



Behavioral Responses and Heart Rate Changes in Dogs During Routine Veterinary Visits

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Abstract: Veterinary visits are commonly associated with emotional arousal in dogs, even when procedures are routine and non-invasive. The present study aimed to evaluate behavioral responses and heart rate changes in dogs during a veterinary visit, comparing the waiting room and the clinical examination phases, and to investigate the relationship between behavioral expression and physiological activation. A total of 55 client-owned dogs undergoing routine veterinary visits were included. Behavioral responses were assessed using a structured observational scoring system, and heart rate was recorded during both the waiting room and clinical examination phases. Differences between phases were analyzed using paired statistical tests, and associations between behavioral scores and heart rate were evaluated using Spearman's rank correlation. Behavioral scores were significantly higher during the clinical examination compared to the waiting room ($p < 0.0001$), indicating a worsening of behavioral responses during examination. Heart rate values also increased significantly during the clinical examination ($p < 0.0001$). Significant positive correlations were observed between behavioral scores and heart rate, particularly during the clinical examination phase. These findings indicate that routine veterinary visits are associated with concurrent behavioral and physiological changes in dogs, with the clinical examination representing the most impactful phase. The integration of behavioral observation and heart rate assessment may provide a more comprehensive evaluation of dogs' responses during veterinary care and support strategies aimed at improving animal welfare and clinical management.

Key Words: Dog; veterinary visit; behavioral assessment; stress indicators; heart rate.

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Introduction

Veterinary visits are widely recognized as a source of acute stress for companion dogs, even when consultations involve routine and non-invasive procedures (Mariti et al., 2015). Exposure to unfamiliar environments, transportation, novel sensory stimuli, physical restraint, and interaction with unfamiliar people can elicit emotional responses characterized by increased arousal and activation of stress-related physiological systems (Csoltova et al., 2017; Herbel et al., 2020; Byrne et al., 2024). These responses may negatively affect animal welfare and interfere with clinical evaluation by altering both behavioral expression and physiological parameters (Csoltova et al., 2017; Mandese et al., 2020).

Stress-related responses in dogs encompass a range of emotional states involving fear- and anxiety-related components, which differ in duration, predictability, and eliciting conditions (Houpt, 2018; McMillan, 2017; Lodrini et al., 2025). In routine clinical contexts, however, these emotional states often overlap and may not be readily distinguishable based on observable behavior alone, particularly during brief and potentially arousing interactions such as veterinary visits (Gazzano & Ogi, 2020). This overlap poses a challenge for the accurate assessment of dogs' emotional states during veterinary care and highlights the need for structured and objective evaluation approaches.

Behavioral observation represents a primary tool for assessing dogs' emotional responses in clinical settings (Mills et al., 2006). Changes in posture, activity level, interaction with people and the environment, and the expression of stress-related or appeasement behaviors can provide valuable information about how dogs experience the veterinary visit (Lind et al., 2016; Gazzano et al., 2025). Behavioral assessment is particularly relevant in routine practice, as it can be performed rapidly and non-invasively and may allow identification of stress-related responses that

are not immediately apparent through clinical examination alone (Gazzano et al., 2025).

In parallel, physiological parameters are commonly used as objective indicators of stress-related autonomic activation. Heart rate, in particular, is frequently employed in veterinary contexts as a marker of emotional arousal and sympathetic nervous system activity (von Borrel et al., 2007). Increases in heart rate have been reported during potentially stressful situations, including veterinary handling and examination (Squaire et al., 2023; Edwards et al., 2019). However, behavioral and physiological responses do not always show a linear relationship, and dogs may exhibit elevated physiological arousal in the absence of marked behavioral signs, or vice versa (Beerda et al., 1998). This dissociation underscores the importance of integrating behavioral and physiological measures to obtain a more comprehensive evaluation of stress during veterinary visits (Gazzano et al., 2025).

