as a welfare concern but is currently, in many instances, regarded as a normal part of the veterinary visit [9]. Fear and aggression are expected behaviors during a veterinary visit; for example, muzzles are used more often than treats in the examination room, and this shows that the handling of animals often relies more on negative actions than on rewards [10].

This literature review will focus on controlled, peer-reviewed studies of methods aimed at minimizing the stress of dog's at the veterinary clinic. I will focus on the factors predicting the fear, anxiety, stress, and aggression response of dogs. I aim to address how to reduce the acute stress experienced by the dog during a veterinary visit and the factors that affect this. The usefulness of the handling methods and behavioural modification techniques studied in

alleviating stress in dogs at veterinary clinics will be reviewed. Pharmacological methods to alleviate fear and anxiety will not be dealt with.

The target group of this review is veterinarians and staff at veterinary clinics. I hope that my work can show that it is worth paying attention to the handling of dogs to reduce fear and anxiety and to encourage them to engage with the owners to instruct them on how to prepare the dog for a visit at the clinic.

2. Methods

For this literature review, peer-reviewed literature reviews and original research articles were obtained from a range of searches and sources such as Google Scholar, PubMed, and Science Direct, to mention a few. As the research field is quite new, relevant scientific books and guidelines on providing humane pet care, force-free dog training and learning techniques were also studied and used to gain a better understanding on the emerging nature of research within this field.

During the process, a primary focus to include the keywords "dog/canine," "stress," and "veterinary" was considered in the search of relevant material. To improve the search scope, these keywords were combined with several search terms. The exploration began with terms encapsulating the physiological and behavioural stress responses of dogs, including search words such as: behaviour, chronic/acute stress, fear, fear-free, low-stress, stress-free, anxiety, aggression, behavioural response/signs, and physiological response. Additionally, keywords to explore factors and methods influencing these responses was used, such as: risk factors, restraint, physical environment, handling methods, learning techniques and behavioural modification techniques. Including amongst others; operant and classical conditioning, positive reinforcement, desensitization, counterconditioning, and collaborative care.

3. Addressing Stress at the Veterinary Clinic

There is no inherent fear of veterinary clinics in dogs. It is not possible to totally avoid stress at a veterinary clinic, and the situation at a veterinary clinic is a typical stressful situation for a dog; the dog cannot control the situation and the procedures at the clinic are, from the dog's point of view, unpredictable [7]. The stress-related behaviour and an accompanying physiological response an animal exhibits in the veterinary clinic can be perceived as a somewhat normal reaction [11]. However, the provocation of fear in a dog to a veterinary clinic is a learning process where the unpleasant experience of stressors evokes a stress response. Repeated exposure to a stressor can intensify the stress response, thus sensitizing the dog to stress during subsequent visits to the veterinarian. If the negative experience during a veterinary visit is strong enough, a conditioned fear response can emerge even after only one exposure to the stressor [7]. Therefore, in order to accurately approach a dog at a veterinary clinic, it is essential to recognize the signs of fear, anxiety, and stress of a dog as well as have an insight into the range of factors that play a role in the experience at the clinic.

3.1. Stress, Anxiety and Fear

Stress can be perceived as a physiological and behavioral response to the emotions of fear and anxiety. Fear has been described as the emotional reaction to a real threat, and anxiety as the emotional response to an anticipated or potential presence of a threat [12]. Stress has been defined as “a response [that] consists of the physiological, behavioural, and psychological changes that occur in the face of a challenge to an individual’s state of well-being” [13]. Regardless of the threat of real danger, the stress response of the animal follows from the perceived danger of the stressor [14, 15].

Encountering a stressor and the subsequent distress causes a reduction in the welfare of the animal, and every negative experience may increase the fear and anxiety that the dog experiences at the next veterinary visit [1]. The fear of the animal affects the owner as well. In one study, 22% of dog owners reported that the fear of their dog in the veterinary clinic affected the frequency with which they otherwise would visit the clinic [16]. The owners would visit the veterinarian more often if the dogs would not be fearful. Avoiding veterinary visits could potentially be harmful to the long-term health of the dog [1, 17]. Human safety is also an important reason for addressing stress at the veterinary clinic. An increase in the level of fear leads to aggression, where the dog can resort to, for example, lunging, snapping, and biting [1, 6, 10, 11, 18].

Minimizing the stress for the dog at a veterinary clinic has been suggested to be achieved by a low-stress environment and handling the animal so that it does not experience more stress than needed for the procedure [3].

It is essential to detect signs of stress in the clinical setting. Methods used in studies identifying stress in dogs during veterinary visits, range from questionnaires or surveys to the owners [19, 20] and veterinary staff [19], observations of behavioral signs of stress [6, 8, 10], and to the physiological reactions to stress [9]. There are several responses to any stressor [9] and consequently, several problems and sources of bias when measuring the stress of dogs.

