Existing Methods for Managing Fear, Anxiety, and Stress in Shelter Animals

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Abstract

The prevalence of Fear, Anxiety, and Stress (FAS) is a major issue in animal shelters. The shelter environment is an unfamiliar and unpredictable space, and staying at the shelter often heightens an animal's stress. FAS is detrimental to both physical and mental welfare of shelter animals, worsening behavior problems or even leading to euthanasia. Therefore, it is essential to notice FAS in animals, respond to it, and take all measures to reduce it. By reviewing the scientific literature and guidelines from animal welfare organizations to compile resources on FAS, this study aims to find what measures should be taken to reduce fear, anxiety, and stress in animal shelters. Section 1 is about recognition and response to FAS, and it discusses behavioral signs of fear, behavioral cues and biochemical cues of FAS, behavioral scoring scales that can aid in FAS assessment, distinguishing and managing pain, and methods for behavior modification. Section 2 focuses on environmental factors, including design considerations for the enclosure and environment, general housing and enrichment guidelines, benefits of co-housing, and the effects of appeasing pheromones in the shelter setting.

Introduction

Fear, Anxiety, and Stress (FAS) is commonly found in shelter animals, as the shelter environment is often a place of general discomfort. Overstimulation from strong smells or loud sounds, long periods of confinement, limited social interaction with people, lack of choices in their environment, and unpredictability of a shelter setting are all factors that worsen the animal's stay at the shelter, according to the The Association of Shelter Veterinarians or ASV. This causes medical and behavioral problems to emerge or worsen due to the animal's stressed state, and the animal is unable to cope due to the limitations of their confinement. Animals in a stressed state are more prone to illness, as the immune system would be compromised. Stress may also induce or worsen behavior issues, which are a common reason for animal relinquishment (Levy et al. "Module 8: The Case of the Barking Dog"), which would result in more shelter backlog and euthanizations. It would also contribute to the working conditions and overwork of shelter staff, who experience high levels of stress and burnout (Wolf et al. 6-7).

The purpose of this study was to identify ways to recognize and respond to FAS behaviors, and outline environmental adjustments for reducing FAS. This was done by reviewing existing literature on reducing FAS in shelters and for animals in general.

Section 1 of this article discusses methods to recognize FAS and reduce it using biochemical cues or behavioral assessment tools, pain scales to distinguish stress from pain, and examples of behavior management protocols. Reducing FAS is essential to prevent animal reactivity and improve welfare in the shelter. To reverse or correct behavioral issues, it is better to intervene sooner than later to prevent escalation of reactivity. Many animals in the shelter environment may be experiencing physical pain, which is difficult to distinguish from stress as they are often co-occurring. It is necessary to determine when animals are experiencing pain, as there could be underlying medical needs which affect their quality of life.

Section 2 discusses the environment and routine of the shelter, which also influence the animal's comfort during their stay and their FAS level. Factors of housing such as enclosure size, ambient noise, sharp smells, temperature, ventilation, and lighting should be considered for minimizing discomfort. The section will also discuss the importance of kennel setup, regular

enrichment and interaction with people, and co-housing with compatible animals. Use of synthetic appeasement pheromones products such as Adaptil and Feliway will be touched on as well. These products replicate the appeasing pheromones that mother dogs or cats release after giving birth to strengthen the bond with their young and are meant to have a calming effect for conspecifics, but their effectiveness is debated (PetMD Editorial and Coates; Chadwin et al. 418).

Section 1: Recognition and Response to FAS

Recognition and correctly responding to fear, anxiety, and stress (FAS) in animals in a shelter environment is important due to the negative effects FAS has on animal health and behavior. Shelter animals represent a population that are more likely to experience stress due to the many unfamiliar individuals, confined enclosures, and noise in the animal shelter environment. When FAS is recognized and addressed, the animal will be less likely to become reactive or aggressive and will be more cooperative in the long run. This reduces the risk of harm to the animal, shelter staff, and potential adopters. If FAS in animals is disregarded, reactivity and behavior problems will worsen over time and become difficult to correct.

1.1 Recognition of FAS

1.1a Behavioral Cues and Behavioral Scoring Tools

Early recognition of FAS is important to prevent further deterioration and allow for easier intervention. FAS in animals can be recognized via animal behavior or biochemical cues. There are certain behaviors and signs of body language associated with FAS, though different animals express these behaviors to various degrees.