The veterinary visit comprises distinct phases that may differ in their emotional impact on the dog. The waiting room, characterized by the presence of unfamiliar dogs, noises, and olfactory cues, may act as an initial stressor, while the subsequent clinical examination involves direct handling and restraint that may further influence behavioral and physiological responses (Csiplo & Popescu, 2025). Despite this, limited information is available on how dogs' behavioral and physiological parameters change across these phases during routine veterinary visits under real clinical conditions.

The aim of the present observational study was to evaluate behavioral responses and heart rate in dogs undergoing routine veterinary visits, comparing measurements obtained in the waiting room, and during the clinical examination. In addition, the study investigated the association between behavioral scores and heart rate values across the two phases of the visit, with the objective of assessing whether behavioral indicators of stress are reflected in physiological responses during routine veterinary care.

Material and Methods

This observational study was conducted during routine veterinary visits at a small animal veterinary clinic in Pisa, Italy. Data collection took place under real clinical conditions, without experimental manipulation of the examination procedure. The study design aimed to assess behavioral and physiological indicators of stress in dogs during two distinct phases of the veterinary visit: the waiting room and the clinical examination.

All procedures were carried out during standard appointments for preventive or routine care, including physical examination and vaccination. No invasive or painful diagnostic procedures were performed as part of the study protocol.

Animals

A total of 55 client-owned dogs were enrolled in the study. Dogs of different breeds, ages, sex, and body sizes were included. Only dogs presented for routine veterinary visits and considered clinically healthy based on the veterinarian's assessment were eligible for inclusion. Exclusion criteria included the presence of acute illness, ongoing pain, aggressive behavior preventing safe handling, or the need for invasive diagnostic or therapeutic procedures.

Behavioral Assessment

Behavioral evaluation was conducted using a structured observational approach specifically developed for the assessment of dogs during routine veterinary visits. The assessment was based on direct observation of the dog's behavior under real clinical conditions and was designed to allow rapid evaluation without interfering with standard veterinary procedures.

Behavioral observations focused on postural indicators, activity level, interaction with the

environment and people, and the presence of stress-related or appeasement behaviors. Each dog was evaluated during two phases of the visit:

1. Waiting room phase, defined as the period from arrival at the clinic until entry into the examination room;
2. Clinical examination phase, defined as the period during which the dog was physically examined by the veterinarian.

During each phase, dogs were assigned an overall behavioral score reflecting their emotional state, classified along an ordinal scale ranging from relaxed to highly stressed. In addition, specific behavioral elements associated with stress (e.g., freezing, avoidance, trembling, panting, lip licking) and appeasement signals were recorded when present.

The overall behavioral state was scored using a six-point ordinal scale reflecting increasing levels of stress and emotional activation:

- (1) relaxed dog;
- (2) presence of appeasement signals;
- (3) signs of tension without growling;
- (4) signs of tension with growling;
- (5) attempts to escape;
- (6) attempts of aggression.

The same behavioral scoring system was applied during both the waiting room and clinical examination phases to allow within-subject comparison.

In addition, the degree of physical restraint required during the clinical examination was recorded using a five-point ordinal scale, ranging from no restraint to strong restraint with muzzle. This measure was included to account for the potential influence of handling intensity on behavioral and physiological responses.

All behavioral observations were performed by a single trained observer to minimize inter-observer variability. The observer remained unobtrusive and did not interfere with routine handling or dog-owner or dog-veterinarian interactions.

Heart Rate Measurement

Heart rate was used as a physiological indicator of autonomic activation and was recorded during both the waiting room and the clinical examination phases of the veterinary visit. Measurements were obtained by palpation of the femoral artery, with heart rate counted for 15 seconds and multiplied by four to obtain beats per minute (bpm). Heart rate recordings were performed while the dog was standing or sitting calmly, when possible, and before the onset of any potentially stressful manipulation during the clinical examination.

Data Collection Procedure

For each dog, behavioral scores and heart rate values were collected sequentially during the waiting room phase and again during the clinical examination phase. All data were recorded on standardized data collection sheets immediately after each observation.

