

Development of a Pilot Behaviour-Based Stress Screening Framework for Dogs and Cats During Veterinary Consultations

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Abstract: Veterinary consultations are commonly associated with acute stress in companion animals due to transportation, unfamiliar environments, handling procedures, and previous negative experiences. Although behavioural observations are widely used to recognise stress, practical behaviour-based screening frameworks suitable for routine veterinary practice remain limited. The aim of this pilot study was to identify owner-reported behavioural observations in dogs and cats during veterinary consultations and to develop a preliminary behaviour-based stress screening framework for clinical use. Behavioural data were collected from 50 companion animal owners using a structured questionnaire completed immediately after routine veterinary consultations. Owners reported behavioural responses observed before entering the veterinary practice, immediately after entering, and approximately 10 minutes after entering the waiting area. Behavioural observations were analysed using descriptive statistics according to their frequency and apparent intensity to support the development of a preliminary clinical framework. Attempting escape, fear, trembling, vocalization, and agitation were the most frequently reported stress-related behavioural indicators, while multiple concurrent behaviours were commonly observed, suggesting that behavioural profiles provide more meaningful information than isolated responses. Based on these findings, a preliminary behaviour-based stress screening framework was developed to facilitate rapid clinical interpretation of behavioural observations during routine veterinary consultations. Although further validation using standardized behavioural assessments, independent observers, and larger study populations is required, this pilot study suggests the feasibility of integrating structured behavioural observations into routine veterinary practice and may serve as a starting point for the future development of standardized behaviour-based stress screening methods.

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1. Introduction

Incompatibility between the behaviour of companion animals and the behavioural expectations of their owners remains an important factor contributing to relinquishment, rehoming, and, in some cases, euthanasia of dogs and cats [1]. Consequently, veterinarians play an essential role not only in maintaining animal health but also in promoting positive behavioural development and recognising behavioural problems at an early stage [1]. Veterinary consultations are frequently perceived by companion animals as stressful events due to transportation, unfamiliar environments, novel sensory stimuli, restraint, handling procedures, and previous negative experience [2-6].

Behavioural and physiological responses to these stressors may begin before the animal enters the consultation room, as exposure to multiple consecutive stressors can result in cumulative activation of the stress response, commonly referred to as *stress stacking* [2,3,6]. Acute stress during veterinary visits may compromise clinical examination, reduce the reliability of behavioural assessment, increase the risk of defensive reactions, and negatively influence both animal welfare and owner experience [6-8].

Several approaches have been proposed to minimise stress during veterinary visits, including low-stress handling techniques, environmental modifications, Fear Free®

principles, and clinical audit procedures designed to improve patient care and practice management [6–9]. Although these strategies have significantly improved veterinary practice, practical behaviour-based screening methods that can be rapidly incorporated into routine consultations remain limited. Behavioural observations represent one of the most accessible and clinically applicable approaches for recognising acute stress in companion animals. Behaviours such as attempting escape, fear, trembling, vocalization, agitation, avoidance, and defensive aggression are widely recognised indicators of negative emotional states and may provide valuable information regarding an animal's affective experiences [2–6,10]. Within the Five Domains Model, behavioural responses contribute primarily to the assessment of the mental state domain, reflecting the animal's emotional experiences generated by nutrition, physical environment, health, and behavioural interactions [11,12]. However, behavioural observations alone cannot provide a comprehensive assessment of animal welfare and should therefore be interpreted within the broader context of welfare evaluation.

Therefore, the aim of this pilot study was to identify owner-reported stress-related behavioural indicators in dogs and cats during veterinary consultations and to develop a preliminary behaviour-based stress screening framework suitable for routine veterinary practice. Rather than proposing a validated diagnostic or welfare assessment tool, this study represents an initial step towards the future development and validation of standardized clinical screening methods for recognising acute stress in companion animals.

