A review on mitigating fear and aggression in dogs and cats in a veterinary setting

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Simple summary

The majority of dogs and cats are fearful during veterinary visits, and some individuals may show aggression as a result. We review ways to avoid negative experiences and promote positive emotions in animals visiting the veterinarian. Whenever an animal is in the practice, the veterinary team should endeavour to make the visit as pleasant as possible by using non-threatening body language and by creating positive associations. Unless animals need to be fasted, high-value food or toys should be used generously throughout the visit. In the interaction with the animals, low-stress handling methods, brief pauses and adjusting the procedure based on the animal's body language help them to feel secure. Distractions can be used to minimise perceived pain from injections. If a known painful area needs to be treated, pain killers are advised. For animals that are very fearful, there are medication options that can be given prior to the veterinary visit to help them with their fears. With reward-based training, animals can learn to accept veterinary procedures. A stress-free veterinary visit benefits all involved parties – the animals, their owners, as well as the veterinary team.

Abstract

A high proportion of dogs and cats are fearful during veterinary visits, which in some cases may escalate into aggression. Here, we discuss factors that contribute to negative emotions in a veterinary setting and how these can be addressed. We briefly summarise the available evidence for the interventions discussed. The set-up of the waiting area (e.g. spatial dividers; elevated places for cat carriers), tailoring the examination and the treatment to the individual, considerate handling (minimal restraint when possible, avoiding leaning over or cornering animals) and offering high-value food or toys throughout the visit can promote security and, ideally, positive associations. Desensitisation and counterconditioning are highly recommended both to prevent and address existing negative emotions. Short-term pain from injections can be minimised by using tactile and cognitive distractions and topical analgesics, which are also indicated for painful procedures such as ear cleanings. Recommendations for handling fearful animals to minimise aggressive responses are discussed. However, anxiolytics or sedation should be used whenever there is a risk of traumatising an animal or for safety reasons. Stress-reducing measures can decrease fear and stress in patients and consequently their owners, thus strengthening the relationship with the clients as well as increasing the professional satisfaction of veterinary staff.

Keywords: Stress, fear, anxiety, aggression, veterinary visit, low-stress handling, counterconditioning, behaviour modification, anxiolytic medication, psychoactive drugs, dogs, cats

1. Introduction

Veterinary care is an essential element of maintaining good welfare of companion animals. However, studies indicate that a great majority of dogs and cats show signs of fear when visiting the veterinarian [1–3], making veterinary visits stressful also for their owners [4]. Indeed, 28% of cat owners and 22% of dog owners reported that they would consult the veterinarian more often if the visit was not associated with so much stress for their pet [4]. Animals' stress associated with the veterinary visit can distort physiological measurements, hamper the physical examination and, in case of aggression, pose a risk to the veterinary team [5]. Veterinarians are thus faced with the challenge of carrying out important medical procedures, some of which may be painful, while also considering the emotional well-being of their patients. Although a classic paper investigated fear-related behaviour in dogs at a veterinary clinic already in 1981 [6], awareness on how individual animals experience veterinary visits and how negative experiences can be counteracted has been increasing only relatively recently [7,8]. Here, we provide a comprehensive review of causes for and measures to reduce, or ideally prevent, fear and subsequent aggressive behaviour in dogs and cats at the veterinarian, based on controlled studies and – in the absence of such studies – peer-reviewed guidelines or expert texts.

1.1. Fear, anxiety & stress – evolutionarily adaptive

From a biological point of view, fear, anxiety and stress reactions are highly adaptive as they organise behavioural responses to avoid or cope with threat [9,10]. In dangerous situations, two major behavioural patterns can be distinguished. The "fight-or-flight response" constitutes an active coping strategy, while "freezing" is a passive coping strategy [11]. Which behavioural reaction the animal chooses when it feels threatened depends on the one hand on its personality [12], and on the other hand on the situation, for example the distance to the alleged threat, the availability of an escape route and the perceived degree of danger [11,13].

Both fear and anxiety are unpleasant emotional reactions to the presence (fear) or potential presence (anxiety) of a threat [14]; however, there is no empirical data on distinguishing expressions of anxiety vs fear in dogs and cats (c.f. [15,16]). Therefore, and since anxiety promotes fear and vice versa, [13,17], we subsequently use the term "fear" to denote both fear and anxiety responses.

The term stress refers to the organism's response to a stimulus or event, often referred to as "stressor", that poses a potential threat and triggers a physiological and behavioural response, including activation of the sympathetic adrenal medullary axis and the hypothalamic-pituitary-adrenal cortex axis [18,19]. For example, in cats, the transport to the veterinary practice and routine visits for vaccinations can elicit significant physiological changes including elevations in blood pressure, rectal body temperature, pulse, respiratory rate and blood glucose, as well as a change in the cortisol-creatinine ratio [5,20–22]. In some healthy dogs, the urinary corticoid:creatinine ratio increased following a veterinay visit to a level that would be consistent with hyperadrenocorticism [23]. A reduced effectiveness of sedation [24] and an increased risk of anaesthetic complications [25] are to be expected in stressed animals,.

Potential stressors during a veterinary visit include exposure to other animals and unfamiliar people [26,27], odours (e.g. disinfectants and alarm pheromones from other animals), noises (barking dogs, clippers, alarms etc.), and smooth or slippery surfaces such as floor coverings or metal examination tables [27]. For cats, leaving the familiar environment is often particularly stressful [28,29]. The unpredictability of the situation and the loss of control during restraint constitute a majour source of

97   stress [29,30]. In addition to an immediate reduction in welfare, it should be considered that every
98   negative experience may increase fear during subsequent veterinary visits [2,3]. Moreover, the
99   experience of discomfort or pain, especially in response to physical manipulation, might lead to
100 escalated behaviour such as aggression [31–35].

101 To reiterate, aggressive ("fight") responses are an inherent component of the biological fear reaction
102 [11], and in a veterinary context, aggression ensues most frequently due to fear, pain or fear of pain
103 [32,36]. As long as it is possible to avoid a perceived threat, many animals may initially freeze or hide.
104 However, when the danger is perceived to be too close, the animal may may attempt to flee, and if
105 there is no escape route, it may try to attack [11,13]. But also freezing may again be shown when the
106 animal realises that no escape is possible [11].

107 Since aggression is one of the indicators that an individual's fear threshold was exceeded,
108 interventions to reduce fear in animals usually apply in the same way to animals showing aggressive
109 responses, and veterinary staff should be no less compassionate towards animals reacting aggressively
110 than to those that are overtly fearful. Thus, by use of low-stress handling methods, adjusting to
111 already subtle indicators of distress, creating positive associations, and where necessary use of
112 anxiolytic medication, the animals' emotional state can be improved so that heavy restraint becomes
113 unnecessary, the animals feel less cornered, and the risk of aggression, and thus potential injury to
114 veterinary staff, is reduced.

115 *1.2. Identifying stress and fear in dogs and cats*

116 The recognition of (subtle) stress signs enables the veterinary team to respond early to the first signs of
117 discomfort and to adjust the interaction accordingly. Such signs include shifting of body weight away
118 from the trigger, crouching, and increased muscle tension on the face and throughout the body
119 [27,29,37,38]. Gaze avoidance, changes in activity level (freezing or agitation), distance-increasing
120 attempts and whether an animal is willing to consume offered food give further indications about the
121 patient's stress level [27,29,37,38].
122
123 Fearful dogs usually have their ears directed backwards or flattened. Further signs of fear in dogs
124 include a lowered posture, a lowered or even tucked tail, panting, increased salivation, trembling and
125 emptying of the anal glands [3,15,37,39]. Lip licking is a commonly used appeasement signal in a
126 social context [15,40]. However, when feeling severely threatened, dogs may freeze completely [39]
127 and no longer show other communicative signals [40]. Defensive aggression such as stiffening, staring,
128 growling, and snapping or biting may ensue [39].
129
130 Fearful cats typically make themselves smaller. The ears are directed backwards, sideways or
131 flattened, and the pupils are enlarged [29]. When lying or sitting, the tail is kept close to the body. Tail
132 swaying in cats indicates agitation, annoyance or high arousal; often high vigilance can be observed
133 from ear movements [41]. When displaying defensive behaviour, cats may crouch, hold the ears
134 downwards or sideways and hiss, growl or shriek, but they can also stand on tiptoes, holding the tail
135 stiffly upwards or downwards, and appearing larger due to piloerection [41,42]. Aggression is often
136 imminent when the ears are swiveled sideways so that the inner pinnae are displayed and the pupil is
137 oblong. Also note that purring in cats is not only shown due to contentment, but also when sick [41].
138
139 While freezing and fleeing are usually the primary coping strategies when fearful, when no escape is
140 possible in a hospital setting, the animal may feel increasingly threatened and eventually may resort to
141 aggression [41]. Dogs may growl, lunge and bite. Cats may hiss, growl, swat with their paws and bite
142 [36]. Notably, signs of fear, such as backwards-directed ears, may disappear or only be shown during
143 earlier stages as the arousal heightens and the aggressive behaviour intensifies [36]. There may also be
144 a learned component to aggressive behaviour at the veterinarian's: if this strategy was successful in
145 stopping an unpleasant situation during a previous visit, the animal may opt for the "fight" strategy
146 again the next time [36]. Needless to say, such escalation should be prevented whenever possible, by