To minimize confounding factors, all measurements were performed within the same veterinary clinic and during routine operating hours. However, variables such as time of day, previous veterinary experience, and individual temperament were not experimentally controlled.

Statistical Analysis

Statistical analyses were performed using GraphPad Prism version 9 (GraphPad Software, San Diego, CA, USA). Data distribution was assessed using the Shapiro-Wilk test. Statistical analyses were performed using appropriate parametric and non-parametric methods based on data distribution. Normality of heart rate values and behavioral scores was assessed and confirmed; therefore, comparisons between the waiting room and clinical examination phases were conduct-

ed using paired t tests. Associations between behavioral scores, heart rate values, and degree of physical restraint were evaluated using Spearman’s rank correlation coefficient, as these variables did not meet assumptions of normality. Results are reported as mean ± standard deviation for normally distributed variables. Statistical significance was set at $p \leq 0.05$.

Ethical Considerations

The study involved non-invasive observational procedures conducted during routine veterinary care. No additional stressors or experimental manipulations were introduced. Participation was voluntary, and written informed consent was obtained from all owners prior to data collection. All procedures were conducted in accordance with ethical standards for research involving client-owned animals.

Results

A total of 55 client-owned dogs were included in the study. The study population comprised 24 males (43.6%) and 31 females (56.4%), with different neuter status distributions between sexes. Dogs had a mean age of 6.28 ± 3.69 years and a mean body weight of 16.27 ± 10.91 kg. Most dogs were presented for vaccination (74.5%), while the remaining subjects underwent routine clinical examinations, dermatological evaluations, or minor diagnostic or therapeutic procedures (Table 1).

Table 1. Demographic characteristics of the study population.

Characteristic	Value
Number of dogs	55
Sex, n (%)	24 males (43.6%), 31 females (56.4%)
Neuter status, n (%)	
Males	5 neutered (20.8%), 19 intact (79.2%)
Females	24 neutered (77.4%), 7 intact (22.6%)
Age (years)	6.28 ± 3.69 (range 1–17)
Body weight (kg)	16.27 ± 10.91
Breed, n (%)	
Mixed-breed	19 (34.5%)
Purebred	36 (65.5%)
Reason for visit, n (%)	
Vaccination	41 (74.5%)
Routine clinical examination / check-up	5 (9.1%)
Minor diagnostic or therapeutic procedures	9 (16.4%)

During the waiting room phase, most dogs showed low behavioral scores. Specifically, 56.4% of dogs were classified as relaxed, 40.0% displayed appeasement signals or mild tension, and only 3.6% showed signs of tension.

During the clinical examination phase, a shift toward higher behavioral scores was observed. The proportion of relaxed dogs decreased to 12.7%, while 58.2% of dogs were classified in the intermediate category and 29.1% showed signs of tension (Table 2).

Table 2. Distribution of behavioral scores recorded during the waiting room and clinical examination phases of the veterinary visit.

Behavioral score	Waiting room n (%)	Clinical examination n (%)
1 – Relaxed	31 (56.4%)	7 (12.7%)
2 – Appeasement / mild tension	22 (40.0%)	32 (58.2%)
3 – Tension	2 (3.6%)	16 (29.1%)
4–6	0 (0%)	0 (0%)
Total	55 (100%)	55 (100%)

Heart rate differed significantly between the two phases of the veterinary visit. Mean heart rate during the clinical examination was higher than during the waiting room phase (paired t test: $t = 4.673$, $df = 54$, $p < 0.0001$), with a mean increase of 14.1 ± 22.4 bpm (Figure 1).