2. Materials and Methods

2.1. Study Design and Dataset

This pilot observational study was conducted to identify stress-related behavioural indicators in companion animals during routine veterinary consultations and to develop a preliminary behaviour-based stress screening framework suitable for clinical practice. The study was exploratory and descriptive in nature, focusing on the feasibility of behavioural screening rather than on the validation of a diagnostic or welfare assessment instrument.

Behavioural information was collected using a structured questionnaire completed by pet owners immediately after routine veterinary consultations. The study was designed to characterize behavioural responses at different stages of the veterinary visit and to identify behavioural profiles that could support rapid clinical recognition of acute stress.

2.2. Study Population

The study included 50 companion animals (27 dogs and 23 cats) presented for routine veterinary consultations. Only clinically healthy animals, as determined by the attending veterinary team during the consultation, were included in the analysis. Participation was voluntary. Before enrolment, owners received information regarding the objectives of the study and provided informed consent for the anonymous use of the collected data.

Collected data were anonymized in accordance with Regulation (EU) 2016/679 on the protection of personal data [13].

2.3. Questionnaire Design

A structured questionnaire comprising 47 questions was developed to collect information regarding the veterinary visit, the home environment, and owner-reported behavioural observations.

The first section included general information regarding owner consent, the reason for the veterinary visit, and basic characteristics of the animal. The second section addressed aspects of the animal's home environment, including outdoor access, the presence of conspecifics or other animal species, and owner–animal interactions.

The third section focused on behavioural observations recorded at three predefined stages of the veterinary consultation:

- immediately before entering the veterinary practice;
- immediately after entering the practice;
- approximately 10 minutes after entering the waiting area.

Owners selected behavioural descriptors from a predefined list of 19 behaviours commonly associated with stress. Behavioural indicators were selected based on a list provided in a previous research study on pet owners' perceptions of key factors affecting animal welfare during routine veterinary consultations [14]. They were also given the opportunity to describe additional behaviours using free-text responses.

The questionnaire was available in both paper-based and electronic formats according to owner preference.

2.4. Selection of Behavioural Indicators

Behavioural indicators included in the screening framework were selected according to their clinical relevance, reproducibility, and documented association with acute stress responses in companion animals reported in the scientific literature [2-6,10,15].

The evaluated behaviours included escape attempts, fear-related responses, trembling, vocalization, agitation, anxiety, hyperexcitability, insecurity, tail tucking, refusal to enter the veterinary practice, aggression, shyness, and other owner-reported behaviours. These indicators were considered practical behavioural markers that can be readily observed during routine veterinary consultations without specialised equipment or prolonged behavioural assessment.

2.5. Development of the Preliminary Behaviour-Based Stress Screening Framework

Following descriptive evaluation of owner-reported behavioural observations, behavioural indicators were organized according to their apparent association with low, moderate, and high levels of acute stress. Classification of behavioural indicators into low, moderate or high levels of acute stress was based on the relative frequency of owner-reported behavioural traits in their pets during the routine veterinary consultation. The proposed classification was developed exclusively as a preliminary clinical framework intended to facilitate rapid behavioural screening during routine veterinary consultations. It should not be interpreted as a validated welfare assessment or diagnostic instrument. The conceptual basis of the framework was informed by the Five Domains Model, particularly the Mental State domain, while recognising that behavioural observations alone cannot provide a comprehensive assessment of animal welfare [11].

2.6. Methodological Considerations

The proposed framework was based exclusively on owner-reported behavioural observations obtained during routine veterinary consultations. Consequently, behavioural interpretation may have been influenced by owners' experience, perception, and ability to recognise behavioural expressions.

Furthermore, behavioural observations represented only one component of animal welfare assessment and were not validated using physiological measurements, independent behavioural observers, or standardized behavioural assessment protocols.

Accordingly, the present study should be regarded as a pilot exploratory investigation intended to support future development and validation of standardized behaviour-based stress screening methods.

2.7. Statistical Analysis

Data were analysed using descriptive statistics. Behavioural indicators observed at each stage of the veterinary consultation were summarized as frequencies and percentages.