3.1.1. Behavioural Signs

A patient's welfare can be compromised by stress. A dog can respond behaviourally to stress either actively or passively. A crouching, freezing or sitting dog, a low tail posture or flattened ears, gaze avoidance, refusing to eat, rolling on its back, and the retention of urine, can be seen as passive responses of the dog to stress [10, 21]. The active stress response involves an emotional behaviour where the dog attempts to avoid the real or the perceived threat. The intensity of the active behavioural response depends on the stress-level, personality and previous experience of the dog. A low-intensity active response could be exhibited by lip licking or other displacement behaviour. When the response progresses, it can include leaning away from a threatening stimulus, crouching, and an increased stiffness of the face and body muscles. As the response intensifies further, the dog may pant, tremble and empty its anal glands. The hairs may bristle, the stand up positioning of the ears may increase. The dog may snarl, snap, and even bite [1, 6, 10, 11, 18, 22, 23]. Aggression is indeed suggested to be a sign that a dog's threshold for fear has been exceeded [4]. The ensuing distress behaviour (e.g., aggression) thus presents a risk to both owners and staff [21].

Studies addressing stress in dogs in the veterinary clinic use a combination of different measures, either to observe signs of stress during the veterinary visit or to compare the level of stress between a control and a treatment group [8, 9, 24–26]. It is useful to include several factors in measuring stress in complex situations such as the veterinary clinic, and a stress response index has been suggested to be a valuable tool to assess multiple physiological stress markers when comparing different veterinary handling techniques [9].

Studies have attempted to develop scales for the owner/guardian/client to measure the stress a dog may experience. The owners are able to subjectively measure the major stress signs, but miss minor signs of stress of their dog to some degree [17, 27]. For example, a scale of behaviours to address different levels of fear and stress could be used to distinguish the magnitude of stress. A mildly or moderately fearful dog avoids eye contact and feared objects, is crouching and cringing, has its tail lowered or between the legs, is vocalising (whimpering or whining), freezing, and trembling. Moreover, a severely fearful dog is vigorously cowering, retreating, or hiding, as well as attempting escape. The aggression of a dog can be classified as exhibiting mild to moderate aggression by vocalisation (barking

or growling) and showing teeth. Snapping, lunging, biting, or attempting to bite were defined as severe signs of aggression [6].

A standardized scale could reliably be used across different persons performing the behavioural assessment (both comparing different persons as well as assessment by the same person of different dogs) to assess the behaviour of dogs during their visit at the clinic. A comprehensive example of a 5-level scale of fear- and anxiety-related behaviour of the dogs at the entry into the exam room and during a standardized exam included measures such as [28]:

- 1) **Relaxed**, i.e. relaxed, calm, displaying non-fearful, friendly social behaviour towards persons, exhibiting no concern.
- 2) **Alert**, i.e. alert and very attentive to all activities, calm and cooperative
- 3) **Tense**, i.e. tense but cooperative, panting slowly, not relaxed but can be easily handled on the leash, paces or stands quietly
- 4) **Very tense**, i.e. very tense and anxious, shaking, panting, whining, does not sit down (except behind owners leg), not easily handled at a leash, avoids entering the examination room. Exhibits problematic dominant behaviour (mounting and jumping on handler or other people)
- 5) **Extremely stressed**, i.e. extremely stressed, vocalizing (barking, growling or howling), hiding, showing vigorous attempts to escape, refusing to move and has to be lifted into the room, trying to jump off the table or is completely freezing

3.1.2. Physiological Measurements of Stress

Studies also rely on measuring different physiological stress markers or a combination of them to report on the level of stress [29, 30]. The physiological measurements to describe stress during a veterinary encounter are, for example, salivary, hair and urinary cortisol, urinary catecholamines, heart rate and heart rate variability, increased rectal temperature, maximal ocular surface temperature, temperature under the front limb, increased tympanic membrane temperature, increased respiratory rate, and blood pressure as well as an elevated neutrophil/lymphocyte ratio and creatinine kinase, a few to mention [8, 9, 29–39].

Interpretation of results from measuring physiological data should be done with caution, and it is relevant mainly in a study setting under a very controlled study design [38]. For example, cortisol is often measured in different studies on acute stress in dogs. However, physiological

measures give some indication of the magnitude of the response but not of the level of the underlying emotional response [9]. A controlled experimental design should be carefully considered, especially when comparing results between studies [38]. For example, serum cortisol is affected by many factors that are not related to acute stress (e.g., chronic stress, different hormonal disorders, play, mating, time of day, and eating) [9]. There is a large variation of the cortisol level, both within the individual animal as well as between different individuals in both control and study groups [38].

3.2.Factors Affecting Fear, Anxiety and Stress of Dogs in a Veterinary Setting

Fear during veterinary visits is common. Owner-directed surveys have been conducted with a reported prevalence of fear in dogs visiting veterinary clinics ranging from 41-78% showing mild to moderate fear and 14-29% showing severe or extreme fear ([1, 2, 5, 17, 40]. There are several studies conducted, both in general as well as in a veterinary setting, on factors that influence the fear and anxiety in dogs. The fear and aggression -inducing factors of a dog at the veterinary clinic are related to its character and experiences from early life- both outside of and in the veterinary clinic, as well as related to the dog owners' experience of a veterinary visit [6, 41]. The fear of a dog has been shown to positively predict the arising of aggression at the veterinary clinic. However, the factors that cause fear at the clinic are not necessarily the cause of aggression [6].