For most animals, signs of FAS include: piloerection, trembling, tucking the tail close to the body, leaning backwards, crouching when approached, flattened ears, holding the head low with eyes averted, and glancing around frequently. Abnormally high/low activity, eating, or drinking also indicate stress. The animal will also freeze or attempt to flee, resorting to aggression when perceiving an inescapable and increasing threat (Moffat 985-986). Animals may display displacement behaviors such as out-of-context yawning, smacking/licking lips, or grooming in order to decrease arousal and cope with stress. These subtle FAS-based behaviors should be monitored in order to avoid escalation into aggression (Moffat 987). Some other FAS behaviors specific to dogs include excessive barking, hypersalivation, nose licking, and inappropriate urination/defecation. Panting and paw-lifting are indicators of short-term stress. When experiencing higher stress, dogs can become more active and startle more. (Hiby et al. 390). A highly alert and rigid dog is ready to display aggressive behavior. Meanwhile, the anxious cat will crouch with ears swiveling sideways, muscles tensed, and tail held close to its body, ready to flee. It will aim to warn others from approaching with its arched back, dilated pupils, curved swishing tail, bared teeth, and claws exposed to swat.

A behavioral assessment upon intake could help in determining the reactivity of the animal and the next course of action for the shelter. This would ensure that more fearful or aggressive animals are handled by experienced staff, preventing risk of injury to inexperienced volunteers or the possibility of sensitizing the animal further. In surrender cases, getting information from the previous owner about the animal's behavioral patterns and history is helpful to understanding potential triggers and recognizing changes that may be health-related.

In cases where no history is available on an animal, behavioral assessment questionnaires can be used to help determine the animal's temperament. The BSAVA

Canine/Feline behavioral questionnaire, which has both a canine and feline version, is reliable for assessing the animal's behavior. It is a 10 page, detailed questionnaire originally intended to be used by a veterinarian to help obtain a patient's behavioral and medical information. While this form is too long to be practical in a shelter environment, a shortened version focusing on behavior may be helpful in shelters. Another canine behavioral assessment option is the C-Bar Q. The original long C-BARQ, a 100-item questionnaire, has been used reliably in research and other settings for evaluating dog behavior and temperament but is too long for use in shelters (Wilkins et al. 2). The Short C-BARQ (C-BARQ(S)) was developed by combining questions from the original into 42 questions designed specifically for behavior problem screening of surrendered shelter dogs. It can be completed in less than 10 minutes and found to be comparably valid, since it had high agreement to the original version (Wilkins et al. 5-8).

The Feline Spectrum Assessment by the American Society for the Prevention of Cruelty to Animals (ASPCA) is helpful for evaluating cats' comfort level with humans and their suitability for a home or for return to the field. It is a short 5-minute test, done four times over the first 3 days of intake. Any evaluator with basic cat communication knowledge and mobility can conduct the test, as it includes detailed instructions on use of the tool. The test consists of 4 evaluation items: 1) greeting the cat, 2) cracking the cage door, 3) interaction with the toy, and 4) touching the cat with a wand. The cat's response behavior to each item is checked off on the scoring sheet, and points are totaled to place the cat on a scale from 1 (Extremely Unlikely to be Socialized) to 50 (Extremely Likely to be Socialized). A combination of certain engaged and relaxed behaviors immediately identifies a cat as social and ends the test (ASPCApro "The ASPCA's Feline Spectrum Assessment Training Manual and Guide.").

This test was used to evaluate the sociability of cats post-adoption, where completely social control cats were compared with cats suspected to be less sociable. As a whole, FSA cats showed lower affection and greater fearfulness than control cats. Shelter cats rated "Less Likely to be Sociable" or below had reduced welfare in a home and reduced owner satisfaction, in comparison to cats rated "Likely to be Sociable" or above (J. Ellis et al. 3-6). The success of the Feline Spectrum Assessment in predicting post-adoption sociability here supports its validity.

1.1b Biochemical Cues

One commonly used biochemical method to determine FAS in animals in research is to measure their cortisol levels, as cortisol is a hormone whose release is triggered by stress. Urinary cortisol-to-creatinine (C/C) ratio is a less invasive method to determine the dog's cortisol levels. This is determined by collecting urine and analyzing it in a lab. Cortisol within the body is excreted by the kidneys into urine, with higher blood concentrations of cortisol correlating to higher cortisol concentrations excreted into the urine. As the urine accumulates in the bladder for hours before being excreted, urine cortisol concentrations provide a measurement of the animal's average stress over a period of time compared to a measurement at a single point in time.