Because the primary objective of this pilot study was exploratory and focused on the development of a preliminary behaviour-based stress screening framework rather than hypothesis testing, no inferential statistical analyses were performed.

3. Results

3.1. Distribution of Stress-Related Behavioural Indicators

A total of 50 questionnaires completed by companion animal owners were included in the analysis. The behavioural indicators used are presented in Table 1.

3.2. Frequency of Stress-Related Behavioural Indicators

The frequency of all owner-reported stress-related behavioural indicators observed at the three stages of the veterinary consultation is presented in Table 1, while the temporal distribution of the five most frequently reported behaviours is illustrated in Figure 1.

Table 1. Behavioural indicators in various moments of the veterinary visit

Indicator	Right Before Entering the Veterinary Practice (%)	Right After Entering the Veterinary Practice (%)	10 Minutes After Entering the Veterinary Practice (%)
Attempting Escape	20.00	11.84	4.84
Fearful	0	19.75	6.45
Trembling	14.67	6.58	8.06
Vocalizing	12.00	9.21	8.06
Agitation	8.00	7.89	9.68
Anxious	0	2.63	6.45
Hyperexcitable	4.00	3.95	0
Insecurity	5.33	2.63	0
Tail Tucking	1.33	0	0
Refusal to Enter	1.33	0	0
Aggressive	0	0	0
Shy	0	5.26	0
Other Behaviours	2.67	0	0

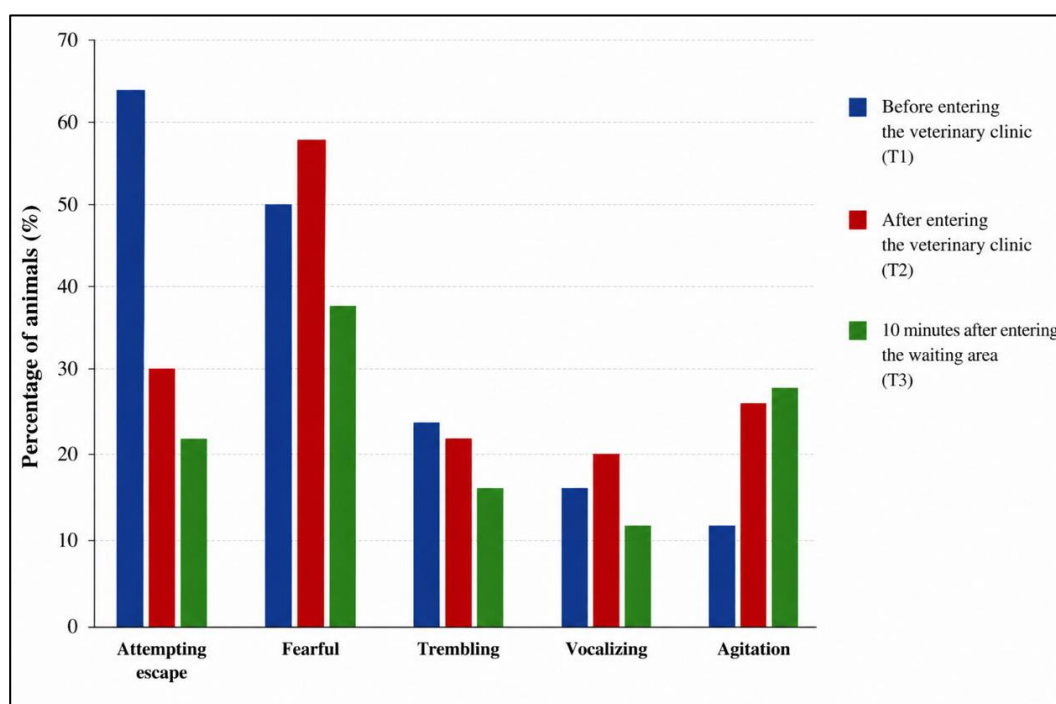


Figure 1. The five most frequently reported behaviours

3.3. Behavioural Profiles and Preliminary Clinical Interpretation

Based on the observed behavioural combinations and their apparent intensity, a preliminary clinical interpretation framework was developed to facilitate rapid recognition of different levels of acute stress during routine veterinary consultations (Table 2).