3.2.1. Dog-related Factors

Factors related to the dog and its behaviour, in general, have been suggested as predictors for its fear and aggression at a veterinary clinic. In online surveys to owners, several features of the dog's behaviour outside the clinic were associated with showing fear at the clinic (fear and aggression related to strangers, fear of new situations, non-social fear, showing stress, and aggression during body handling) [6, 41]. However, in one survey, only 7% of the variation of fear between dogs at the veterinary clinic was explained by dog-related factors [41].

Based on an extensive online survey (13 700 dogs), there appeared to be a strong genetic contribution to anxiety-related traits, as different breeds had a large variation in the prevalence of anxiety-related behaviours [20]. This has been corroborated by another survey of 26555 responses where the breed was shown to have the most significant effect on the prediction of fear at the veterinary examination. The highest prediction scores were noted for mixed breeds, toy show dogs, and hounds. Hunting dogs and working dogs exhibited the lowest prediction scores [41]. However, in a meta-analysis of 61 studies, no effect of breed on cortisol levels could be recorded [38].

Dog personality can also affect the expression of fear at a veterinary clinic. In a population, 10% of puppies showed strong avoidance behaviour at a simulated veterinary examination [42]. Dogs that show mild to moderate fear in new situations in general, also have a higher risk of showing fear at the veterinary clinic [41].

Gender and neuter status are considered predictors for the cortisol level in dogs; intact bitches have higher cortisol levels than intact males, neutered bitches, and neutered males [38]. Males also show more signs of aggression than bitches, whereas bitches are more often fearful than males [20]. This finding is also supported by a study of the reactions of 30 dogs during which bitches had significantly higher heart rate during the examination than male dogs [37].

There are controversial results of the associations between age and fear. Old and middle-aged dogs have been reported to be more fearful than younger dogs [1], whereas, in other studies, age has not been shown to be related to the increased risk for fear during a veterinary visit [6]. The effect of the presence of owners on the exhibition of fear-related signs during a standardized physical examination has been shown to be age-related as the owner-presence decreased fear-related rate of lip licking in older dogs more than in younger dogs [43]. If an owner has experienced nervousness during a previous visit, the risk of fear and fear-related aggression in the dog can increase [6]. In a meta-analysis performed on data from 61 different studies, the level of cortisol of the dogs at the clinic was lower if the owners were present during the visit [38].

3.2.2. Previous Experience

Naturally, past experiences in as well as outside the veterinary setting do affect the fear and aggression of dogs at a veterinary clinic. It has been reported that dogs with a previous negative experience at a veterinary clinic were significantly more fearful than dogs with only positive previous experiences in a veterinary setting [1, 43]. Dogs that are more fearful of new situations and strangers outside the clinic are also more stressed in the clinics [6, 25]. Neutering at the age of less than one year, receiving a nail trim at the clinic at an older age, or having a negative experience at a previous veterinary visit have also been shown to be risk factors for fear [6]. Experiences outside the veterinary setting also have an effect on the level of fear at the clinic. Breeding, show, as well as working dogs exhibit less fear compared to companion, sporting, and hunting dogs. The origin of the dog will also predict its level of

fear at the clinic. Dogs originating from breeders or directly from another owner were less fearful at the clinic than dogs from shelters or rescued dogs [41].

3.2.3. Handling

The examination and the treatment of the dog are the parts of a veterinary visit where most of the dogs exhibit some degree of stress [1, 39, 44]. Touching of certain parts of the body (elbow, abdomen, and chest) is predictive of fear and aggression [6, 39, 43]. Dogs showed more behavioural signs of fear when physiological manipulation was performed (head, lymph node, and body palpation) in comparison to respiratory and heart rate assessment as well as axillary temperature measurement. Avoidance behaviour was, however, greater during the heart rate and axillary temperature-taking phases, suggesting that this was because less restraint was used during the aforementioned phases. Therefore, the dog had a higher possibility to perform avoidance behaviours [25].

Aggression is usually a sign of highly elevated stress. A dog has a higher risk of being aggressive if it is already showing signs of fearfulness at the clinic, has tried to bite a member of staff, or is fearful of body handling and drying of the feet [10]. The dogs with pre-existing aggression against their owner exhibited a decrease in aggression against the veterinary staff if the dog was removed from the situation when showing aggression. If the dog was not removed from the situation, the level of aggression increased. Restraining techniques, such as muzzling and forceful restraint in a towel, also have an effect on the risk of aggression [6].

The time the dog is allowed to investigate its surroundings at the veterinary clinic also seems to lower the fear [6]. This is also in line with the results that the level of cortisol of dogs during a veterinary visit was affected by the time in the environment before testing (a longer waiting period decreased the level of cortisol) [38].