147   considerate handling (see below Section 3) and adjustments according to the animal's more subtle
148   signs of distress.
149

150   **2. Creating a low-stress environment**

151   *2.1. Reception area and waiting room*

152   While the examination and treatment represent the most stressful parts of a veterinary visit [3,43], a
153   high percentage of dogs and cats are already fearful in the waiting room [1,2]. Even completely
154   harmless activities, such as weighing on the scale were found to increase signs of stress in 53% of dogs
155   [38]. Many dogs and cats react stressed to the presence of conspecifics or other species both inside and
156   outside of the practice [44,45]. These difficulties are exacerbated if it is not possible to avoid other
157   animals in confined spaces. Thus, the waiting area should be set up to allow maximum distance
158   between animals and should include barriers to reduce visual contact between patients [7](Figure 1).
159   In the waiting room, like throughout the clinic, sound-absorbing tiles, rubberised floors or wall panels
160   and solid doors are recommended to absorb potentially aversive sounds (reviewed in [8]).
161
162

163
164   **Figure 1.** A spacious waiting area with visual barriers is ideal. Due to the layout of the benches,
165   waiting animals do not need to face each other. Cat carriers should be placed on an elevated surface;
166   ideal would be an additional covering of the carrier. Photo: Stefanie Riemer

167
168   Whenever possible, separate premises are recommended for dogs and cats, as the presence of dogs
169   can cause fear in cats [27,36,42]. If this is not possible due to the local infrastructure, visual barriers
170   can be used to section off 'cat zones' [46]. Another option to avoid exposure to dogs is to offer
171   consultation hours for cats only [29]. Elevated spots for cat carriers, for example extra chairs or
172   shelves, and covering the carrier with a cloth can reduce cats' stress in the waiting area [29,46].
173
174   If a dog is known to have problems with other dogs, this should likewise be taken into account
175   when making appointments, so that the dog can be booked in at off-peak times. In order to
176   minimise time in the waiting room, owners can be advised to wait in the car or to take the dog for a
177   walk when a longer waiting time is foreseeable [32]. Waiting in other areas has also been
178   demonstrated to be effective in alleviating stress: after waiting in a garden outside the clinic with
179   their owners for twenty minutes, dogs had lower heart rates and cortisol levels than dogs that
180   spent the same time in the waiting room [47](Figure 4). Fewer stress signs also occurred when
181   waiting in an empty examination room as compared to the waiting room [48].
182
183   Fear prevention can commence by reception staff offering treats to the animal upon entering the
184   practice (taking into account individual dietary requirements) [36]. Weighing, a source of stress for

185 approximately every second dog [49], is more comfortable for dogs if the scale has a non-slip
186 surface, and is not set up in a corner [27,42]. Fear of weighing can be reduced by encouraging and
187 rewarding dogs for stepping on the scale on their own [42]. Easy-to-clean dog beds that insulate
188 from the cold floor can improve dogs' comfort [50], even more so if owners bring their own blanket
189 or dog bed [29,36]. Owners can furthermore bring chews or toys to occupy the dog during the waiting
190 time [27,36](Figure 2).
191

192
193 **Figure 2.** Owners can be advised to bring a blanket from home and to distract the animal with food or
194 toys in order to decrease stress during the waiting time. However, the potential for resource guarding
195 when using toys or chews needs to be considered. Not suitable when sufficient spacing between
196 animals in the waiting area is not possible. Photo: Stefanie Riemer
197

198 *2.2. Examination room*

199 More than three-quarters of dogs observed in a veterinary practice were categorised as fearful in the
200 examination room [3], with the highest occurrence of fearful behaviour on the examination table. This
201 can be attributed to dogs not being used to standing on a table, but in particular to negative
202 associations, which can quickly form with stimuli that were present during a previous negative
203 experience such as a painful treatment. Such negative associations can also include the veterinary staff
204 or the treatment room (reviewed by Döring et al. [3]). Counterconditiong can be used to change such
205 negative associations and replace them with positive ones [3](see below Section 9.1.).

206 The examination/treatment should take place where the animal feels most comfortable [29,37]. Many
207 dogs are more relaxed when examined on the floor than on the table [3]. Cats often stay calmer if they
208 can remain in the bottom of the carrier during the examination; therefore carriers with a removable
209 top half are ideal [29,36,37,51–53]. Slippery, hard and cold surfaces can cause discomfort, which can be
210 avoided by the use of non-slip mats or soft foam pads or by provision of towels and blankets (using a
211 new, clean one for each patient) [54](Figures 3-5). Owners can also be encouraged to bring their own
212 blankets or towels, as the familiar smell is comforting [28].

213

Figure 3. A non-slip mat improves the animal's comfort. By feeding the animal during the examination or treatment, positive associations can be created. Photo: Christine Arhant, Vetmeduni Vienna

Cats and small dogs can also be examined on the veterinarian's or the owner's lap [29,36,37]. For some individuals with severe negative associations with the examination room, performing the examination outside may be the least stressful option [54].

'Taking the animal to the back' for minor procedures should be avoided. [55] performed a crossover trial in which dogs were examined in an exam room in the presence of their owners vs in the owner's absence in a common treatment area. The common treatment area included two exam tables, two tables for dental procedures, cages holding cats and small dogs as well as a row of large dog runs. Compared to the examination in the exam room, dogs exhibited a significantly elevated behavioural score for measuring fear, anxiety and stress and heart rate was on average 20bpm higher in the common area [55].
Similarly, a study using the same methodology with client-owned cats demonstrated that heart rate was 30pbm higher in the common treatment area than in the exam room with the owner. Additionally the behavioural score during the examination was higher than baseline in the common area, whereas no significant change was noted in the exam room [56].
These studies demonstrated that, whenever possible, examinations or minor procedures should be performed in the exam room with the owner is present [55,56]. If for any reason the owner's presence is not desirable, it is recommendable to request the owner to leave the examination room and perform the intervention in that room, instead of taking the animal to the common treatment area [56].

2.3. Sensory considerations

When stressed, dogs and cats can produce alarm pheromones, such as from their paw pads and, in dogs, anal gland secretions, which could subsequently have an alarming effect on other patients [26,28,57]. Thus, surfaces must be cleaned not only for hygienic reasons, but also in order to minimise odours from other animals [24], using cleaning agents that lead to denaturation of the corresponding components [26]. Since the smell of disinfectants can be perceived as aversive by animals [27], sufficient time should be allowed for cleaning agents to evaporate [24]. Good ventilation of the rooms can also reduce aversive odours [27].