Table 2. Proposed preliminary clinical interpretation framework on stress-related behavioural indicators observed during veterinary consultations

Stress Level	Behavioural profile	Clinical interpretation	Suggested clinical approach
Low	No stress-related behavioural indicators or only one mild behavioural response	Animal appears to cope well with the veterinary environment	Routine consultation while maintaining calm handling and positive reinforcement
Moderate	Two or three concurrent stress-related behavioural indicators (e.g., fear, trembling, vocalizing or agitation)	Moderate acute stress that may influence behaviour during the consultation	Apply low-stress handling techniques, minimise restraint whenever possible, and allow acclimation before examination
High	Multiple concurrent stress-related behavioural indicators, particularly escape attempts associated with fear, agitation or vocalization	High likelihood of acute stress that may compromise the examination and negatively affect welfare	Consider additional stress-reduction strategies, behavioural support, or postponement of non-urgent procedures when appropriate

4. Discussion

4.1. Behavioural Responses During Veterinary Consultations

Veterinary consultations expose companion animals to a sequence of potentially stressful events, including transportation, unfamiliar environments, restraint, handling procedures, and interactions with unfamiliar people [2,6,10,15]. Consequently, behavioural responses observed during veterinary visits are dynamic and may vary throughout the consultation depending on the animal's previous experiences, coping ability, and the cumulative effect of multiple stressors [2,3,6,16].

The present pilot study identified attempting escape, fear, trembling, vocalization, and agitation as the most frequently reported stress-related behavioural indicators during veterinary consultations. Behavioural responses varied considerably among individual animals, with many owners reporting more than one stress-related behavioural indicator during the veterinary consultation. Many animals displayed multiple stress-related behavioural indicators simultaneously rather than isolated behavioural responses. Combinations of attempting escape, fear, trembling, vocalization, and agitation were characteristic of animals showing more pronounced behavioural responses during the consultation, whereas animals displaying none or only one behavioural indicator generally appeared to cope better with the veterinary environment.

Rather than occurring independently, these behaviours were commonly observed in combination, suggesting that behavioural profiles may provide more meaningful clinical information than isolated behavioural responses. Similar behavioural manifestations have been reported in previous studies investigating fear, anxiety, and stress in companion animals during veterinary visits [6,10,16–19].

Attempting escape was the most frequently reported behavioural indicator before animals entered the veterinary practice and became progressively less common after entering the clinic and during the waiting period. In contrast, fear-related behaviours reached their highest frequency immediately after entering the veterinary practice. Trembling and vocalization were consistently observed throughout the consultation but showed a tendency to decrease during the later stages of the visit. Agitation was reported at all observation stages and showed a slight increase after animals had remained in the waiting area for approximately 10 minutes.

Overall, these findings suggest that behavioural responses changed throughout the veterinary visit (according to pet owners), suggesting that different stages of the consultation were associated with distinct manifestations of acute stress.

The temporal variation observed among behavioural indicators is also consistent with previous reports describing behavioural adaptation during veterinary consultations [6,18]. Attempting escape was most frequently reported before animals entered the veterinary practice, whereas fear-related behaviours became more common immediately after entering the clinic. This pattern may reflect the transition from anticipation of an unfamiliar event to direct exposure to environmental and handling-related stressors [2,3,6].

4.2. Clinical Relevance of the Proposed Screening Framework

Behavioural assessment represents one of the most practical approaches for recognising acute stress during routine veterinary consultations because it is non-invasive, inexpensive, and requires no specialised equipment [6,8,18]. Early identification of stress-related behaviours may facilitate the implementation of low-stress handling techniques, improve communication with owners, and contribute to safer clinical examinations and improved patient management [6,8,18,20].