In one study where both behavioral and biochemical measurements of stress were taken, increasing C/C ratios were significantly correlated with indicators of stress (more drinking, startling, walking around), and dogs with higher C/C show higher arousal compared to dogs with lower C/C (Hiby et al. 389-390). The fact that behavioral indicators of stress correlate increased C/C ratio validate this biochemical method for detecting stress in dogs.

Although biochemical methods provide a more objective measurement of stress, determining FAS with biochemical methods is inconvenient for a shelter since urine sample collection and lab analysis is required. Realistically, most shelters will be observing behavior.

1.2 The Confounding Factor of Pain (2 pgs)

1.2a Distinguishing Pain

It is difficult to distinguish behaviors caused by FAS from those caused by pain. Physiological signs do not solely indicate one or the other, and each animal has a unique response to pain stimuli. Disease and surgery can also be underestimated as causes of pain. Stress and pain often occur simultaneously, but there are certain ways to help tell them apart.

The American Animal Hospital Association and the American Association of Feline Practitioners (AAHA/AAFP) have developed a set of Pain Management Guidelines published in 2007. It gives four general signs of pain – 1) loss of normal behavior, 2) expression of abnormal behaviors, 3) reaction to touch, 4) physiologic parameters – and lists the specific signs of these (Hellyer et al. 241). Stressful animals are difficult to distract/calm by interaction or handling, administering more opioids does not help them, and a source of pain cannot be readily identified. However, an animal in pain can be temporarily distracted/calmed by interaction/handling, helped by repeated opioid doses, and has an identifiable pain source. Touching the painful or tense area will cause them to look at it (Hellyer et al. 240).

The updated 2022 Pain Management Guidelines adds that chronic pain can be identified by observing abnormal behavior and awkward posturing, as animals move to accommodate the source of their discomfort (Gruen et. al 59-62). Constant observation is difficult for a shelter due to limited resources, but recording any irregularities noticed by staff or volunteers would be helpful to catch signs of pain.

Several pain scales exist to aid with determining the presence and level of pain in a more standardized way. Ideal times to pain score an animal at the shelter would be upon arrival, after they experience illness or injury, or after any sudden behavioral change. Enough time should be provided for the animal to naturally adjust before testing for each item of the test.

The Glasgow Pain Scales, which has both a canine and feline version, are short and convenient for a busy shelter. It covers both physical and behavioral signs of pain. The Glasgow Composite Measure Pain Scale (CMPS) is a simple 7 question scale developed to assess pain in dogs. The evaluator approaches the kennel, opens the door, encourages the dog to come, walks the dog slowly if possible, and touches the painful area. The dog's response is observed and a qualitative answer on the CMPS is selected for each item. The CMPS has been used in clinical trials, and would be most applicable for animals receiving medical treatment or recently had surgery (Reid et al. "CMPS-SF" 97). One limitation of the CMPS is that it might not be as helpful when the source of pain is unknown.

A short-form CMPS (CMPS-SF) was developed with the help of vet surgeons for quick dog pain scoring in clinics and is used for research as well. The items in the original qualitative scale were shortened and ranked into a numerical scale, but evaluation procedure is similar to the original. When the CMPS-SF was used across three animal hospitals, the median score for dogs considered to need analgesia was 7, 7, and 8 while the median score for those that didn't was 4, 2.5, and 3 (Reid et al. "CMPS-SF" 100). The validity of the CMPS-SF is shown through the significant difference in pain score between dogs considered to need analgesia versus dogs that didn't, as well as through the score consistency across the three veterinary hospitals.

A feline version (CMPS-Feline) has been developed as well. It includes 4 questions on cat vocalizations, body language, behaviors, and ear position and muzzle shape. In a validating study for the CMPS-Feline, 80% of cats were correctly identified as needing analgesia by the

test with 17.6 percent misclassification (Reid et al. “Definitive Glasgow acute pain scale for cats” 449); this shows that the scale is relatively accurate.

Another pain scale option for cats is the Feline Grimace Scale (FGS), which provides detailed FGS training resources intended for general use, not just for vets. Scorers evaluate five action units, which are ear position, eye shape, muzzle tension, whisker position, and head position. This test was validated by geometrically measuring distances and angles of cats’ ears, face, and head positions from video screenshots (Evangelista et al. 1-3). The FGS has high internal consistency and significantly distinguishes painful cats from non-painful cats (Evangelista et al. 4-7). It only takes 1 hour to film the cat, so pain assessment could become very convenient if machine learning were integrated with the FGS for shelter use.