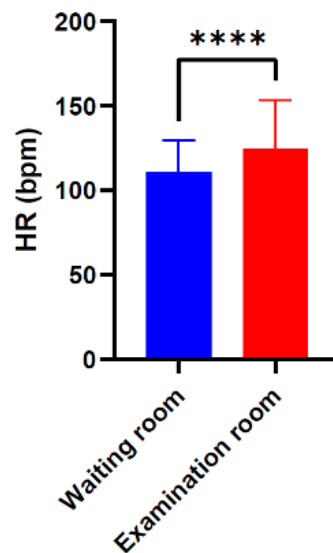


Figure 1. Mean ($\pm$ SD) heart rate values recorded during the waiting room and clinical examination phases of the veterinary visit (**** $p \leq 0.0001$).

Behavioral scores differed significantly between the two phases of the veterinary visit (Fig. 2). Mean behavioral score during the clinical examination was significantly higher than during the waiting room phase (paired t test: $t = 10.16$, $df = 54$, $p < 0.0001$), with a mean increase of 0.69 ± 0.50 points.

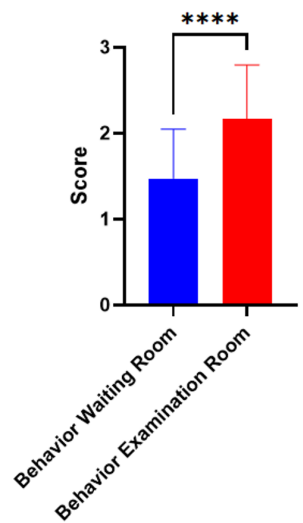


Figure 2. Mean ($\pm$ SD) behavioral scores recorded during the waiting room and clinical examination phases of the veterinary visit (**** $p \leq 0.0001$).

Spearman’s rank correlation analysis revealed significant positive associations between behavioral scores and heart rate values (Fig. 3). Heart rate measured during the clinical examination was positively correlated with behavioral score recorded during the same phase ($\rho = 0.582$, $p < 0.001$). In addition, behavioral score in the waiting room was positively correlated with heart rate measured during the clinical examination ($\rho = 0.306$, $p < 0.01$), and heart rate in the waiting room was positively correlated with behavioral score during the clinical examination ($\rho = 0.256$, $p < 0.05$).

A strong positive correlation was also observed between behavioral scores recorded in the waiting room and during the clinical examination ($\rho = 0.705$, $p < 0.001$). No significant correlations were found between the degree of physical restraint and either behavioral scores or heart rate values.



Figure 3. Spearman’s rank correlation matrix showing associations between behavioral scores, heart rate values, and degree of physical restraint during the veterinary visit. Color intensity indicates the strength and direction of correlations (* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$).

Discussion

The present study evaluated behavioral responses and heart rate changes in dogs during routine veterinary visits, comparing the waiting room and the clinical examination phases and examining the association between behavioral scores and physiological parameters. Overall, the results indicate that even non-invasive, routine veterinary procedures are associated with significant and measurable changes in both behavioral expression and autonomic activation.

Behavioral assessment showed a clear and statistically robust increase in behavioral scores during the clinical examination compared to the waiting room. In addition to the descriptive shift toward higher stress-related categories, paired analysis confirmed that behavioral scores were significantly higher during examination, indicating a consistent worsening of dogs' behavioral responses across the study population. This finding supports the view that the clinical examination represents a particularly salient phase of the veterinary visit, likely due to direct handling, physical manipulation, and reduced opportunity for avoidance. Döring et al. (2009) reported that 78.5% of dogs displayed fear-related behaviors on the examination table, including panting, trembling, and avoidance postures, and that even a single previous negative experience significantly increased the probability of fear on subsequent visits. Notably, stress was not limited to the examination phase: Mariti et al. (2015) documented that more than 40% of dogs displayed at least four stress-related behavioral signals already in the waiting room, and that owners frequently underestimated the level of distress compared to independent behavioral assessment. These data suggest that stress at the veterinary clinic accumulates progressively from arrival onward, and that evaluating only the examination phase may underestimate the animal's overall emotional burden.