249 Although the examination and handling generally constitute greater stressors for animals than the
250 ambient noise [43], it is advisable to keep the noise level as low as possible. This can be accomplished
251 by structural measures, e.g. use of sound-absorbing materials on walls, floors and doors, as well as by
252 speaking with a quiet and calm voice and avoiding unnecessary ambient noise such as from slamming
253 cage doors [24,58]. In addition, playing soothing background music (classical music or commercially
254 available recordings) has been recommended [24]. One study indicated that music specifically
255 designed for cats, but not classical music, was associated with fewer stress indicators and reduced
256 resistance to handling in cats during a clinical examination compared to no background music [59]. In
257 dogs, some studies suggest a possible calming effect of music (reviewed in [60], but the only study
258 performed in a veterinary context could not demonstrate a reduction in fearful or aggressive
259 behaviour. However, owners found the waiting time more pleasant and veterinarians indicated that
260 they enjoyed the music [59]. Further studies are needed to adress species-specific preferences, as well
261 as individual responses [60].
262

263 **3. Low-stress handling and creating positive associations**

264 *3.1. Treatment plan*
265 A treatment plan should be made for each individual patient, taking into account their behavioural
266 evaluation and the planned procedures. On this basis, decisions should be made regarding the
267 location of the examination (e.g. table vs. floor), the degree of restraint, the use of food and toys,
268 the use of aids and the assessment of a potential safety risk [54].
269 The planned examinations and interventions should be ranked according to invasiveness, and the
270 examination should begin with the least unpleasant step, with the most unpleasant procedure
271 performed last [29]. If an animal shows severe distress and treatment is not urgent, it should be
272 considered whether interrupting the procedure and setting up a new appointment would be more
273 conducive to the psychological health of the animal (and its owner). The animal could then be
274 prepared for this next visit either by pre-visit anxiolytic medication or by cooperative care training
275 in which the animal is trained through positive reinforcement to accept handling and treatment
276 [38,54]. The use of sedation is preferable to creating a traumatic experience. Since sedation is less
277 effective when animals are in an elevated state of arousal, it should be administered before fear
278 escalates, if foreseeable [39,54].
279
280 Considerations that are most important when animals are known to be fearful or to react aggressively
281 include preparing all the equipment needed before attempting to handle the patient and being aware
282 of possible 'problem zones' when handling the animal, since pain or the expectation of pain increase
283 the likelihood of aggression [62].
284

285 *3.2. First contact with the animals*
286 When greeting dogs, it would be ideal if the dog initiates the first contact on its own initiative [61].
287 Contrary to the common recommendation, it is not advisable to stretch out the hand to make
288 contact or to hold it in front of the dog's nose to sniff [37]. Instead, it is less threatening for the
289 animals if the hands are held loosely on the side of the body [61]. Many gestures performed by
290 humans with friendly intentions can be perceived as threatening by animals, such as direct eye
291 contact, a frontal approach and leaning over the animal [37,54]. Therefore, turning sideways when
292 greeting an animal, or approaching from the side if no approach is initiated by the animal, is
293 recommended. Nervous dogs can be greeted sitting or squatting, with the body weight shifted
294 away from the animal. For safety reasons, the face should be kept out of reach of the animal's face
295 [7,24,42,62]. Using the animal's name and talking to it in a friendly voice can promote familiarity
296 and security [62]. A positive bias is facilitated by the use of treats [61]. With confident dogs, treats
297 can be handed directly; with shy animals, they should be offered or tossed on the floor to avoid an
298 approach/avoidance conflict [50]. It is best to commence the examination where the animal is most
299 likely to accept touch [54].

300

301 Cats should never be dragged or even shaken out of their carriers, an extremely frightening
302 experience due to the complete loss of control [29,37,52]. A little patience often pays off: in one
303 study [53], more than half of the cats left the carrier within three minutes. When the cat has exited
304 its carrier, it is beneficial to allow it to explore the treatment room while the medical history is
305 taken (provided there are no inaccessible hiding places or escape possibilities) [29]. The lower part
306 of the carrier should remain accessible throughout the examination. More than 90% of the cats like
307 to use it as a retreat during the clinical examination [53].

308

309 In carriers with a removable top, the cat can remain in the lower part during the entire examination
310 [37,51–53]. A towel placed over the lower part and over the cat serves as a hiding place and may
311 promote a sense of security [37,52]. If examining in the carrier is not an option and the cat shows no
312 intention to exit the carrier after a few minutes, luring it with high quality food or toys can be
313 attempted [36]. Should it be necessary to manually remove the cat from the carrier, reaching
314 around the caudal abdomen and hind legs and applying light pressure can motivate calm cats to
315 move forward [29]. For timid animals, the use of a towel may be helpful to gently pull them
316 forward [37].

317

318 *3.3. Considerate body language*
319 Smooth, slow handler movements and calm speech are conducive to the patients' relaxation [42,54],
320 while sudden position changes can be perceived as startling or threatening [61]. During contact,
321 repeated letting go and touching of the animal should be avoided. Instead, the hands can be slid
322 along the body to the area of interest [24]. Although physical contact and petting can have a
323 calming effect on animals [63], this should only be done by the veterinary team if the animal
324 obviously enjoys it [7]. Periodic brief pauses of the examination and enabling some play or pleasant
325 activity can promote derousal and more positive emotions [36].

326

327 *3.4. Creating positive associations*
328 Whenever an animal is at the veterinary practice, it should be endeavoured to create positive
329 associations, which can often be achieved easily by the use of food or toys – these should not be
330 limited to the end of the visit but can already be used generously during the examination or
331 treatment, both to distract the animal and to elicit positive emotions [61,62] (Figure 3, Figure 4). For
332 example, animals can lick delicious paste while on the table and receiving an injection, or the owner
333 can offer a handful of treats in quick succession [36].

334

335
336 **Figure 4.** Use of high-value food (or toys) can increase cooperativeness and promotes positive
337 emotions. Photo: Christine Arhant, Vetmeduni Vienna

338

339 *3.4. Balancing physical and emotional health*
340 The emotional state of the patients should be continually evaluated. For example, Herron & Shreyer

341 [24] propose a colour scale system for this purpose: As long as the animal is within the green zone, it is
342 relaxed, able to take food and safe to handle. Yellow indicates that the patient is anxious and alert.
343 While the animal is more likely to reatreat at this stage, aggressive reactions cannot be excluded if it is
344 provoked further [24]. Here, steps should be taken to alleviate the animal's stress, e.g. pausing the
345 examination, adjusting the restraint technique or location of the animal, involving the owner, and
346 providing distraction with incentives such as food or toys [24,38].
347 A red rating refers to an animal that appears to fear for its life and is ready to attack. Safe handling is
348 not possible under these circumstances. If it is essential to proceed the examination and/ or treatment
349 for health reasons, chemical restraint should be performed prior to any continuation of the procedure,
350 both to avoid traumatising the animal and to mimimise risk to the staff [24,38]. Note in this context
351 that sedation is less effective when the animal is already agitated; therefore if needed, sedatives should
352 ideally be administered prior to any escalation [39,54]. For non-essential visits and when owner
353 compliance can be expected, rescheduling the visit and preparing the animal with a handling plan
354 and/ or pre-visit anxiolytic medication is recommended [24,38].
355
356 Although accommodating perceived "difficult" animals may initially cost more time, investing into
357 individual routines and enabling the animals to feel safe leads to more efficient examinations and
358 treatment in the long term [3,38] and reduces the risk of injury to the staff [29,39,54].
359

360 **4. Restraint methods**

361 The more comfortable an animal feels in its environment and during manipulation, the more likely
362 it is to remain calm and cooperative [37], which not only improves the individual's welfare but also
363 reduces risk to the staff, since forceful handling is one of the contexts associated with an increased
364 likelihood of aggression [3,32,36]. The examination or treatment should therefore be carried out in
365 a position and using a restraint method which causes the least stress to the animal in order to
366 perform the respective intervention lege artis while ensuring the safety of all involved [37](Figure
367 5). The use of food enhances the animal's cooperativeness so that minimal restraint is often
368 sufficient [42](Figures 3-4).
369
370

371
372 **Figure 5.** Performing the examination in a position that is most comfortable for the individual and
373 using the minimal amount of fixation needed, improves the patients' compliance and well-being.
374 Photo: Christine Arhant, Vetmeduni Vienna
375
376 Unpredictability and loss of control are among the strongest psychological stressors [64]. Accordingly,
377 full body restraint (e.g. lateral recumbency with the fore and hind legs held firmly) or scruffing the
378 neck lead to stronger defensive reactions and more escape attempts and signs of stress than
379 minimal fixation, in which the animal is allowed to remain in any body position and is only gently
380 prevented from moving away from the examiner [29,30,37] (Figure 5). Alternative methods of head