Basic training and socialization outside the veterinary clinic, for example, handling and grooming the dogs in non-familiar settings, protect them from fear at the veterinary clinic. In line with this, show and working dogs are usually less fearful in the veterinary setting than companion dogs [41]. Fear at the clinic has been shown to be lower for dogs accepting treats. Furthermore, dogs that have been trained with positive punishment have an increased risk of showing fear at the veterinary clinic [6]. Westlund (2015) suggested that using treats

during a veterinary visit could potentially lead to reduced stress for the dog, having a calming effect on the owner. This could condition the dog to enjoy visits more in the future, decrease the need for sedation during the visit, facilitate accurate diagnosis, and reduce the risk of injury to the staff [45].

3.2.4. Physical Environment

The environment at a veterinary clinic can include many fearful, novel, and strange situations for a dog, including strangers, new rooms, and strange noise and smell. There are numerous environmental stressors mentioned in the literature for the individual dog and different phases of the visit in the veterinary clinic. The alleviation of these stressors has been addressed in several guidelines and books [4, 46, 47]. However, there are not yet many scientific peer-reviewed studies on the subject [2].

It has been suggested that many of the stressors of the physical environment stem from the dog's innate behaviour; dogs that are more fearful of new situations and strangers outside the clinic are also more stressed in the clinic [6, 25]. Despite the fact that the waiting room is a place where the dog can be subjected to meeting strange people, other dogs, cats, or the smell of these, which have been shown to provoke fear in dogs [20], some studies indicate that the examination room is more stressful for the dog than the waiting room [8]. The examination and treatment are the parts of a veterinary visit where most of the dogs exhibit some degree of stress [1, 25]. In one study, a significant increase in the average heart rate in the examination room compared to the waiting room was recorded [37]. On the other hand, in a survey, owners evaluated the anxiety levels of dogs in the waiting room as being higher in comparison to the anxiety levels of the dogs in the examination room [48].

Being on the examination table has been suggested to be the most stress-inducing part of a veterinary visit for dogs [44]. Furthermore, according to an owner survey including 135 dogs, 78.5% of all dogs showed fear at the examination table [1]. Experimental studies have also shown that the highest heart rate and lowest heart rate variability occur during the examination of the dogs, indicating a higher level of stress [8]. In line with these results, one study showed that the biggest increase in the heart rate during different stages of a veterinary visit was recorded at the beginning of the exam. The increase occurred after lifting the dog up on the table, during the stroking of the dog by the examiner, and at the end of the exam during the simulated vaccination. Behavioural signs such as having the tail tucked between

the legs and ears positioned backwards supported the interpretation that the heart rate increase indicated stress [37].

The importance of the waiting area design is mentioned in many published guidelines and books [3, 4, 7, 47]. The level of fear, anxiety, stress, and heart rate was clearly elevated in dogs if examined in the common treatment room compared to when examined in a single examination room [49]. The surfaces of the scale, the examination tables, and the floors are often described as important in the low-stress clinic. In a large online survey, 23.5% of dogs show fear of surfaces and heights according to their owners [20]. However, there was no mention of what type of surface fabric that provokes fear. Furthermore, there was no distinction between the fear of surfaces and the fear of heights. The fear of surfaces may emerge in any part of the clinic, but the most likely place where fear of heights would emerge is the examination table.

Noise sensitivity has been reported as the most common cause of anxiety in dogs by 32% of the owners [20]. However, in one study, experimental veterinary background noise (prerecorded talking, barking, and metal doors clanging) increased only dogs respiratory rate out of all the other fear parameters assessed [39]. In a clinical setting, quiet classical background music affected owner satisfaction, but no effect was observed in dogs [48]. In addition, a recent study conducted in a simulated veterinary setup, where classical music was played at a rhythm matching a dog's resting heart rate, found that the music did not have any noticeable effect on the dog's stress. Instead, the stress levels seemed to increase gradually during the visit [50].

3.3. Learning Techniques and Stress Reduction at the Clinic

Training has also been reported to affect the fear and anxiety in veterinary clinics. Dogs that had been trained with positive punishment during training (ignoring the dog during unwanted behaviour and using a spray bottle for correction) were reported to have an increased risk of showing fear at the veterinary clinic [6].

There are a wide variety of different training and behavioural modification techniques found in books that are recommended to be used in dogs in a veterinary setting [46, 47]. Many of them are based on studies done on other animals and adapted from, for example, zoo animals or dogs outside of a veterinary setting. Only in recent years, studies on the efficacy and consequences of training and behavioural modification of dogs in a veterinary setting have been performed [8, 9, 25]. The studies have been conducted on dogs receiving different methods of training and behaviour modification techniques involving a range of recommended methods such as positive reinforcement (operant conditioning), cooperative care training, counterconditioning, desensitization, and just in general keeping in mind the basic minimal restraint focus, as well as other factors, thought to influence fear of dogs at the clinic. The studies have evolved more towards a collaborative care approach, taking into account the whole experience [8, 9].

The techniques represent different aspects of animal handling and training, often with overlapping principles and goals aimed at creating a positive and stress-free experience for the animals [51]. I will first briefly present the theoretical basics for the methods used and, after that, focus on the specific studies executed on dogs with the aim of investigating the efficacy of the training methods in a veterinary setting.