The advantages of these scales is that they are fast and simple to use in the shelter setting, with minimal training required. Studies that validated Glasgow Pain Scale and Feline Grimace Scale included patients suffering pain from varied sources, which makes the studies more generalizable to different cases of pain (Reid et al “Definitive Glasgow acute pain scale for cats” 449; Evangelista et al. 4). But both these two scales, along with many other available pain scales, were validated by veterinary professionals and intended for use in a clinic. This may undermine its accuracy when used in a shelter environment by non-veterinarians. In a study evaluating Glasgow Pain Scale agreement, it was shown that vet experience is a factor in score accuracy. Vet professionals had good inter-group agreement in pain scores, while the vet students had poor agreement with each other and tended to score higher than the vet professionals (Marco-Martorell et al. 5). It was shown that gender could play a role in pain scores as well. (Marco-Martorell et al. 10). Therefore, it may be best for shelter staff to evaluate pain in a group for a more consistent pain score and work with a vet professional. There is still a need for pain scores specifically for recognizing pain in shelter settings, which has a higher-stress environment and staff with widely varying levels of experience.

1.2b Managing Pain

Pain management is important as pain decreases quality of life, negatively impacts health through pain-induced stress responses, and affects behavior which risks staff safety. Pain can be considered as adaptive (normal response to tissue damage that responds to treatment, such as inflammation) or maladaptive (physical changes from untreated pain that causes pain to be generated spontaneously, such as nerve damage or abnormal stimulus processing). The longer the pain is left unmanaged, it will more likely turn maladaptive and difficult to treat. It is essential to bring animals suspected of pain to a veterinarian soon and prevent further deterioration.

Local or topical anesthetics help with managing smaller discomforts. Also, preemptively giving pain medication before surgery helps dampen the pain response and reduce doses required to maintain anesthetic (Hellyer et al. 239). Reducing pain in other veterinary procedures would also help, and anxiolytics, sedation, or analgesia should be used when an animal must be handled excessively Dosage and analgesic drug type vary by affliction and animal. Use of multimodal intervention, which means utilizing multiple pain medications that target different receptors/mechanisms, helps to prevent over-use of one medication (Gruen et al. 56). This reduces side effects and reduces overall pain. If unsure of whether pain medication should be used, it would be best to consult a veterinarian.

Using more careful handling methods which are adjusted to accommodate the pain will help the animal. If the source of pain cannot be resolved, palliative care with pain medication should be implemented to maintain good quality of life and prevent the pain from becoming

more maladaptive. Preventative care such as dental maintenance and managing obesity to prevent osteoarthritis reduces pain development later (Hellyer et. al 236). While consistent care for one animal may be an unrealistic goal to achieve for each animal in the shelter environment, other interventions such as environmental accommodation, positive interaction to lower FAS, regular exercise, and diet/weight management to reduce joint stress is more realistically achievable (Hellyer et al. 244; Gruen et al. 70). Cold therapy via applying cold temperatures to painful areas is also an easy way to provide relief, if approved by a veterinarian for that animal.

1.3 Behavior Management

1.3a Prevention of Escalation

Behavior issues relating to FAS often stem from fear and learned reactivity. When faced with a negative outcome or threat, the animal's goal is to avert the threat. They will first try to do this through appeasement, displaying their discomfort with mild fear behaviors and attempts to flee or freeze. However, their expressions of appeasement are often unnoticed or ignored for the sake of efficiency, and the animal learns to escalate quicker to receive a favorable outcome. To prevent this, staff and volunteers should be trained to identify and respond to subtle FAS signs. The animal should be given the option to flee when uncomfortable, and gentle handling with minimal restraint should be used by staff. Noticing and responding to these signs will allow the staff to de-escalate the situation, preventing the animal from learning aggression (Moffat 984).

Vets help animals acclimate to the exam room by spending time sitting on the floor with the animal and subtly offering food treats (Moffat 988). This approach can also be utilized by shelter staff. Acting in a non-threatening manner by kneeling to the side of the animal or cage door, minimizing noise and speaking softly, and putting smaller animals on one's lap can make them feel more comfortable. Approaching frontally and looking directly at the animal, walking or reaching over them, or cornering them should be avoided.