381 control, such as the use of towels or blankets should be preferred [29,37] (see below Section 4.1.1).
382
383 If an animal resists restraint for more than two to three seconds, interrupting and repositioning
384 may be helpful. If the animal remains uncooperative after two to three further attempts, a different
385 handling approach should be attempted [37]. For urgent interventions, sedation should be
386 performed before the situation escalates [29]. If the procedure is simply continued by using force,
387 this carries a high risk of increasing fear and aggression during the next visit as well as the
388 potential for staff injury [3,32,36]. Reactions such as a strict "no", punitive measures or forceful
389 restraint further increase the risk of aggressive behaviour [36,65]. Thus, for both, animal welfare
390 and staff safety, stress reducing measures should constitute an essential part of everyday
391 veterinary practice, and if these are not sufficient to allow a safe examination, anxiolytics and
392 chemical restraint should be considered whenever a situation may entail excessive fear or the display
393 of aggressive behaviour [36].
394

395 *4.1. Tools to facilitate restraint and safety*
396
397 *4.1.1. Towels, blankets, and alternatives*
398 Towels and blankets are often recommended for restraint of cats and smaller dogs, to shield animals
399 from visual stimuli and to create a sense of hiding [36,37,54] (Figure 6). Providing a protective barrier
400 between person and patient, towel wraps can constitute an effective safety measures [36], as they
401 can also protect against cats' claws. They can furthermore be used to control the head, especially in
402 small and brachycephalic dogs and in dogs that show fear of the muzzle [54].
403 'Cat bags' can be used as a means to restrain cats in similar ways as with towels, but some concerns
404 have been raised that placing the cat into the bag may be difficult and that fitting it too tight might be
405 distressing whereas restraint might not be sufficient with a loose-fitting bag [29]. Thus, using towel
406 techniques was suggested to be preferable for this purpose [29].
407

408
409 **Figure 6.** Towels and blankets can be used in various ways for safe restraint of cats and small dogs..
410 Photo: Christine Arhant, Vetmeduni Vienna
411
412 Anxious and agitated animals can be calmed by placing a towel over their head, suppressing visual
413 stimuli [36]. Another way to achieve the latter may be the use of 'calming caps', which are placed over
414 dogs' heads including the eyes to reduce visual stimulation [24,42]. One potential advantage is the
415 prevention of anticipatory anxiety as the dog does not see preparatory actions leading to a procedure.
416 Another use might lie in preventing aggressive dogs from seeing conspecifics or people when
417 kenneled or when moved within the hospital [24]. However, the effectiveness of calming caps in
418 reducing animals' distress has not yet been researched.
419

420   *4.1.2. Muzzles and alternatives*

421   Muzzles constitute important tools to ensure the safety of all involved parties [66], reducing the
422   risk of a bite and thus enabling veterinary staff to be more confident and calmer in the interaction
423   [36]. Muzzles must not be abused to manhandle a resisting dog and to carry out a procedure
424   despite the dog's struggling [50]. In such cases, other measures such as short-term sedation, pre-
425   visit medication, and in the longer term behavioural training must be used [37].
426
427   Since stressed dogs often pant [67], muzzles that restrict the dog's ability to open the mouth and
428   thus panting, such as soft nylon muzzles, are only suitable for very short-term use such as during
429   an injection. Unsuitable muzzles may restrict normal breathing and thermoregulation, which can
430   in the worst case become life-threatening [36]. Only muzzles that do not obstruct air circulation
431   and are deep enough to allow unrestricted opening of the mouth and panting are suitable for
432   prolonged wearing [68].
433
434   Ideally, every dog would have received muzzle training by the owner. For untrained animals that
435   do not need to be fasted, smearing attractive food inside the muzzle is helpful. The muzzle is then
436   offered from below, slipped over the nose and secured as quickly as possible while the dog licks
437   the food inside the muzzle [24,37]. In order to promote a positive association with the muzzle, food
438   should be offered during the entire duration of the procedure [37], e.g. by feeding paste from a
439   tube or a large syringe [7](Figure 7).
440

441
442   **Figure 7.** Muzzles increase safety. Food can be used to entice the dog to place its nose into the
443   muzzle and should be offered repeatedly during wearing in order to create positive associations.
444   Photo: Christine Arhant, Vetmeduni Vienna
445
446   Cat muzzles cover both mouth and eyes [24]. However, unlike dog muzzles, cat muzzles can
447   hardly be adjusted to the animal, and cats usually do not receive muzzle training. Soft nylon
448   muzzles are a possibility if visual shielding is the primary aim [24,29], whereas hard plastic
449   muzzles are more suitable for the prevention of bites [24,36]. The ball-shaped "Air Muzzle" (Air
450   Muzzle, SmartPractice, Phoenix, Arizona), which can be used for small and especially
451   brachycephalic dogs and cats, encloses the entire head and enables normal breathing. Its advantage
452   is that the handler's hands stay protected behind the device when putting it on [36].
453
454   Still, the use of towel wraps may impose less stress on cats or small dogs while achieving good
455   head control [24,36,69]. Another alternative to control the head of dogs and cats and increase safety
456   when handling difficult animals is the use of Elizabethan collars [24,36].
457
458   *4.1.3. Tools that should only be used when alternatives are not feasible*
459   The use of "clipnosis" in cats is under debate [29], with some contradictory results on the welfare
460   implications reported [30,70–73]. It cause an inhibition of behaviour and therefore immobilisation

461   in cats (although responsivity differs between individuals) [72,73], but it has been controversial
462   whether this behavioural inhibition actually reflects calming or freezing (c.f. [24]). One study
463   suggested that cats showed a lower heart rate and lower pupil dilation when clipnposis was
464   applied compared to scruffing [73], but another study indicated that clipnosis is similarly stressful
465   as full body restraint, the restraint method associated with the most negative reactions, and more
466   stressful than scruffing [71]. In this study, cats showed increased pupil dilation and increased
467   vocalisations at similar levels during full body restraint and clipnosis, whereas scruffed cats
468   vocalised less. Thus it was concluded that full-body restraint, clips and scruffing are aversive to
469   cats and should be avoided as much as possible, so that manual scruffing might be the method of
470   choice when minimal restraint is not sufficient [71]. Nonetheless, as described above, the use of
471   anxiolytics and chemical restraint might be preferable in such situations [36].

473   If nets are to be used at all, this should only be the case in special circumstances and never for longer
474   than a few seconds (e.g. to administer an injection)[29]. With very aggressive or feral cats, it has been
475   suggested that using nets for capturing may incur less stress than forceful manual handling (such as
476   scruffing) while also increasing the handler's safety [36], but some experts hold the opinion that their
477   use is never justified [29].

479   Dog catchers (poles with wire loops that can be thrown over the animal's head and tightened)
480   should only ever be used if there is no other option, for example when there is no other way to
481   remove a highly aggressive dog from the kennel. This is extremely stressful for the animal and
482   carries a risk of injury with improper handling and should therefore be avoided wherever possible
483   [62].

485   Similarly, the use of crush cages is only intended for emergencies to perform an injection quickly and
486   safely [50,62]. Pressure in the crush cage should only be applied for as long as necessary for the
487   injection [50]. Before and after the injection, both the cage and the net should be covered with a cloth
488   to block visual stimuli [24].

490   Gauntlets should only be used under special circumstances and in combination with other tools
491   such as nets and towels [37]. The gloves provide protection for arms and hands, but can cause
492   additional stress to the animals and dexterity is limited during wearing. Thus they should only be
493   used to restrain patients or to remove them from their carrier or cage if no less stressful alternative
494   is available [37,50].

5. Reducing the perception of pain

5.1. The power of distractions

498   A number of pediatric studies have tested interventions to reduce pain in human infants during
499   injections or vaccinations [74]. Both tactile and cognitive distractions have been shown to be
500   effective in reducing perceived pain [74]. Examples of tactile stimulation include vibration, but also
501   the passive movement of a body part [74–76]. The reduction of pain through simultaneous tactile
502   stimulation can be explained by the Gate Control Theory [77]. According to this theory, thin
503   nociceptive nerve fibres (C-type) are inhibited by the simultaneous activation of thick nerve fibres
504   (A-type), which process touch stimuli [78]. Consequently, tactile stimulation slightly preceding and
505   continuing through an injection such as tickling, light tapping or massaging likely contributes to a
506   reduction in pain also in animals [7].