Heart rate analysis revealed a parallel pattern, with significantly higher values recorded during the clinical examination compared to the waiting room. The increase in heart rate observed in most dogs suggests heightened autonomic activation during examination, consistent with previous reports describing physiological arousal in dogs exposed to potentially challenging or emotionally salient situations (Csoltova et al., 2017; Edwards et al., 2022). In this regard, Mandese et al. (2021) demonstrated, in a prospective randomised crossover trial involving 44 client-owned dogs, that heart rate was approximately 20 bpm higher when dogs were examined in a common treatment area without owner presence compared to baseline, with 64% of dogs displaying moderate to severe stress scores in that condition. Although the present study did not manipulate examination location or owner presence, the magnitude of heart rate increase observed during clinical examination is comparable to values reported in controlled contexts and reinforces the sensitivity of cardiac parameters to changes in handling conditions. Together, the behavioral and physiological findings indicate that the examination phase elicits stronger responses than the waiting room alone.

A central result of this study was the significant association between behavioral scores and heart rate values, particularly during the clinical examination. Dogs displaying higher behavioral scores also showed higher heart rate values, indicating concordance between observable behavioral expression and physiological arousal in this context (Edwards et al., 2022). However, the correlations were moderate rather than strong, suggesting that behavioral and physiological responses may not always vary in a strictly parallel manner. This partial dissociation is consistent with established findings in the canine stress literature: Beerda et al. (1998) demonstrated that behavioral and physiological indicators can diverge substantially depending on individual temperament and coping style, with some dogs displaying elevated autonomic activity in the absence of overt behavioral signs. Stellato et al. (2021), using an owner-reported cross-sectional survey on 1,346 dogs, further identified that fear and aggression within veterinary clinics are associated with dog personality traits, the history of prior negative veterinary experiences, and owner behavior during the visit, highlighting that individual-level factors are major determinants of

behavioral expression even when physiological arousal is similarly elevated. The moderate magnitude of the correlations observed in the present study is therefore likely to reflect comparable sources of inter-individual variability rather than measurement inconsistency. This interpretation is further supported by Kartashova et al. (2021), who, in a comprehensive review of stress assessment methods in dogs across clinical and experimental settings, concluded that no universal quantitative indicator of stress exists and that even cortisol, the most widely used stress biomarker, lacks standardized reference intervals across contexts. The authors explicitly recommend combining behavioral observation with physiological parameters as the most reliable approach to characterizing an animal's psychological state during a veterinary appointment.

The positive correlation between behavioral scores recorded in the waiting room and those observed during the clinical examination further suggests a degree of consistency in individual dogs' responses across different phases of the veterinary visit. Dogs showing higher behavioral reactivity upon arrival tended to maintain higher scores during examination, indicating that early behavioral observation may provide useful information for anticipating responses during subsequent handling and clinical procedures. This finding has practical implications: Edwards et al. (2019), in a large-scale C-BARQ-based study involving 26,555 dogs, reported that established demographic predictors such as breed, weight, and source account for only approximately 7% of the variance in veterinary fear, suggesting that pre-visit profiling alone has limited predictive utility. In contrast, real-time behavioral observation during the waiting room phase, as supported by the present findings, may offer a more sensitive and immediately actionable indicator of individual risk, allowing veterinary staff to adapt their approach before examination begins.

Interestingly, no significant association was found between the degree of physical restraint and either behavioral scores or heart rate values. While restraint is often considered a relevant stressor, its impact may depend on qualitative factors such as duration, technique, and familiarity with handling (Lloyd et al., 2022). Squair et al. (2023) showed that it is the overall quality of the handling approach – including the adoption of low-stress techniques and collaborative examination protocols – rather than the degree of physical restraint per se, that is associated with reductions in serum cortisol and behavioral stress indicators across repeated veterinary visits. The absence of a significant association between restraint degree and stress responses in the present study is consistent with this interpretation: in routine clinical conditions involving predominantly low restraint, this variable shows limited variability and may not capture the qualitative dimensions of handling that are most relevant to the animal's emotional state.