3.3.1. Introduction to Classical and Operant Conditioning

The groundstones of learning theory are classical conditioning, discovered by Ivan Pavlov, and operant conditioning, first mentioned by Thorndike, and further developed by B.F Skinner. Habituation and counterconditioning are the two main divisions of behaviour modification techniques. Moreover, flooding and desensitization belong to subcategories of habituation, whereas classical and operant counterconditioning are subdivisions within the counterconditioning technique [47].

Classical conditioning

Classical conditioning, learning by association, occurs continuously and daily in animals [47, 51]. As a result, animals have a positive or negative emotional response to a conditioned stimulus. Reflexes and emotions (involuntary responses) can be conditioned through classical conditioning [51].

The initial phase of classical conditioning is an unconditioned stimulus, which leads to an unconditioned response (reflex/involuntary behavior). Neither of these has to be learned as they are innate reactions built into the behavior and physiology of an animal. In this active learning process, a neutral stimulus (stimulus without natural reflex initiation) is paired enough times with the unconditioned stimuli until it elicits a similar response by itself, consequently becoming a conditioned stimulus with a conditioned response [51]. Anything (smell, sight, person, place) at the veterinary clinic could be a possible stimulus leading to an undesired (e.g., fear, anxiety, stress) or a desired response (e.g., calm, secure, cooperative) [47, 51].

If the learned response to the conditioning is considered as negative, it can be harmful to the welfare of the dog, the owners, and the safety of the veterinarians. Harmful behaviors (e.g., fear, anxiety, stress, conflict, panic, avoidance, tachycardia, tachypnea, urination, defecation, vocalization) at a veterinary visit can occur after a negative classical conditioning process if the animal associates the second visit to the veterinarian with aversive conditions from the previous visit; (e.g., unfamiliar smell and sound in the veterinary clinic or pain from a vaccination). On the second visit, the pain and fear experienced at the previous visit are associated with the clinical setting, thus becoming a conditioned stimulus initiating a conditioned response [1, 47, 51]. A puppy can, for example, be classically conditioned to

feel fear at the veterinary clinic (examination tables, veterinarian, different rooms in the practice) due to the conditioning by a negative, unpleasant experience [1].

The conditioning can also be viewed as positive, leading to desirable behavior (calm, secure, cooperative) if the association to the stimuli at the clinic is creating an innate positive response. Repeating pairing of a neutral stimulus with the positive innate stimulus would lead to the neutral stimulus becoming a conditioned positive stimulus [51]. For example, the first time a puppy enters a veterinary clinic can be considered a neutral stimulus if the puppy has no previous negative associations with the clinic. If a puppy entering a veterinary clinic is given a treat just before entering, the puppy will respond to the stimulus by salivating. Classical conditioning has occurred when entering the clinic (conditioned stimulus) elicits a similar response to the treat (unconditioned stimulus). In this case, the puppy is likely to feel happy and safe on arrival at the clinic.

The most effective learning happens when the neutral stimulus is presented prior to the unconditioned stimulus, called a short delay classical conditioning. In this scenario, the neutral stimulus foresees the presentation of an unconditioned stimulus, subsequently becoming a conditioned stimulus. The timing, as well as the fact that each individual is different when it comes to response, the associations made, and to which extent the classical conditioning occurs, needs to be considered at the veterinary clinic when trying to prevent fear and anxiety in the dog during a veterinary visit [51].

Operant conditioning

In contrast to classical conditioning, operant conditioning encompasses the conditioning of voluntary behaviours. The foundation of operant conditioning comprises four principles: positive reinforcement, negative reinforcement, positive punishment, and negative punishment (Figure 1). The term positive in this context signifies the fact that something is added to learn/change a behaviour, while negative refers to the fact that a stimulus is removed for the same purpose [51].