508   Cognitive distractions, which draw attention to something else, are also effective in human studies
509   to reduce pain perception [74,79]. In pets this could be achieved by the simultaneous
510   administration of food, in well-trained animals also by performing a trained behaviour, such as

511   resting the chin on the owner's hand [7]. The use of food can further contribute to a positive
512   association with the situation (counter-conditioning) [37]. By using distracting techniques, negative
513   experiences can thus be avoided, and the likelihood of aggressive reactions reduced.
514

515   *5.2. Topical analgesics*

516   The application of EMLA cream (active ingredients lidocaine/prilocaine) can reduce defensive
517   movements in dogs during catheterisation; however, an application time of 60 minutes was
518   necessary (no observable difference to placebo after 30 minutes) [80]. In cats, efficacy of EMLA
519   cream already 30 min after application was demonstrated in cats undergoing jugular blood
520   sampling: The stress score in cats receiving the EMLA cream was significantly lower than in the
521   placebo group, and withdrawal movements were observed in only one of nine cats of the EMLA
522   group, compared to seven of nine in the control group. Moreover, the blinded clinicians rated
523   jugular venipuncture as easy in eight of nine cats having received EMLA and one of nine cats in
524   the placebo group. In already sedated cats, a positive effect of EMLA on struggling during jugular
525   catheterisation has been reported just 20 minutes after application [81]. For jugular catheterization
526   in unsedated cats, there was also a tendency for less struggling one hour after EMLA application,
527   but the level of statistical significance was just missed [82]. In addition, it was observed that some
528   cats did not react to the initial insertion of the needle, but to the progression of the catheter into the
529   vein, so that sedation was necessary for successful catheterisation [82]. Thus, the results support
530   the usefulness of EMLA in clinical practice for blood sampling in cats, while success was somewhat
531   lower when catheterization was necessary without prior sedation. However, if animals
532   subsequently need to undergo anesthesia anyway, intramuscular sedation as a standard procedure
533   before further invasive procedures such as the insertion of a venous catheter has been
534   recommended in order to minimise the risk of a negative experience [38].
535

536   A possible explanation for the longer application period necessary to achieve a sufficient analgesic
537   effect in dogs compared to cats might lie in differences relating to the skin, but also behavioural
538   species differences. Furthermore, stress-induced peripheral vasoconstriction could influence the
539   effectiveness of topical analgesics [83].
540

541   When examining an animal that is known to be affected by a painful condition or when performing
542   procedures associated with pain such as ear cleaning and anal sac expression, preemptive analgesia
543   can reduce and ideally prevent pain and thus ameliorate the negative experience and avoid potential
544   aggressive reactions [41].
545

546   *5.3. Optimised use of needles*

547   To further facilitate blood sampling, using butterfly needles is recommendable (reviewed in [8]).
548   For injections, it is advised to use the the smallest gauge needle that is practical for the respective
549   purpose, and to use a new needle after drawing the medication in order to ensure that the needle is
550   sharp [8,27].
551

552   **6. Minimising non-painful discomfort**
553   When medication needs to be administered orally, hiding it in palatable treats would be optimal. If
554   this is not possible, a pill administrator or pill gun is useful by avoiding the medication's contact with
555   the tongue [24].
556

557   To prevent animals from scratching or licking wounds, products that minimise discomfort while
558   ensuring safety should be chosen, e.g. protective clothing such as recovery suits or Elizabethan collars
559   made of soft material instead of plastic cones [50,84].

560

7. The owner's influence

Dogs show attachment behaviour towards their caregivers, which shows parallels with the attachment between infants and their parents [85–87]. The presence of the owner can reduce the extent of the stress response in new situations ("secure base effect", [85]) or when the dog is frightened and seeks out the owner ("safe haven effect", [88]). One study compared physiological parameters in dogs that were either kenneled at a clinic for 12 hours or were brought in immediately prior to gonadectomy. Dogs that spent the night in the clinic showed a significantly higher oxidative stress index and increased cortisol levels in a blood sample taken just before surgery than those that were brought in directly before surgery [89]. In another study, dogs had higher blood pressure and higher heart rate in the absence of their owners compared to when the owners were present [90]. Consequently, whenever possible, enabling the owner to be present is an important factor in reducing stress in dogs [7].

Csoltova et al. [91] compared signs of stress in dogs during a standardised clinical examination during which owners were either present but passive (3 m away from the table) or petted and talked to their dog while on the table. In the 'contact' condition, dogs made significantly fewer attempts to jump off the table and exhibited a significantly lower heart rate and a significantly lower eye temperature, measured by a thermographic camera, than in the 'non-contact' condition, indicating a lower stress level when having physical contact with the owner [91].

One exception to owners' beneficial influence is when the owner is very stressed or anxious him- or herself. In unclear situations, dogs will look back at their caregiver to better assess the situation and adapt their behaviour according to the owner's emotional expressions [92,93]. If the owner signals that the situation is dangerous or scary, this may indeed affect the dog negatively, and in rare cases, treatment in the absence of the owner may be preferable [7].

Furthermore, some patients may show less aggression when the owner is absent [36]. This does not necessarily mean that they are less fearful, but they adopt a different coping strategy [24]. While treating the pet in the owner's absence in these cases may seem a solution, it carries the risk of traumatising the animal. Moreover, if the animal learns that freezing is not successful in avoiding the perceived threat, it may opt for a different strategy next time, so that handling may become progressively more difficult [24]. Thus, replanning the visit with premedication or behaviour modification, as described in section 9.1., or the use of chemical restraint if the procedure cannot be postponed is most likely more conducive to the animal's welfare [24,37] and does not carry the risk of the owner assuming that the pet is being mishandled when they hear crying, barking or growling next door [36].

Studies on the influence of the owner on the behaviour of cats in the veterinary situation are still lacking. However, previous study results suggest that cats also form a bond with their owners [94,95] and that the owner is important to the cat, although they generally seem to be affected less by separation than dogs [96].

8. Inpatients

Hospitalisation and the separation from the owner are highly stressful for many animals [89]. Stress can have a negative effect on wound healing, cardiovascular health and the gastrointestinal system. In the long term, immunosuppression is also possible (reviewed by [97]). Stress reducing measures are therefore especially important for hospitalised patients.

Similar to the waiting room, dogs and cats should be housed separately, and dog barks should ideally

609   not be audible in cat holding areas [58]. For both species, it is recommended that the cages or kennels
610   face the wall, so that there is no visual contact with other animals. Predictability of daily routines and
611   control of stressors (e.g.minimising noise during cleaning activities) are associated with improved
612   welfare, and the animals are more likely to make contact with the caregivers [58].

614   A major problem when housing dogs is noise exposure and restlessness caused by barking and other
615   forms of vocalization. Studies from shelter settings indicate that playing classical music [98] or audio
616   books [99] and offering activity feeding [100] can reduce vocalizations. Feeding enrichment, such as by
617   provision of puzzle toys filled with food, is furthermore valuable by reducing boredom [42]. Regular
618   positive contact with caregivers, e.g. stroking, walking, presence of a human, are associated with
619   reduced stress levels in kenneled dogs and cats [101–103].

621   Cats have an instinctive need to hide in threatening situations; thus the availability of hiding places
622   such as by providing boxes, or simply by covering (half of) the cage with a towel is important for their
623   welfare [42]. Studies demonstrated that hospitalised cats with a hiding box in the cage or a towel
624   draped over the cage had lower heart rates compared to controls without hiding places. In addition,
625   cats that had a box available showed fewer behavioural stress signs than the control group [104,105]. A
626   trend in the same direction was observed in the group with the towel [105]. By using towels to cover
627   only half the cage, visual access for the clinic staff is possible while still giving the cat a sense of
628   security [106].

630   Especially for inpatients, familiar odours (e.g. blankets, toys) are recommended to provide security
631   [50]. If there are concerns that personal belongings may be lost or have to be disposed of for hygienic
632   reasons, owners could be asked to bring old towels with their scent. These can be cut into smaller
633   strips and stored in closed containers to best retain the smell. The used strips can be replaced as
634   necessary so the animal still benefits from the owner's scent [7].

636   When an animal has a known tendency to react aggressively, putting a sign on its cage and recording
637   this in its medical history helps to ensure that all staff members are aware of the animal's special
638   needs. Leaning into the kennel or blocking the doorway should be avoided as it may cause the animal
639   to feel trapped, increasing the risk of a bite [62]. Talking softly while adopting a sideways rather than
640   frontal stance may encourage the animal to approach; this is much preferable to reaching into the cage
641   to grab the animal [36]. With fearful or aggressive dogs, it may also be helpful to leave a lightweight
642   lead attached to the collar or preferably harness to facilitate handling [62].