Taken together, these findings highlight the value of integrating behavioral assessment with physiological measures when evaluating dogs' responses to veterinary visits. Behavioral observation provides immediate insight into emotional expression, while heart rate offers an objective index of autonomic activation. The combination of these approaches allows for a more comprehensive assessment of dogs' responses to routine veterinary care than either measure alone. This multimodal perspective aligns with current recommendations in the canine welfare literature (Kartashova et al., 2021; Gazzano et al., 2025), which emphasize that no single indicator is sufficient to reliably characterize the stress state of individual dogs, and that integrating behavioral and physiological data improves both diagnostic accuracy and the ability to tailor welfare-oriented interventions. From a practical standpoint, the simultaneous assessment of behavioral scores and heart rate during routine visits could support the identification of high-risk patients and inform targeted management strategies aimed at reducing stress in veterinary settings.

Several limitations should be acknowledged. The observational design precludes causal inference, and heart rate was assessed as a single physiological parameter without concurrent measurement of additional stress-related markers. Behavioral assessment relied on a structured but non-validated scoring system, and individual factors such as previous veterinary experience were not controlled. Future studies should include validated behavioral tools, multiple physiological indicators, and larger samples to further clarify the relationship between behavioral expression and physiological arousal.

during veterinary visits. Furthermore, interventions aimed at reducing anxiety-related responses in clinical settings, such as nutraceutical supplementation, may represent a complementary approach to improve dogs' emotional well-being (Giuliano et al., 2024). Future research could also consider the integration of emerging biomarkers related to the gut-brain axis, which have been linked to anxiety and fear-related behaviors in dogs (Sacchettino et al., 2025). In this context, it would be interesting to explore integrated experimental approaches in which validated behavioral and physiological measures are combined with nutraceutical interventions and gut-brain axis biomarkers to advance our understanding of anxiety-related responses during veterinary visits.

Conclusion

In conclusion, the present study demonstrates that routine veterinary visits are associated with significant increases in both behavioral scores and heart rate, particularly during the clinical examination phase. The observed associations between behavioral and physiological measures underscore the importance of combining these indicators to better characterize dogs' responses to veterinary procedures and to inform strategies aimed at improving clinical management and animal welfare.

References

- Beerda, B., Schilder, M., Hooff, J., Vries, H., & Mol, J. (1998). Behavioural, saliva cortisol and heart rate responses to different types of stimuli in dogs. *Applied Animal Behaviour Science*, 58, 365-381. [https://doi.org/10.1016/s0168-1591\(97\)00145-7](https://doi.org/10.1016/s0168-1591(97)00145-7).
- Byrne, A., & Arnott, G. (2024). Empathy or Apathy? Investigating the influence of owner stress on canine stress in a novel environment. *Applied Animal Behaviour Science*. <https://doi.org/10.1016/j.applanim.2024.106403>.
- Csiplo, A., & Popescu, S. (2025). Pet Owners' Perceptions of Key Factors Affecting Animal Welfare During Veterinary Visits. *Animals : an Open Access Journal from MDPI*, 15. <https://doi.org/10.3390/ani15060894>.
- Csoltova, E., Martineau, M., Boissy, A., & Gilbert, C. (2017). Behavioral and physiological reactions in dogs to a veterinary examination: Owner-dog interactions improve canine well-being. *Physiology & Behavior*, 177, 270-281. <https://doi.org/10.1016/j.physbeh.2017.05.013>
- Döring, D., Roscher, A., Scheipl, F., Küchenhoff, H., & Erhard, M. H. (2009). Fear-related behaviour of dogs in veterinary practice. *Veterinary Journal*, 182(1), 38-43. <https://doi.org/10.1016/j.tvjl.2008.05.012>
- Edwards, P., Smith, B., McArthur, M., & Hazel, S. (2019). Fearful Fido: Investigating dog experience in the veterinary context in an effort to reduce distress. *Applied Animal Behaviour Science*. <https://doi.org/10.1016/j.applanim.2019.02.009>.
- Edwards, P. T., Smith, B. P., McArthur, M. L., & Hazel, S. J. (2022). At the heart of a dog's veterinary experience: Heart rate responses in dogs vary across a standard physical examination. *Journal of Veterinary Behavior*, 51, 23-34. <https://doi.org/10.1016/j.jveb.2022.03.003>.
- Edwards, P. T., Hazel, S. J., Browne, M., Serpell, J. A., McArthur, M. L., & Smith, B. P. (2019). Investigating risk factors that predict a dog's fear during veterinary consultations. *PLOS ONE*, 14(7), e0215416. <https://doi.org/10.1371/journal.pone.0215416>.
- Gazzano, V., Curadi, M., Baragli, P., Mariti, C., Cecchi, F., Cavallo, S., Sacchettino, L., & Gazzano, A. (2025). Physiological and Behavioral Evaluation of Shelter Dogs During Veterinary Routine Health Checks. *Veterinary Sciences*, 12. <https://doi.org/10.3390/vetsci12060583>.
- Gazzano, V., & Ogi, A. (2020). Canine Phobia. *Dog Behavior*, 6, doi:10.4454/db.v6i2.121.
- Giuliano, V. O., Sacchettino, L., Gazzano, V., Ciccarelli, D., Napolitano, F., & d'Angelo, D. (2024). Supplementation with nutraceutical Calmina® (BuonaPET) improves anxiety status in shelter dogs: a pilot study. *Dog Behavior*, 10(3). <https://doi.org/10.4454/db.v10i3.194>.