In general, good behavior must be intermittently and meaningfully rewarded for all dogs to maintain positive emotions and good behavior, especially in the stressful shelter environment. Stressful procedures can be made more pleasant by providing toys and treats, handling gently, and removing other animals. In shelters, it's common to see a mix of defensive aggression motivated by danger of harm and offensive aggression motivated by resource control (ASV 45-46). Since reactivity is mostly learned, it's important to monitor animals that show mild FAS and displacement behaviors to avoid escalation up a "Ladder of Aggression" (Shepherd 14-15).

1.3b Behavior Tracking Methods

It is helpful to track animal behavior patterns during their stay at the shelter in order to recognize changes, which may indicate worsening behavior problems, increased stress, or even medical problems. Grading each animal for friendliness upon intake and documenting their score on their kennel card should be feasible for shelters. A green, yellow, and red color-coded system may help with categorizing animals as all-volunteer, adult-only, or manager-only interactions. High-FAS animals should only be handled by experienced staff, as allowing less experienced caretakers to interact with reactive animals risks injuries and inadvertent reinforcement of bad behavior for the animal. Additionally, keeping a paper or other space near the enclosure where staff and volunteers can write down observations during their interactions with an animal (ex. resource-guarding) is suggested to facilitate identification and communication of the most apparent cases of animals experiencing FAS in the shelter

environment. Utilizing kennel cards to record the food intake of animals would help monitor their wellness.

Normal eating and drinking patterns can indicate that an animal has habituated to the new environment. Real-time behavior tracking computer programs like the Observer software package from Noldus Information Technology have been found to be highly accurate for monitoring animal eating and drinking (Eagan et al. 2). Computer programs may become helpful in the future for high volume shelters and overcome a lack of human resources as an easy and cost-effective way to track important animal behaviors, but it is still in development.

1.3c Examples of Behavior Modification Programs

Behavioral modification programs are extremely important in correcting reactivity and aggression. This section will discuss two examples of dog behavior modification programs supported by the ASPCA in order to identify common methods to treat behavior issues.

The first is the Wenatchee Valley Humane Society (WVHS) behavior treatment program. Its staff and volunteer protocol is available for download in an ASPCA article, along with kennel cards and other resources. The second is from an ASPCA observational study on rehabilitation of fearful shelter dogs, abbreviated as “ASPCA’s program/study” from this point on.

Upon intake, dogs’ status is evaluated from their behavior and fear in both programs. The WVHS program rates the dog with the Fear Free 0-5 FAS scale to list them as Available or Unavailable. The dog is also categorized based on its specific behavior issues. Meanwhile, the ASPCA’s program conducted subtests by replicating environments of the home and shelter environment. Staff scored boldness, sociability, and aggression scales, then gave an overall letter grade from A (no fear) to D (severe fear). They were re-evaluated about every 21 days, for a total of 6 tests throughout the program. After intake, both programs provide a safe decompression space for dogs. However, dogs with longer acclimation periods did not have faster behavioral improvement, indicating that behavioral intervention is still needed. (Kristen Collins et al. 7)

Both programs used weekly staff meetings to discuss each dog’s progress throughout their behavior modification program and the next steps to take. The programs utilized desensitizing and counterconditioning techniques for triggers like handling. The ASPCA’s program worked on “Socialization with People, Leash Application and Walking, and Handling” specifically in its behavior modification protocol through 15-minute daily treatments. Reserving toys, high-value foods, and social interaction with other dogs to these sessions helped create a positive association with human interaction and training. A “helper dog” was often implemented in these sessions to encourage interaction with people.

WVHS’s program instead describes how general staff and volunteers can support dogs’ needs. It utilizes regular positive interaction as well, like greeting dogs and putting treats in their kennels in passing. In addition, staff can clicker train dogs to react calmly to stimulus. Behavior protocol for specific types of issues, such as utilizing free feeding to reduce resource guarding, is also listed in the program (WVHS “The Wenatchee Valley Humane Society's Behavior Modification Program”). WVHS kennel cards lists ways to support its dogs via “tossing treats”, “allowing” the dog to approach, and “respecting” their choices (WVHS “I’m a Polished Pup!”). This is helpful in educating volunteers and adopters, which ensures regular positive interaction with humans and reduces FAS over time.