644   **9. Prevention and training measures**

645   Whenever an animal comes to the practice, every effort should be made to keep it feeling safe and to
646   create positive experiences. A simple and time-efficient way is to feed the animals during the
647   examination [36,61]. The first impression is particularly important – thus, the first examination or
648   vaccination can have a lasting effect on a dog's behaviour [3]. As described above, painful experiences
649   during vaccination can be minimised by tactile distraction as well as feeding the animal through the
650   procedure [7].

652   Veterinary personnel should be trained in desensitisation/ counterconditioning techniques and use it
653   whenever possible (c.f. [38]). Additionally, 'happy visits' can be used to create a more positive
654   emotional state in the clinic (Figure 8). Owners can be encouraged to bring their animals to the clinic
655   just to greet the reception staff, be rewarded for stepping on the scale, or briefly visit an examination
656   room where a staff member may greet them and give them treats [36]. Such visits to the practice
657   without any examinations or treatments reduce the risk that the animal will later show conditioned
658   fears (e.g. in connection with injections) [3], enable positive experiences and can also be incorporated
659   in a training plan for already fearful dogs [36].

660

661
662 **Figure 8.** 'Happy Visits' enable positive experiences in the clinic environment. In this setup, several
663 forms filled with lickable food (normal wet food works well) are spread throughout the examination
664 room and the dog is free to choose without any pressure. A reduced version of such a 'happy visit' can
665 also be offered during normal consultations – the dog can lick some food while the veterinarian is
666 taking the history. Photo: Stefanie Riemer
667
668 In addition, owners play an important role in preparing their pets for veterinary visits. Ideally,
669 puppies and kittens would be trained to accept touching of the whole body and examinations such as
670 opening the mouth and handling the paws from a young age [3]. This is best done according to the
671 principle of desensitisation/counterconditioning (see Section 9.1., c.f. [38]).
672 Carrier training should be essential for any cat (and dog) [37,52]. To this end, owners should create
673 positive associations with the carrier at home, such as by placing it in the living room and regularly
674 offering incentives such as food, toys or petting in and around the carrier [28,37,52,53]. Voluntary
675 entry and remaining in the closed carrier can furthermore be trained using positive reinforcement [53].
676 The choice of a carrier model with an easily and quietly removable top and an additional opening at
677 the top facilitates removing and returning the cat from/to the carrier [41,52]. Travel sickness can be
678 prevented by medication such as Maropitant (approved for dogs; also recommended for cats) [29].
679 Each dog should also receive muzzle training (Figure 7) to ensure that the muzzle does not act as an
680 additional stressor should it become necessary [38].
681
682 During the veterinary visit itself, owners should convey positive emotions and confidence, which
683 can be aided by a sympathetic stance from the veterinary team and by advising owners on how to
684 help to make the visit most pleasant for their animal. This includes bringing favoured food, chews,
685 toys and a familiar blanket [7,29,36,62] as well as refraining from feeding a full meal prior to the
686 visit [29,36] so that counterconditioning methods using food treats can be implemented while the
687 animal has some appetite [107].
688
689
690 *9.1. Behaviour modification techniques*

691 The primary recommended behavioural techniques to reduce fear responses in animals are
692 **counterconditioning** and **desensitisation** (see below). Mere **habituation** (reactions to a stimulus
693 decline when it is presented repeatedly or over a longer period of time [108] is usually not sufficient to
694 improve fear at the veterinarian's (e.g. [91]). Conversely, **sensitisation** may occur and the individual's
695 response to the stimulus may become stronger [108]. **Flooding** (the animal is exposed to a fear-
696 inducing stimulus at full intensity and is prevented from escaping, with the aim of extinguishing the
697 fear response) creates a situation of extreme fear, can lead to panic reactions and carries the risk of

698   aggravating the fear. Flooding often inadvertently happens during veterinary examinations or
699   treatments, but it is no longer a recommended technique in veterinary behavioural therapy due to
700   animal welfare reasons [107].
701

702   With **desensitisation**, the animal is exposed to a fear-inducing stimulus at such a low intensity that it
703   does not induce any fear. Stimulus intensity is then gradually increased as long as the animal remains
704   relaxed. Over the course of numerous repetitions, the initial fear response can thus be extinguished.
705   Critical to the success of desensitisation is that the stimulus must be presented at a level at which the
706   animal remains relaxed. If stimulus intensity is too high, this can inadvertently lead to **sensitisation**.
707   As a consequence, the individual's reaction to the stimulus increases [108]. Desensitisation is most
708   effective when combined with counterconditioning [107].
709

710   In **counterconditioning**, the fear-eliciting stimulus is paired with desirable consequences such as food
711   or play in order to replace the association with a positive one [109]. The (former) trigger should be
712   reliably followed by a reward each time in order to build a strong positive association.
713   Counterconditioning works best if carried out in parallel with desensitisation, i.e. stimulus intensity
714   should initially be kept low so as not to elicit a fear response and can slowly be increased over the course
715   of training (see [107]).

716   To achieve this in a veterinary context, the examination and treatment are broken down into small
717   approximations, and each step is immediately followed by a reward, usually food (Figure 9). The
718   approximations are designed so that the animal shows no or hardly any signs of stress, e.g. the examiner
719   might start by moving the hand towards the animal (without touching) followed by a reward and then
720   touching a nonsensitive area followed by a reward. Each further step, such as moving the hand to the
721   target area and gradually increasing time and intensity of the examination, should be followed by a
722   reward. As each step is repeated several times, the animal should become more relaxed – an increase in
723   body tension can be an indication of sensitisation taking place. In the latter case, even smaller steps have
724   to be taken, i.e. the units should be made even shorter or less intense, or other strategies (additional
725   administration of anxiolytic medication) should be used [27,37,38]. Detailed protocols for /
726   counterconditioning in a veterinary context are given in [38].
727

728   **Figure 9.** During counterconditioning, a potentially unpleasant or fear-
729   inducing stimulus is paired with a high-value incentive. For optimal results, the start of the potentially
730   aversive stimulus should precede the start of the positive desired stimulus so that it becomes a
731   predictor of something positive. Thus, the ideal sequence of events is as follows: start touch, then start
732   feeding and continue feeding throughout the touch. When you stop touching, also stop feeding.
733   Photo: Christine Arhant, Vetmeduni Vienna

734

735 While relaxation should always be the goal , in classical counterconditioning a reward is always given
736 contingent on the stimulus, regardless of the animal's behaviour (see [107]). In the past, this method was
737 used less, because it was wrongly assumed that giving rewards when the animal showed fearful
738 behaviour could reinforce the fear. However, a negative emotion cannot be rendered more negative
739 by adding something positive; on the contrary, the positive experiences can improve the emotional
740 state [107]. Thus, in classical counterconditioning, one works first on the level of emotions, which
741 subsequently leads to a behavioural change [107]. Of course this does not mean that the training should
742 be conducted at a level that is over the individual animal's threshold, but when it does happen, a reward
743 should be given anyway, as the best success can be achieved when the contingency between the fear-
744 inducing stimulus and the reward is reliable [107]. If the animal does react fearfully or even
745 aggressively, this is a clear sign that the situation needs to be adjusted in a way that helps the animal to
746 keep feeling safe [110], such as by changing the training plan or use of anxiolytics when necessary
747 [27,37,38].

748 Crucial to the success of counterconditioning is that the reward used is of extremely high value to the
749 animal to produce a strong conditioned positive response [107]. Highly palatable food is particularly
750 suitable, but also play and petting can be used [38]. Counterconditioning is most effective when the
751 potentially aversive stimulus, such as for example touch of the animal by a veterinarian, is a predictor
752 of something positive. Thus the order should be touch, then feed, and not the other way around [38].

753 Note that his method should not only be applied in the treatment of already existing fears but can be
754 used in the same way to prevent negative associations [38], also see [111] on the power of preventative
755 counterconditioning.