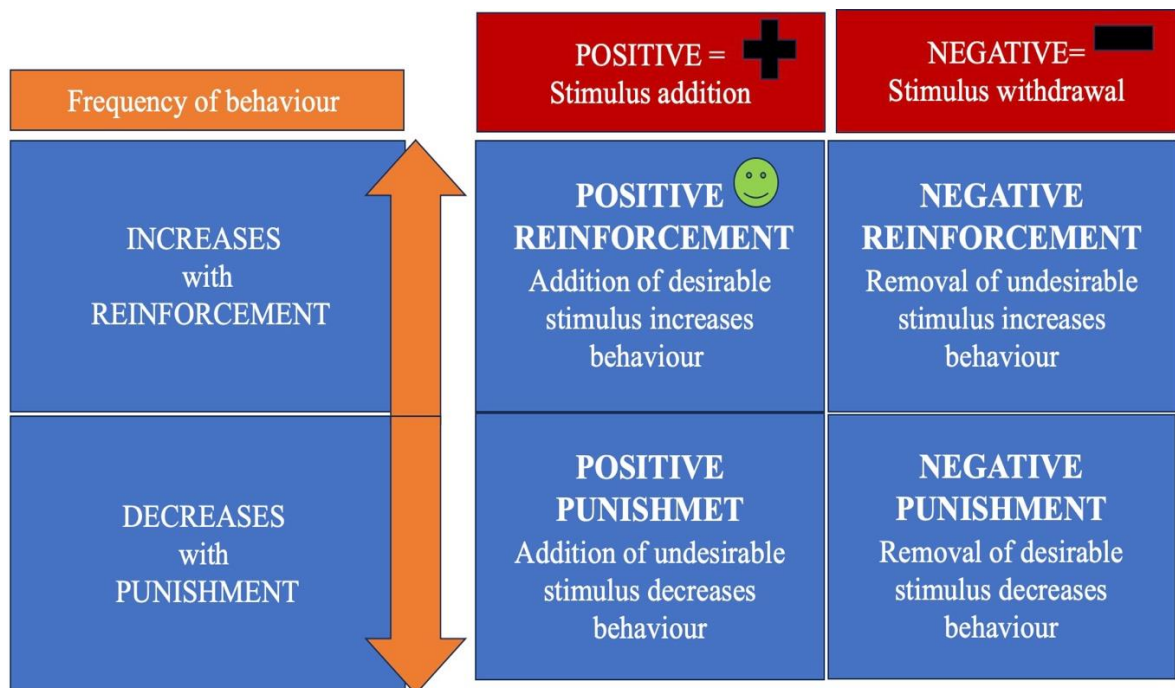


Figure 1 Operant conditioning (Amended from Landsberg et al.,2023, p.150)

Reinforcements versus punishment portray the intended outcome, whether it is incidental or deliberate. Reinforcement is used to describe when the goal is to increase a behaviour, whereas punishment is used to describe when the intention is to decrease the frequency of a behaviour [51].

When these four abovementioned terms are combined, they give rise to the four distinct principles of conditioning (Figure 1): Positive reinforcement entails adding a desirable stimulus to increase a behaviour, whereas negative reinforcement entails the removal of an undesired stimulus, also with the result of increasing the frequency of a behaviour. Positive punishment can be explained by adding an unpleasant stimulus to increase the frequency of a behaviour, whereas negative punishment is when a desired stimulus is removed in order to

decrease the frequency of a behaviour. Positive reinforcement is widely advocated as the preferred and most animal-friendly method of the four operant techniques [51].

Owners perceive some methods of positive punishment used to correct aggressive behaviour towards the clinical staff, enhancing the dogs' fear and aggression response, whereas other positive punishment methods (grabbing the muzzle, using a shock collar, verbal correction) did not, according to the owner alter the unwanted behaviour. Also, negative punishment (ignoring unwanted behaviour) used in the veterinary clinic is reported to enhance aggression levels [6].

3.3.2. Habituation

One of the simplest forms of learning is habituation. Habituation, to get used to stimuli, involves desensitization and flooding. Flooding is the forced exposure to a stimulus above the fear threshold [51]. Flooding is related to increased levels of fear and aggression [6].

Desensitization is a more animal-friendly form of habituation. The intensity of the stimulus applied in desensitization is initially weaker, less intense, or localized at a distance. Ideally, the strength of the low-intensity stimulus used in desensitization is slowly and gradually increased, keeping in mind to only increase the strength of the stimulus when there is no reaction from the animal. This is done to minimize the chance of a fearful response to the stimuli. If the intensity level of the stimuli is increased too fast, it could lead to sensitization to the stimuli with a possible fear or anxiety reaction.[47]

Desensitization may have a better outcome if used together with operant and classical counterconditioning. An early-age habituation and conditioning program for puppies to get them accustomed to the veterinary visit has been suggested [1], including habituation to, for example, touching, opening of the mouth, or holding a paw [52]. Results have shown decreased overall stress after an 8-week training program involving, amongst other methods, a desensitization process for procedures generally conducted at a veterinary clinic [9]. Furthermore, owners reporting using desensitization both at the clinic as well as a training method outside the clinic reported lowering levels of aggression toward the veterinary staff at the clinic[6].

3.3.3. Counterconditioning

If an unintentional, undesired conditioned association has been formed, this may be replaced with a new conditioning. This is called counterconditioning, as the association that was previously conditioned is now replaced or “countered” with the use of a new association [47]. Döring et al. (2009) is advocating counterconditioning and desensitization programs to reduce fearful behavior at a veterinary clinic after fear has been triggered by a classical conditioning process[1]. There have been mild positive effects shown with a standardized desensitization and counterconditioning training program in reducing fear levels in dogs during two standardized veterinary visits four weeks apart. However, 44% of the participating owners did not follow the training program properly [25]. In line with this, the serum cortisol levels decreased in a study conducting desensitization of the dogs to the veterinary setting [9].

3.3.4. Cooperative Care and Collaborative Care Training

Cooperative care, involves training animals to voluntarily participate and cooperate in the care and handling procedures in the clinical setting [8]. The procedure of cooperative care training teaches dogs to communicate consent to certain handling and how to withdraw consent. The animal is taught to perform specific behaviours that facilitate care (like standing still or presenting a paw). The voluntary participation of the animal is emphasized. The training method involved is often positive reinforcement [51]. Cooperative care training may improve the welfare of a dog by allowing it to control the fearful situation by giving it the freedom of choice to participate or not participate in a situation [8, 53]. However, so far, there are only a few controlled studies on such training to reduce stress in dogs at the veterinary clinic [8, 9].