In the ASPCA’s Program, psychotropic medications were used to assist with treatment by reducing fear. A combination of fluoxetine and gabapentin were most effective and didn’t have

many observable side effects. Medication was weaned off over 2-3 weeks before graduation. The initial medication protocol had to be revised when the program moved to North Carolina, as almost every dog needed psychotropic medication 8 weeks into treatment. Use of psychotropic medications is important for putting animals in a more relaxed state and improving their response to behavior treatment.

The ASPCA's program's graduation rate was 86.17%. Graduating dogs spent around 96 days in the program and averaged 78 treatment sessions. On average, graduating dogs received an initial evaluation score of C which improved to a B by their final evaluation. 99% of graduates were adopted after the program, and most adopters who responded to post-adoption surveys reported high satisfaction. Non-graduating dogs averaged 86 sessions over 125 days, and had lower average initial and final grades compared to graduating dogs (Kristen Collins et al. 6). Although the ASPCA's observational study cannot prove causation, it shows that the majority of fearful dogs enrolled in the behavior modification program showed largely positive outcomes. Programs like this can help guide other shelters to develop and employ their own behavioral modification programs.

These two examples showed how standardized behavioral evaluations, calm decompression space, enrichment, staff communication, regular behavior modification sessions, positive engagement with the dog, and use of prescribed psychotropic medication are important parts of shelter behavior management programs.

Section 2: Environmental factors

The unfamiliar surroundings of the animal shelter are a major source of fear for admitted animals. Measures must be taken to design an environment that is low-stress, allows animals to feel safe, and facilitates habituation to the shelter. A comfortable and spacious enclosure, roommate companionship if applicable, and a predictable schedule with regular enrichment will heighten the animal's quality of life. Pheromone use may also help calm the animal.

2.1 Enclosure and Environment Design Considerations

The design of the facility has an effect on shelter animals' mental states and level of fear, anxiety, and stress. A stable enclosure that is easy to sanitize, accounts for the animal's needs, and has a comfortable ambience will help reduce FAS.

Solid walls and doors are recommended, but wire or slatted floors are unacceptable due to discomfort for the animal. A sealed, impermeable surface like urethane or epoxy resin makes good flooring; tile flooring may be used as well but is harder to clean. The cracks where floor meets wall should be sealed so that pathogens do not collect there. Drainage should be implemented to maintain a comfortable and clean environment. Gently sloped floors that allow wastewater to run into covered drains would help with this. Outdoor enclosures should also have similar designs (ASV 18). Humane temperature conditions for animals should range from 20°C (68°F) to 30℃ (86°F) (National Research Council et al. 163), depending on their conditions and age. Partially or fully outdoor-housed animals must protect against weather, temperature, predators, harassment, or escape; if the outdoor temperature falls below 10°C (50°F), dogs should not be kept in permanent outdoor runs (USDA p.164). Additional temperature adjustment measures should be taken if the animal is not comfortable. Humidity should be kept between 30% and 70% (USDA p.40). Proper ventilation to keep good air quality in the whole shelter is essential for well-being of both animals and personnel, and may need to be adjusted seasonally. The air quality at the animal's height should be measured (since

ammonia levels can differ at human height versus the animal's height). Ammonia exposure can irritate animals' eyes and nose (Hurt et al. 2).

Light stress can also affect animals at the shelter. Exposure to natural sunlight is essential in following the circadian rhythm and improving well-being of people and animals. Artificial light should be placed away from the rest area when possible and follow the natural light cycle to promote rest (Hurt et al. 3). For example, permanent light fixtures should not shine directly at a bed or in the animal's hiding place, and should be turned off at night.

The facility design should include noise consideration. Noise levels in shelters can get up to 100+ decibels especially in dog kennels, which is harmful to both the shelter's animals and people (Coppola et al. 1). The excess noise causes overstimulation and hearing loss, elevates stress, and drives away potential adopters. Shelters designed with concrete walls and exposed metal roofing increase noise, since these nonporous walls reflect the noise within the room. A design solution is using porous sound-reducing panels or walls to help absorb the sound (Hurt et al. 1). In addition, using apartment-style quarters like closed off rooms with glass windows instead of dog runs or cages may help contain the noise (Coppola et al. 4-5). Halfway-up viewing windows on kennel doors surprise dogs when people walk past, so they should be avoided. Since shelter dogs themselves cause most of the noise, teaching quiet behavior using positive reinforcement, such as feeding toys and puzzles, can help reduce barking (Hurt et al. 1-2; Coppola et al. 4-5).