756

757 *9.2. Preventing a resurgence of fear*

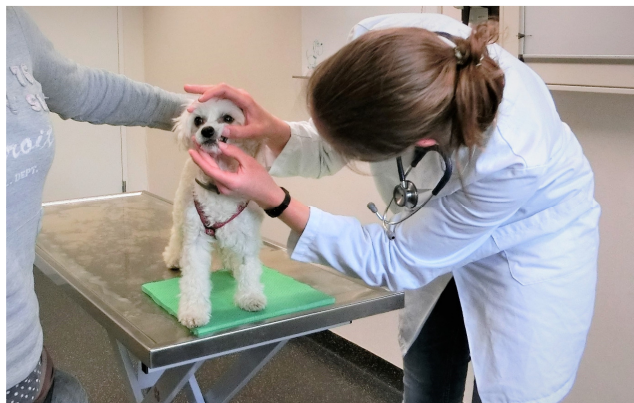
758 From a neurobiological point of view, fear extinction is only successful if a so-called extinction
759 memory is formed and can be retrieved, which 'overlays' the fear memory. However, negative
760 memories are never completely forgotten, since different regions of the brain are responsible for fear
761 and its inhibition [112]. Under acute stress, when the animal has not been exposed to the stimulus for
762 a prolonged time, and when the trigger occurs unexpectedly or in a new context, a resurgence of fear
763 commonly occurs [112–114]. A very important factor in fear extinction is therefore generalisation (e.g.
764 conducting an examination in different places and by different people, etc.) – this should, however, be
765 done very carefully to prevent a new fear reaction [115].

766 Some patients are so fearful that the only realistic goal, both during the visit to the veterinarian and
767 during training at home, is to teach them to tolerate the measures necessary for intramuscular
768 sedation [38]. Under certain circumstances for some individuals, a kind of "emergency" management
769 may be best, such as injecting the sedative as quickly as possible outside the surgery, in a very
770 distracting environment, without prior palpation of the muscle [38]; however, owners should be
771 informed that the risk is increased if sedation is administered without prior examination [116].

772

773 *9.3. Coooperative care training*

774 Cooperative care training has been pioneered by zoos and other institutions that keep wild animals,
775 enabling medical procedures, including invasive ones such as blood sampling, without the necessity
776 of sedation (e.g. [117]). Beyond desensitisation and classical counterconditioning, animals can be
777 trained to give their consent to an action by showing an operantly trained behaviour (for example
778 stepping onto a target mat or placing the chin on a hand or target)(Figure 10). At the same time, the
779 animals can also stop the procedure at any time by discontinuing the learned operant behaviour. This
780 training is always combined with a desensitisation/counterconditioning approach, where the animals

781   learn to tolerate handling and medical procedures in small steps [38]. However, if a procedure has to
782   be carried out to which the animal will likely not consent (all the way through to the end) and
783   breaking off is not an option, the target should not be used. Instead, training animals with positive
784   reinforcement to accept different types of restraint should also be part of cooperative care training so
785   that it is less stressful when needed [115].
786

787
788   **Figure 10.** Animals can be trained to perform a 'consent behaviour' such as stepping onto a target mat
789   to indicate when they are ready for manipulations. When the animal interrupts the behaviour, any
790   manipulations are stopped, thus giving the animal control. Photo: Stefanie Riemer
791
792   Further ways to facilitate medical and husbandry procedures through cooperative care training
793   include the training of behaviours such as opening the mouth, presenting a particular body part,
794   ingesting medication, accepting eye and ear drops or shortening the nails by scratching on a
795   scratchboard (a board with sandpaper) [38,118].
796
797   A study on laboratory cats demonstrated that training kittens to accept venipuncture using a gradual
798   approach was associated with less stress during blood sampling when the cats were adults [119].
799   While no studies on cooperative care training in adult pet cats are available, one study has
800   demonstrated that using positive reinforcement to train cats to voluntarily enter and stay in a cat
801   carrier and habituate them to the car (28 sessions within six weeks) was associated with reduced stress
802   during transport and less time required for the clinical examination, suggesting lower stress and thus
803   increased willingness to cooperate [53].
804
805   If cooperative care training is carried out by the owners themselves, good guidance from the
806   veterinary team or dog trainers/ behaviourists as well as high owner compliance is essential. In a
807   study in which owners were instructed to train their dogs to accept various examination steps over a
808   period of four weeks, using written and video instructions, only minor positive effects were found,
809   despite additional 'happy visits' to the clinic [120]. Owners should therefore be prepared for the
810   necessity of longer-term training, ideally in combination with enabling positive experiences including
811   members of the veterinary team.
812   Often, cooperative care training is recommended as part of a behaviour modification programme
813   when animals are already fearful at the veterinary practice. For successful implementation in the
814   veterinary setting, the cooperation of the practice team is thus essential to enable a successful transfer
815   of the training from the home to the veterinary environment. Training at the veterinary practice/with
816   the veterinary team can be seen as a measure to promote client loyalty or can be charged as a
817   veterinary behavioural/training consultation, depending on the effort involved [115].
818

819   **10. Medication**

820   With some animals, management and stress-reducing techniques are not sufficient to reduce fear and

821 anxiety. If patients cannot be examined and/or treated effectively and safely, medication should be
822 considered. To achieve the best effect, anxiolytic medication should ideally be given before the animal
823 becomes overly aroused and stressed [24]. Therefore, pre-visit anxiolytic medication administered by
824 the owners is typically most effective [39].

825 It is important to emphasise that the use of psychotropic medication must never replace responsible
826 and welfare-compliant handling and interactions with the animal. Rather, it is a supportive measure
827 with the aim of reducing stress and fear without impairing normal behaviour [27] and to reduce the
828 suffering of the animal, improve its welfare and facilitate behavioural training [38]. Hence,
829 behavioural modification techniques alongside medication play an important part of the treatment
830 plan. Through the concomitant use of anxiolytic medication with behavioural training, learning can be
831 facilitated [121].

832

833 *10.1. Application options*

834 When choosing an appropriate pre-visit medication, the purpose of the veterinary visit and owners'
835 ability to administer different types of medications need to be considered. For preventive checkups or
836 vaccinations, the animal generally does not need to be fasted and medication can easily be
837 administered with food. If an animal has to remain fasted, transmucosal forms of application (e.g. in
838 gel form) or medication that is soluble in a small amount of water would be preferable. While gels
839 have to be applied to the animal's gums by the owner, aqueous solutions may not be palatable for
840 animals (e.g. bitter taste of gabapentin). The (forced) oral application of aqueous solutions is difficult
841 for many owners and can lead to significant stress both for the owner and the animal. Therefore a pre-
842 visit discussion with the owner considering the reason for the visit and the application skills of the
843 owner, including the tolerance of the animal to manipulations around its head, is recommended to
844 choose an appropriate medication [115].

845 In the following section, the most relevant classes of anxiolytic medications and the scientific evidence
846 for their effectiveness in a veterinary setting are reviewed. The use of polypharmacy, detailed dosage
847 recommendations, potential side effects, interactions and contraindications in animals with impaired
848 kidney, liver or heart function are not discussed in this review; a consultation with a veterinary
849 behaviour specialist or a pharmacology textbook is advised [115].

850 *10.2. Selected medication options*

851 10.2.1. Trazodone

852 Trazodone belongs to the class of serotonin antagonists and serotonin reuptake inhibitors. High
853 dosages have antidepressant effects, while low and medium doses are used in the context of
854 veterinary fear and other situational fear states [122,123]. In hospitalised dogs, an application of
855 Trazodon led to a reduction of various stress signs, including flattened ears, trembling, panting,
856 licking lips, averting the gaze, pacing, growling and snapping, after 90 minutes [124]. In cats, a single
857 administration of Trazodone 1-1.5 hours before transport to the veterinary practice resulted in a
858 reduction of fear indicators during travel and increased compliance during the physical
859 examination [125].

860

861 10.2.2. Alpha 2 adrenoreceptor agonists

862 Dexmedetomidine transmucosal gel has been approved as Sileo© for noise fears in dogs [126]. In the
863 veterinary context, the use of Sileo© as pre-visit medication increased dogs' compliance and reduced

864   heart rate by up to 30 bpm during the examination compared to a baseline examination [127]. A recent
865   crossover, double-blinded, placebo-controlled study demonstrated that administration of
866   dexmedetomidine oromucosal gel was associated with reduced vocalisations (such as whining,
867   yelping, and grumbling), avoidance behaviours and panting, trembling, urination and defecation
868   during a veterinary examination compared to placebo [128].