The few results of studies on cooperative care training for dogs in a veterinary setting are mixed. In a study by Wess et al. (2022), cooperative care training, which included desensitization and positive reinforcement, was assessed with 47 dogs during veterinary visits. The study did not show a significant reduction in stress for the trained group compared to the control group. Some trained dogs did exhibit improved stress resilience, while compliance during veterinary examinations was reduced. In the control group, some physiological markers indicated elevated stress levels from the first visit [8]. In a case study performed by Jones (2023), cooperative care training initially succeeded in preparing a

fearful dog for a vaccination. However, the dog's cooperation waned in subsequent visits [53].

The collaborative care concept emphasizes teamwork between the animal, owner, and veterinary team during clinical experiences. It may involve owner participation, positive reinforcement, and cooperative care at the clinic. In a study by Squair et al. (2023) involving 28 dogs, an adaptive low-stress collaborative care approach used during veterinary visits reduced stress compared to conventional care. The results suggest that this approach, designed to reduce fear, lowers stress in dogs over multiple visits. However, the specific interventions' individual impact remains unclear [9].

4. Discussion and Conclusion

My aim was to review the current scientific literature on methods used for reducing stress in dogs at veterinary clinics. Although there has been research regarding the risk factors of stress in the clinical setting, there are still gaps to fill. There are several guidelines [10, 18, 47, 54] and a few literature reviews [3, 4, 41] on the stress of dogs and dog handling in the veterinary clinic. Many of the guidelines and conclusions of the reviews are based on expert opinions and experience.

I hypothesized that reducing stress in dogs would benefit both the patients and their owners, improving the overall veterinary practice. While I still believe in this hypothesis, there is insufficient research to recommend specific strategies for minimizing stress in clinics. Various certificates, such as those promoting fear-free or low-stress handling for veterinarians, were beyond the scope of this review. It would, however, be valuable for veterinarians to understand which parts of these certificates are evidence-based and which rely more on expert opinion. Furthermore, there is a lack of research on factors that protect dogs from stress in the veterinary environment, despite numerous guidelines and recommendations. Much of the available data pertains to non-veterinary settings, and some guidelines extrapolate findings from other species to dogs in the veterinary context [3, 4]. Edwards et al. (2019) also called for more studies on stress-reduction strategies for dogs and their acceptance within the veterinary industry [2].

I suggest a range of factors which could be included in strategies to reduce the stress of a dog in a clinical setting. Firstly, we have the dog-related factors: age, sex, and personality. Secondly, we need to consider the previous experiences and the training of the dog and the owner, as well as the education and the attitudes of the veterinary staff. Finally, we have to consider the procedures done to the animal as there is a large variation between different stages of the examination. It might be that sometimes, if the procedure calls for it or if the dogs' personality or level of stress prevents it, we must consider that restraining dogs forcefully for a short while might give a lower overall amount of stress than prolonging an unpleasant procedure trying to get the dog to cooperate. However, forceful or otherwise negative handling should never be used as a routine method.

I found that the reliable identification of dog stress during a veterinary visit is important for adapting the veterinary treatment to the psychological needs of an individual dog and its owner. Recognizing signs of mild stress allows veterinarians to have an early reaction to the primary discomfort signs and according to them, modify the way they interact [4]. However, physiological stress parameters are not very reliable or feasible to measure during a routine veterinary visit, and deviations from normal values may not necessarily be a function of negative emotion [37]. Behavioural signs seem to be a more practical option when identifying stress in dogs in the clinical setting. Both owners [25] and veterinarians [19] are, to a degree, able to identify at least major signs of stress in dogs during a veterinary visit. However, minor signs are often missed by owners. Behaviours may also be overinterpreted or misinterpreted [25].

I show here, that limited research exists on factors that alleviate fear and anxiety in dogs at clinics. Expert opinions, books, guidelines, and certification programs propose a range of strategies, including handling methods (pheromones, advice for initial contact, positive associations, minimal restraint), as well as structural clinic modifications (separating cats and dogs, adjusting lighting and sound). However, there's largely a lack of scientific evidence supporting these strategies, apart from pharmacological behavior modification, to enhance animal welfare and improve the owner's and veterinarian's experience. Future studies have been suggested to integrate training into a veterinary setting and consider a dog's previous experiences in program design as well as adapt an individual approach to training and that the training should be sufficient and involve a veterinarian or a trainer [8, 25].

I want to stress that prevention of negative emotions seems to be the key to reducing fear at the veterinary practice. However, it might be difficult in a busy veterinary setting as the stress-reducing tools need to be tailored to each individual dog, and time and resources are scarce. Stellato et al. (2021) summarizes the challenge of managing fear in veterinary practices; negative experiences at the veterinary clinic easily conditions the dog to feel fear at subsequent visits [6]. Counterconditioning and changing fear-related behaviour is more difficult. Therefore, prevention should be of the essence. Dogs are more aggressive at the veterinary visit if the owners use negative reinforcement training [8]. Thus, I suggest that raising awareness among owners, but also among veterinary staff, of the benefits of positive

reinforcement training in the clinical setting is essential to help owners reduce the occurrence of fear and aggression in veterinary clinics.