- Giuliano, V. O., Sacchettino, L., Rusu, A. S., Ciccarelli, D., Gazzano, V., de Cesare, M., Visone, M., Mizzoni, V., Napolitano, F., & d'Angelo, D. (2025). Well-Being Indicators in Autistic Children and Therapy Dogs During a Group Intervention: A Pilot Study. *Animals*, 15, 2032. <https://doi.org/10.3390/ani15142032>.
- Herbel, J., Aurich, J., Gautier, C., Melchert, M., & Aurich, C. (2020). Stress Response of Beagle Dogs to Repeated Short-Distance Road Transport. *Animals : an Open Access Journal from MDPI*, 10. <https://doi.org/10.3390/ani10112114>.
- Houpt, K. A. (2018). *Domestic Animal Behavior for Veterinarians and Animal Scientists* (6th ed.). Wiley-Blackwell.
- Iacopini, L., & Gazzano, V. (2024). Analysis of the management of a shelter dog kennel. *Dog Behavior*, 9, 183. <https://doi.org/10.4454/db.v9i2.183>.
- Kartashova, I. A., Ganina, K. K., Karelina, E. A., & Tarasov, S. A. (2021). How to evaluate and manage stress in dogs – A guide for veterinary specialist. *Applied Animal Behaviour Science*, 243, 105458. <https://doi.org/10.1016/j.applanim.2021.105458>.
- Lind, A., Hydbring-Sandberg, E., Forkman, B., & Keeling, L. (2016). Assessing stress in dogs during a visit to the veterinary clinic: Correlations between dog behavior in standardized tests and assessments by veterinary staff and owners. *Journal of Veterinary Behavior: Clinical Applications and Research*, 17, 24-31. <https://doi.org/10.1016/j.jveb.2016.10.003>.
- Lloyd, C. D., Bethell, E. J., & Murrell, J. C. (2022). Assessing the relationship between emotional states of dogs and their human handlers, using simultaneous behavioral and cardiac measures. *Frontiers in Veterinary Science*, 9, 897287. <https://doi.org/10.3389/fvets.2022.897287>.
- Lodrin, G., Bellini, V., Bevilacqua, A., Bova, S., Castagnoli, A., Olmo, C., & Gazzano, V. (2025). A Comprehensive Review of Canine Anxiety: Pathogenesis, Behavioral Outcomes, and Treatment. *Dog Behavior*, 11(2). doi:10.4454/db.v11i2.211.
- Mandese, W., Griffin, F., Reynolds, P., Blew, A., Deriberprey, A., & Estrada, A. (2020). Stress in client-owned dogs related to clinical exam location: a randomised crossover trial. *The Journal of small animal practice*. <https://doi.org/10.1111/jsap.13248>.
- Mariti, C., Raspanti, E., Zilocchi, M., Carlone, B., & Gazzano, A. (2015). The Assessment of Dog Welfare in the Waiting Room of a Veterinary Clinic. *Animal Welfare*, 24, 299-305.
- McMillan, F. D. (2017). *Mental Health and Well-being in Animals*. CABI.
- Mills, D.S.; Ramos, D.; Estelles, M.G.; Hargrave, C. A Triple Blind Placebo-Controlled Investigation into the Assessment of the Effect of Dog Appeasing Pheromone (DAP) on Anxiety Related Behaviour of Problem Dogs in the Veterinary Clinic. *Appl Anim Behav Sci* 2006, 98, 114-126, doi:10.1016/j.applanim.2005.08.012.
- Sacchettino, L., Gazzano, V., Mayer, M., Giuliano, V. O., Napolitano, F., Ogi, A., & d'Angelo, D. (2025). Looking beyond the mind: the gut microbiome as a potential new avenue for treating behavioral disorders in dogs. *Dog Behavior*, 11(1). <https://doi.org/10.4454/db.v11i1.200>.
- Squair, C., Proudfoot, K., Montelpare, W., & Overall, K. (2023). Effects of Changing Veterinary Handling Techniques on Canine Behaviour and Physiology Part 1: Physiological Measurements. *Animals : an Open Access Journal from MDPI*, 13. <https://doi.org/10.3390/ani13071253>.
- Stellato, A. C., Flint, H. E., Dewey, C. E., Widowski, T. M., & Niel, L. (2021). Risk-factors associated with veterinary-related fear and aggression in owned domestic dogs. *Applied Animal Behaviour Science*, 241, 105374. <https://doi.org/10.1016/j.applanim.2021.105374>.
- von Borell et al. (2007). Heart rate variability as a measure of autonomic regulation of cardiac activity for assessing stress and welfare in farm animals – a review. *Physiology & Behavior*, 92, 293-316.