869   Dexmedetomidine could also reduce car travel related problems. In a triple-blinded crossover study,
870   dogs showed a significant reduction in panting and yawning when administered dexmedetomidine
871   one hour before the start of a 10-minute car ride [129].

872   In cats, there are numerous studies on the good sedative and analgesic effect of intravenous or
873   intramuscular use of dexmedetomidine (e.g. during anaesthesia)[130–133], but the high probability of
874   inducing vomiting (e.g. [134,135] is considered counterproductive for a stress-reducing function in the
875   awake animal [115].

876   Another alpha 2 adrenoreceptor agonist is Clonidine. Despite its use in veterinary behaviour
877   medicine, only one open label study of the efficacy of Clonidine in dogs diagnosed with different
878   forms of anxiety has been published [136]. No details about its effect during veterinary visits are
879   available so far. Given this lack of studies in dogs and cats, the use of Dexmedetomidine might be
880   preferable for dogs. However, Clonidine tablets may be advantageous if a gel application by the
881   owner is not possible (e.g. aggressive behaviour of the dog when its mouth is manipulated) [115].

882

10.2.3. Gabapentin

884   The anxiolytic effects of the anticonvulsant and structural GABA analogue Gabapentin are mainly
885   known from humans [137] and cats [138]. In cats, a single administration of gabapentin 90 minutes
886   before transport to the veterinary practice was associated with significantly lower stress scores
887   (assessed by the owners) and compliance scores (assessed by the vets)[138]. Gabapentin powder from
888   the opened capsule can be administered with tasty liquid such as tuna juice or with wet food (note
889   that gabapentin powder is bitter and can lead to increased salivation) [115]. In addition, a first dose
890   can be administered on the evening before the veterinary visit [139]. Owners must be informed that
891   there is an increased risk of falling from elevated areas and that cats should remain under supervision
892   after administration to prevent climbing and potential falls [139]. For dogs, studies on the anxiolytic
893   effects of gabapentin are still lacking. In the experience of the authors, dosages at the higher end of the
894   range may be necessary to achieve an anxiolytic effect [115].

895

10.2.4. Benzodiazepines

897   Benzodiazepines are anxiolytic drugs with a rapid onset of action that are suitable for short to mid
898   term use. The most important benzodiazepines are alprazolam, lorazepam and diazepam (the latter is
899   suitable only for dogs as it can cause hepatic necrosis in cats). As no published studies are available on
900   the effect of benzodiazepines on fear in dogs and cats in a veterinary context, and because clinical trial
901   data are generally scarce, recommendations are mainly based on the experience of experts (e.g.
902   [27,36,123]. Alprazolam is recommended for panic-like conditions [140] and was reported to be highly
903   effective for noise fears [141].However, the owners should be made aware that paradoxical reactions
904   such as increased arousal, restlessness, and insomnia may occur [36,123]. Morerover, in animals prone
905   to showing fear-based aggression, benzodiazepines might heighten aggressive reactions due to
906   disinhibition [36]. Administering a test dose to assess any undesirable side effects before an imminent
907   visit to the veterinarian is particularly important for this class of drugs [123].

908

909

910   10.2.5. Why is acepromazine not state of the art anymore?

911   Acepromazine belongs to the class of phenothiazines. It causes sedation, muscle relaxation and a
912   reduction of spontaneous activity. No anxiolytic effect has been demonstrated to date; therefore
913   acepromazine should be rejected as a single medication for the treatment of any form of fear related
914   problems [29]. Acepromazine was not associated with a reduction of stress parameters compared to
915   placebo when used during a flight in dogs [142]. In addition, bitches treated with acepromazine prior
916   to ovariohysterectomy had significantly higher blood concentrations of epinephrine, norepinephrine
917   and cortisol when compared to a medetomidine group, indicating higher stress levels [143]. The
918   administration of acepromazine may even lead to an aggravation of fear symptoms [27]. So it is not
919   surprising that "high psychological arousal" is explicitly listed under counter indication in the
920   instruction leaflet of the licensed product (Sedalin, Vetoquinol, France) for the European Union.

921

11. Pheromone therapy

923   Synthetic pheromone products are often suggested as adjunctive intervention. They are available as
924   spray and diffuser for dogs and cats and as a collar for dogs. Synthetic analogues for dogs correspond
925   to the "Dog Appeasing Pheromone" (DAP) from the mammary glands of the lactating bitch (Adaptil®)
926   and for cats to feline facial pheromone F3 (Feliway®) and are assumed to have a calming effect on the
927   respective species [144]. While some studies indicated beneficial effects of Adaptil® and Feliway® on
928   stress signs (but not aggression) in dogs and cats at the veterinarian [145–147], another study found no
929   positive effect of Feliway® on stress parameters in cats [148]. One study indicated a reduction in
930   pacing, elimination and excessive licking in hospitalised dogs under DAP compared to the placebo
931   group [149]. Another assessed whether DAP influenced behavioural and physiological changes in
932   dogs after neutering compared to behaviour before the operation. No effect of pheromone treatment
933   on serum cortisol or serum glucose were found; however, the prolactin concentration decreased less in
934   the DAP group than in the placebo group [150]. Out of a large number of measured variables, the only
935   behavioural differences noted were in visual exploration behaviour and alertness, with less decreases
936   in the DAP group [150]. A critical review of studies on the use of pheromones specifically for
937   hospitalised veterinary patients concluded that the evidence so far is insufficient to demonstrate the
938   effectiveness of pheromone products in reducing distress in dogs and cats. This conclusion was not
939   only based on a critique of study design and reporting of the analysis of the included studies (e.g.
940   measuring a large number of variables without correcting for type 1 errror), but also because for
941   Feliway spray, the manufacturer stated that strong smelling smelling disinfectants, bleach, biological
942   washing powder, detergents or deodorisers – products that are commonly used in a veterinary setting
943   – can interfere with the product's functioning (reviewed in [106]). Also, several recent controlled
944   studies could not confirm calming effects of Adaptil® on dogs in other contexts including separation
945   from the owner and shelter housing [151–153]. According to a systematic review, the effectiveness of
946   pheromones in dogs and cats on fear behaviour could not be demonstrated in the majority of studies
947   due to a lack of adherence to scientific quality criteria [154].

12. Conclusions

949   Veterinarians are increasingly required to consider not only the physical, but also the psychological
950   health of their patients. Creating low-stress veterinary visits has immediate as well as long-term
951   benefits on the patients' welfare and health, as well as reducing risk of injury to the staff.
952   Considerations range from structural adaptations (e.g. set-up of the the waiting area and inpatient
953   wards) to using low-stress handling approaches, recognising signs of stress, and adjusting the
954   procedure accordingly. But not only should stressful interactions be avoided – pleasant emotions and
955   emotional resilience can be promoted by using incentives (high-value food, toys or petting) to create
956   positive associations throughout the animal's visit. Counterconditioning / desensitisation and
957   enabling 'happy visits' are recommended both for the prevention and the treatment of fears associated
958   with veterinary visits. When management and low-stress handling methods are not sufficient to

moderate an animal's fear, anxiolytic medication is indicated alongside a behavioural treatment plan. Although accommodating perceived "difficult" animals may initially cost more time, investing into individual routines and enabling the animals to feel safe leads to more efficient examinations and treatment in the long term [3,38] and reduces the risk of injury to the staff [29,39,54]. Relationship building measures not only increase client loyalty [39], but also improve staff satisfaction (reviewed in [42]. Thus, a good relationship between the veterinary team, owners and their pets leads to a better lifelong health care for veterinary patients and is of benefit to everyone involved [7,115].

Recommended Literature

- Howell, A.; Feyrecilde, M. *Cooperative veterinary care*; Wiley Blackwell, 2018
- Yin, S. *Low stress handling, restraint and behavior modification of cats & dogs*; Cattle Dog Publishing: Davis, 2009

Training/ Certifications

- FearFree https://fearfreepets.com
- Cat Friendly Clinic https://catfriendlyclinic.org
- Better Vet Visits https://karenpryoracademy.com/courses/better-vet/
- Low Stress Handling® University https://lowstresshandling.com

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Conflict of interest
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