In their primary enclosure, the animal must have enough room to move normally and engage in natural behavior. Dog enclosure sizes vary by breed, but cats generally require at least 8 feet of floor space and also access to elevated surfaces. Animals must have a soft elevated resting place to keep dry and comfortable, and their eating and sleeping area must be separated from the area they urinate and defecate in. All animals should have the opportunity to hide from view and feel secure. This is especially important to reducing FAS, as stress scores of post-operation cats and cats housed in a shelter significantly decreased when a hiding space was provided (Griffith et al. 1155; Vinke et al. 90). Enclosures with multiple compartments are very beneficial, as they offer the animal more choice for hiding and are easier/safer to spot clean (Wagner et al. 639). The ASV Guidelines include diagrams of proper enclosures for both dogs and cats (ASV 15-16). Consulting a veterinarian and a shelter design architect would be helpful in creating the best shelter environment.

2.2 General Care

In general, animals should have a stable environment with a consistent daily routine and consistent caregivers if possible. When events are more predictable, animals experience less stress as they habituate and know what to expect. Then, positive associations with feeding time and play can form which promote positive states of mind (ASV 45).

Enrichment is a required part of animal care. In multiple shelter studies, it's shown that enrichment reduces undesirable vocalization, reinforces calm behavior, and reduces aggression in dogs. This can come in the form of human interaction; Two 15-minute sessions of calm human accompaniment and interaction daily was enough for a majority of previously fearful dogs to pass an aggression screening test (Willen et al. 60). Twice daily in-kennel training for calm behaviors with food toy enrichment also led to significantly less jumping and vocalizing (Herron et al. 689-691). Simply having passerby toss a treat in kennels helps counter-condition dogs' fear of humans approaching their kennel, resulting in significant decrease in decibels of

shelter noise over time. As passerby participation increased, noise levels decreased (Carrero and Bennett 46).

Food enrichment was also found to reduce aggressive vocalization and climbing the pen door post-enrichment compared to a control group (Antonino et al. 31-32). Calming food enrichment in the form of a lickable KONG® toy led to fewest vocalizations during morning kennel cleaning, and so did tactile toys and blankets (Dare and Strasser 8-9). In addition, other forms of enrichment like lavender scent or classical music also help promote relaxed behavior and reduced fear in dogs (Dare and Strasser 9; Willen et al. 59-60).

For cats, toys that promote hunting behavior such as chasing and pouncing are good enrichment. These include fishing rod toys, wire-based toys, balls, or rubber bands on a string. Food puzzle toys are also good mental stimulation. Hiding spaces, like boxes and tunnels, and elevated spaces such as cat trees or shelves enrich the environment as well (S. Ellis 903-905). Some cats are active responders that aim to escape or gain attention, and those benefit from stimulatory enrichment like food toys. Others are passive responders trying to feel more secure, and these benefit more with a hiding place and other physical enrichment (S. Ellis 909).

Playgroups and play behavior are important for good welfare and social contact as well. Dogs should be selected based on health and behavior to maintain safety, and the number of dogs in playgroups depends on the shelter's resources. Dedicated enrichment spaces such as play yards or play rooms should be equipped with double doors and protected from the elements. Intraspecific interaction can also increase cats' welfare as long as they are compatible and resources are adequate (S. Ellis 903).

2.3 Co-Housing

Co-housing animals can be beneficial since it promotes social contact, but the animal's well-being should be prioritized. Trained staff should select animals for co-housing based on sex, behavioral attributes, and other factors. The animals should be first introduced outside the enclosure to minimize risk to and determine if they are a good match. No more than six cats and no more than four dogs should be in a group-housing enclosure together for safety and disease management (ASV 17). Animals should be provided with plenty of space and resources (toys, food and water, hiding spots, perches) to prevent resource guarding behaviors and conflict. Young animals should be housed with their littermates and mother or with similar aged animals to aid their development. Additionally, prey species should still be housed away from predator species since the presence of predator species increases stress.

One study shows the benefits of group housing for reducing stress in dogs with existing social skills. Dogs with adequate dog-dog social skills as determined by the Match Up II test were "single-housed" or "pair-housed", and pair-housed dogs were matched based on staff information, energy levels, and size. The study found that pair-housed dogs had lower lengths of stay and exhibited less signs of stress such as lip licking, whining, and ears back compared to single-housed dogs. Though the C/C ratio didn't significantly differ between single and pair-housed dogs, the pair-housed dogs had a greater average decrease in C/C ratio over 7 days (Hecker et al. 11-12). Overall, group housing with an appropriate match seems to decrease FAS behaviors and stress.