Risposte comportamentali e variazioni della frequenza cardiaca nei cani durante visite veterinarie di routine

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Sintesi

Le visite veterinarie sono comunemente associate a un aumento dell'attivazione emotiva nei cani, anche in presenza di procedure di routine e non invasive. Il presente studio ha avuto l'obiettivo di valutare le risposte comportamentali e le variazioni della frequenza cardiaca nei cani durante una visita veterinaria, confrontando la fase di sala d'attesa con quella di visita clinica ed esplorando la relazione tra comportamento e parametri fisiologici. Sono stati inclusi 55 cani di proprietà sottoposti a visite veterinarie di routine. Le risposte comportamentali sono state valutate mediante un sistema strutturato di osservazione, mentre la frequenza cardiaca è stata registrata in entrambe le fasi della visita. Le differenze tra le fasi sono state analizzate con test per dati appaiati e le associazioni tra punteggi comportamentali e frequenza cardiaca mediante correlazione di Spearman. I punteggi comportamentali sono risultati significativamente più elevati durante la visita clinica rispetto alla sala d'attesa ($p < 0.0001$), indicando un peggioramento delle risposte comportamentali durante l'esame. Anche la frequenza cardiaca è aumentata in modo significativo durante la visita clinica ($p < 0.0001$). Sono state inoltre osservate correlazioni positive significative tra punteggi comportamentali e frequenza cardiaca. I risultati suggeriscono che la visita veterinaria, in particolare la fase di esame clinico, è associata a modificazioni comportamentali e fisiologiche nei cani. L'integrazione di valutazioni comportamentali e fisiologiche può contribuire a una migliore comprensione delle risposte dei cani durante le cure veterinarie.