It is not clear from the few studies done if the behavioural modification techniques are effective in lowering stress for dogs in the veterinary setting or if there is a problem with the study design. Studies regarding the effect of handling often state that “low-stress handling” techniques have been used. The fact that the terminology of behaviour modification techniques is still somewhat unclear in different studies, shows that it is a novel research field within the veterinary setting. The literature is complex and somewhat confusing to which techniques are used. The terms “collaborative care”, “cooperative care”, “desensitization” , and “counterconditioning”, describing the techniques, overlap and are used differently in studies [8, 9].

As I previously stated, there is scarce scientific proof on which handling methods are effective in reducing the stress of dogs in a veterinary setting, and even fewer investigating the combination of handling techniques. Therefore, it is hard to assess if the handling methods used in the testing of the behavioural modification training are reducing the stress of dogs efficiently. Furthermore, future studies on these techniques need to carefully address the dog-related factors, such as personality and temperament, affecting the level of fear at a veterinary clinic.

Creating positive associations by positive reinforcement has mainly been addressed to the dogs that are not fearful yet. [8, 9, 25]. Already fearful or even aggressive dogs need another kind of strategy regarding handling and restraint where the safety of staff and owners might have to take precedence over the stress-free handling of the dog. In a real-life situation, a possible training will be performed by the owners, but their non-compliance rate could be high, as in a study done by Stellato et al. 2019 [25]. The fact that the training takes place outside of a veterinary setting may also hinder the transformation of the learned behaviours into the veterinary setting [8].

Complex studies in behavioural modification techniques need to carefully address study design and bias. This is clearly illustrated in a study of the effect of collaborative training on stress in dogs during veterinary visits. Dogs judged to have achieved the greatest improvement in behavioural signs of stress showed the highest scores on physiological signs of stress. The results might have been affected by a sample-related bias as owners with

fearful dogs were more likely to want to participate in the study. It was speculated that the dogs that improved the most were also the dogs that were most fearful in the beginning. The study was not totally blinded, which might have further affected the level of bias [8].

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Finally, I would also like to dedicate this thesis to my late dog Vildi, whose companionship was one of the greatest supports during my years living in Budapest.

7. Thesis Progress Report and Acceptance Letter

UNIVERSITY OF VETERINARY MEDICINE,
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INTERNATIONAL STUDY PROGRAMS

secretary, student@univet.hu

Thesis progress report for veterinary students

Name of student: Sally Sofia Rosengren

Neptun code of the student: XLP5Q7

Name and title of the supervisors:

1. Senior clinical instructor, docent Laura Hänninen, DVM, PhD, Dip ECAWBM-WSEL,
Department of Production animal medicine, Faculty of Veterinary Medicine, University of
Helsinki, Finland

2. Dr. Jurkovich Viktor, DVM, PhD, Dip ECAWBM-WSEL

Department of Animal Hygiene, Herd-Health and Mobile Clinic, University of Veterinary
Medicine, Budapest, Hungary

Department: Department of Animal Hygiene, Herd-Health and Mobile Clinic

Thesis title: Stress free handling methods of dogs in the veterinary practice






Consultation – 1st semester

	Timing			Topic / Remarks of the supervisor	Signature of the supervisor
	year	month	day		
1.	2022	10	01	Topic introduction, table of content	
2.	2023	01	30	Literature	
3.	2023	03	15	1st draft	
4.	2023	05	15	Exclusion of certain areas	
5.	2023	08	30	Progress meeting and discussion	

Grade achieved at the end of the first semester: 5 (excellent)



Consultation – 2nd semester

Timing				Topic / Remarks of the supervisor	Signature of the supervisor
	year	month	day		
1.	2023	09	30	2nd draft, corrections	
2.	2023	10	07	3rd draft	
3.	2023	10	14	Discussion chapter	
4.	2023	10	26	Figures and references check	
5.	2023	10	27	Final draft	

Grade achieved at the end of the second semester: 5 (excellent)

The thesis meets the requirements of the Study and Examination Rules of the University and the Guide to Thesis Writing.

I accept the thesis and found suitable to defence,

Laura Hänninen

Viktor Jurkovich

signature of the supervisors

Signature of the student: 

Signature of the secretary of the department: 

Date of handing the thesis in... 2023. 11. 14.

I hereby confirm that I am familiar with the content of the thesis entitled
“Stress free handling methods of dogs in the veterinary practice”, written by *Sally Sofia
Rosengren*, which I deem suitable for submission and defence

Date: Budapest, ...13...day.....11.....month.....2023... year

Supervisors names and signatures:

1. Hänninen Laura:



Department of Production animal medicine,
Faculty of veterinary medicine, University of
Helsinki, Finland

2. Jurkovich Viktor:



Department of animal Hygiene, Herd health
and Mobile clinic , University of
Veterinary Medicine, Budapest