2.4 Pheromone Use

Pheromones have been reported to reduce the stress of pets and have been implemented in some shelter settings as well.

A synthetic version of feline facial pheromone (FFP) reduces anxiety in cats in unfamiliar environments. In both sick and healthy cats hospitalized at a clinic, FFP-exposed cats showed significantly more facial rubbing, grooming, and interest in food compared to control cats (Griffith et al. 1155). The FFP-exposed cats also showed more lying and sitting, which indicate calmness, but less sleeping. These results show that FFP may help cats adjust to their environment. However, a study done specifically on shelter-housed cats found no significant difference between a placebo and pheromone diffuser in reducing stress scores in shelter cats or reducing upper respiratory tract infection incidence, which is affected by stress (Chadwin et al. 418). Though pheromone diffusers have been found to be effective in home or clinical settings, cats in shelter settings experience different kinds of stressors and are housed near other highly stressed cats. Use of pheromones may be helpful, but not adequate for the specific needs of shelter cats.

Another synthetic pheromone, the Dog-Appeasing Pheromone (marketed as Adaptil), has been shown to help dogs in the vet clinic and at new homes. In one study, dogs that normally exhibited aggressive behavior at the vet clinic had lower measures of anxiety and higher measures of relaxation when exposed to DAP (Mills et al. 121-122). In another study evaluating newly adopted puppies fitted with a collar containing DAP, a smaller percentage of DAP puppies showed signs of fear on both day 3 and day 15 compared to control. Puppies wearing a DAP collar habituated to their owner and environment faster compared to control puppies as well. The DAP group also did not show as many fearful behaviors when faced with an unfamiliar person or environment compared to the control (Gautier et al. 711). The study concluded that DAP may help shelter dogs react better to unfamiliar situations and get used to their new environment, but this has not been tested in a shelter environment specifically.

Conclusion

This paper discussed methods to recognize/respond to FAS in shelter animals and adjust the environment to reduce FAS. Using behavioral cues and the help of scoring tools, the level of FAS can be determined and presence of pain can be identified. Behavior traits can be tracked on kennel cards to facilitate communication about any areas of concern. Successful behavioral programs utilize in-kennel enrichment, weekly evaluations from behavioral specialists, daily counterconditioning/desensitization treatment to triggers (including handling, leash walking, socialization with people, and meet-n-greet), and psychotropic medication prescribed by a veterinarian as needed.

The animal's enclosure must have comfortable temperatures (20°C to 30℃), regular ventilation, lighting that follows natural day-night cycle. Tolerable noise levels can be achieved by installing sound absorption panels, using apartment-style housing, providing calming enrichment like food toys, and training dogs to behave calmly. Enclosures should allow for natural behavior, include a dry place to rest, and have separate eating and eliminating areas. A fixed daily schedule, ample enrichment, playgroups, and co-housing all help reduce animal FAS. Pheromone use may be able to improve welfare as well.

By following these recommendations shelters can take actionable steps to reduce FAS in the shelter, will lead to less behavior problems, less shelter backlog resulting in decreased rates of euthanasia, improved animal welfare, and increased adoption rates with higher adopter satisfaction.

Discussion

More research is needed to develop better shelter-specific tools. Biochemical cues have been validated as an indicator of stress in shelter dogs, but are difficult to use in shelter settings and can be confounded by pain. Meanwhile, behavioral evaluations and use of scales may be confounded by bias. Distinguishing pain is still difficult as well, especially internal pain. Many scales for behavior and pain have been validated by veterinary professionals, but the validity differs between veterinary professionals and non-professionals. Therefore, adjustments may need to be made to fit a general shelter environment. Limitations to shelter resources can make it impossible to track and monitor the behavior of individual animals, especially since many would show FAS in the shelter setting. Use of computerized behavior monitoring programs may help with this. In addition, some animals in behavior programs were unable to see improvements. Alternative options for those animals other than barn placement and behavioral euthanasia could be explored in future research. The helpfulness of pheromone use is disputed, but there is a lack of research on the effects of pheromones in a shelter environment.

Acknowledgements

Thanks to Sydney Sill for her support, guidance, and expertise which have helped me throughout the writing of this paper.

Conflict of Interests

The author declares no conflicts of interest related to this work.

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