Unlike comprehensive behavioural assessments, which frequently require prolonged observation or specialised expertise, the framework proposed in the present study was designed as a rapid clinical screening approach suitable for routine veterinary practice. Its primary purpose is to organise behavioural observations in a structured manner and assist veterinary professionals in recognising animals that may benefit from stress-reduction strategies. The proposed framework should be regarded as an exploratory clinical aid intended to support behavioural observation rather than as a validated diagnostic or welfare assessment instrument.

The preliminary clinical interpretation framework proposed in Table 2 should not be regarded as a diagnostic or welfare assessment instrument but rather as a practical aid that supports systematic behavioural observation during routine consultations. Such an approach may improve consistency in recognising stress-related behavioural responses while providing a basis for future refinement and validation.

The proposed screening framework required minimal additional time during routine veterinary consultations and relied exclusively on owner-reported behavioural observations obtained without specialised equipment or additional clinical procedures.

Consequently, the proposed framework appears feasible for incorporation into routine veterinary practice as a preliminary behavioural screening approach. However, further validation using standardized behavioural assessment methods and larger study populations is required before broader clinical implementation.

4.3. Behavioural Observations within the Context of Animal Welfare

Behavioural indicators provide valuable information regarding the emotional experiences of companion animals and therefore contribute to animal welfare assessment [10,11]. Within the Five Domains Model, behavioural responses primarily reflect the Mental State domain, which integrates the affective experiences generated by nutrition, physical environment, health, and behavioural interactions [11].

Nevertheless, behavioural observations alone cannot determine the overall welfare status of an animal. Animal welfare is a multidimensional concept requiring integration of behavioural, physiological, environmental, and health-related information [11]. Consequently, the framework proposed in the present study should be interpreted as a behaviour-based stress screening approach rather than a comprehensive welfare assessment method.

This distinction is particularly important because the present study focused exclusively on behavioural manifestations of acute stress during veterinary consultations and did not include physiological indicators or validated behavioural assessment protocols.

4.4. Study Strengths, Limitations and Future Perspectives

The principal strength of the present study lies in its practical orientation. The proposed framework was developed using behavioural indicators that can be readily recognised by veterinary professionals during routine consultations without additional equipment or extensive behavioural training. Consequently, the framework has the potential to be easily incorporated into everyday clinical practice.

Several limitations should, however, be considered. The study was based on a relatively small sample of companion animals and relied exclusively on owner-reported behavioural observations, which may have been influenced by subjective interpretation and previous experience. In addition, behavioural classifications were not validated using physiological indicators, independent behavioural observers, or standardized ethograms. These limitations should be considered when interpreting the proposed behavioural profiles.

Future studies should evaluate the reproducibility, inter-observer agreement, construct validity, and clinical applicability of the proposed framework in larger and more diverse populations of companion animals. Integration of behavioural observations with physiological indicators of stress may further contribute to the development of standardized behaviour-based stress screening methods suitable for veterinary practice [10,11,20,21].

5. Conclusions

This pilot study identified a range of owner-reported stress-related behavioural indicators commonly observed in dogs and cats during routine veterinary consultations and organised these observations into a preliminary behaviour-based stress screening framework. The findings suggest that combinations of behavioural indicators may provide more meaningful information regarding acute stress than isolated behavioural responses.

The proposed framework offers a simple and practical approach for structuring behavioural observations during routine veterinary consultations. However, it should be regarded as a preliminary clinical aid rather than a validated diagnostic or welfare assessment instrument.

Further studies involving larger and more diverse populations, independent behavioural observers, standardized ethograms, and physiological indicators of stress are required to validate the proposed framework and evaluate its reliability, reproducibility, and clinical applicability.

The present study may serve as a starting point for the future development of standardized behaviour-based stress screening methods that may support early recognition of acute stress and contribute to improved welfare-oriented veterinary care.

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