The Advantage of Using Pet Acoustics to Reduce Canine Stress

Biometric Study Shows the Advantage of Pet Acoustics Music in Reducing Canine Stress Compared to Classical Music and No-Music in a Kennel Environment.

Understanding and addressing auditory stress is vital for promoting canine welfare. By recognising the sources and impacts of auditory stress, and implementing strategies to mitigate it, we can improve the quality of life for dogs, particularly those in high-stress environments like shelters and kennels. Reducing auditory environmental stress not only enhances the well-being of dogs but also fosters better human-animal relationships and supports overall animal welfare.

Auditory stress in dogs can originate from various sources, including loud noises, sudden sounds, and continuous background noise, all of which can be prevalent in high-density environments. Chronic exposure to these stressors can lead to behavioural issues, anxiety, and even physical health problems in dogs. Recognising these stressors and their impacts is the first step towards mitigating them. Strategies such as soundproofing kennels, introducing calming music, and providing quiet spaces for rest can significantly alleviate stress. Implementing these measures not only improves the immediate well-being of the dogs but also aids in their long-term emotional and physical health, making them more adaptable and well-adjusted. Managing auditory stress ensures a more humane and supportive environment, ultimately leading to stronger bonds between humans and their canine companions.

Introduction
The purpose of this six-week study was to support canine welfare by helping canines to manage auditory and behavioural stress through the most effective sound intervention for calming.

Canine Auditory Sensitivity
Dogs can hear frequencies ranging from approximately 40 Hz to 60,000 Hz, which is significantly broader than the human hearing range of 20 Hz to 20,000 Hz. This heightened sensitivity allows dogs to detect sounds, such as high-frequency noises emitted by electronic and ultrasonic devices, and other animals. However, it also means that dogs are more vulnerable to auditory stress from loud, sudden, or continuous noises as well as ultra-high and sub-low frequencies not being audible by humans.

Environmental Noise
Environmental noise is a common source of auditory stress for dogs. Sounds such as traffic, construction, fireworks, thunderstorms, and appliances can cause significant stress and anxiety in dogs. Studies have shown that noise phobia, particularly fear of thunderstorms and fireworks, is a prevalent issue among dogs, leading to behaviours such as trembling, hiding, barking, and destructive behaviour (Blackwell *et al.*, 2013).

Kennel and Shelter Environments
Dogs housed in kennels and shelters are often exposed to high levels of noise from barking dogs, cleaning activities, and human interactions. This constant auditory stimulation can lead to increased stress levels, manifesting in behaviours like restlessness, barking, and aggression. Research by Coppola *et al.* (2006) found that shelter dogs exposed to high noise levels exhibited elevated cortisol levels, indicating increased stress.

Use of Music
Playing calming music specifically designed for dogs can help reduce stress and anxiety. Research by Kogan et al. (2012) and Wells *et al.* (2002) has shown that classical music can have a calming effect on dogs, reducing barking and promoting restful behaviour.

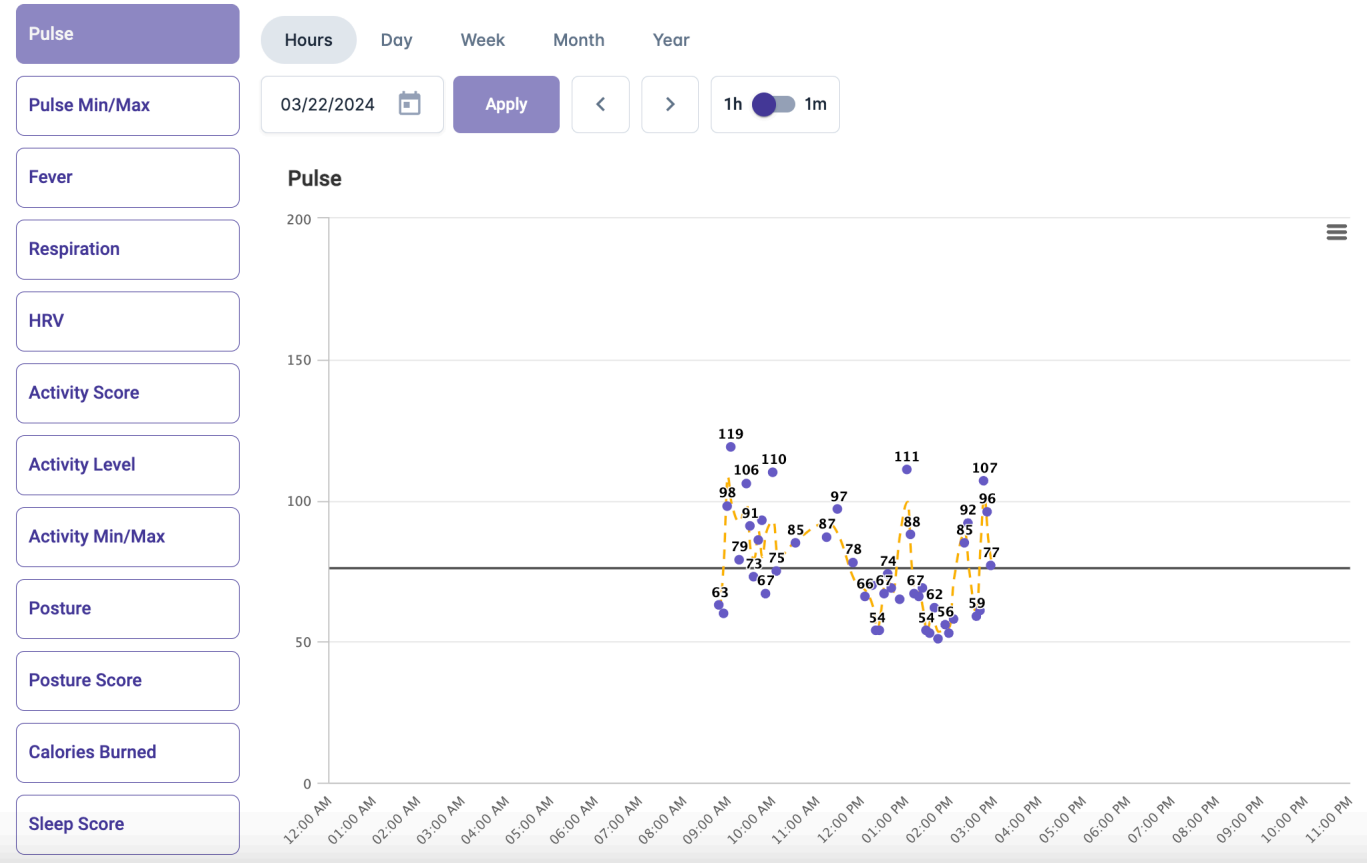
Study Design
This convenient sample study employed a repeated measures design to gain biometric understanding of canine responses to music/sound interventions to diminish stress using three conditions: Pet Acoustics canine-designed music, classical music selections and no-music.

Participants A convenience sample of canines participated in the study. Canine study participants were recruited from Educated Canines Assisting with Disabilities (ECAD, Torrington, CT, US), an Assistance Dog International (ADI) accredited service dog organisation. ECAD reviewed the study for animal welfare and safety considerations and based on the non-invasive biometric monitoring parameters and non-invasive music/ sound interventions agreed to have 12 service dogs in training participate in the study.

The kennel site used for the study was a large kennel room in the E.C.A.D. facility where the service dogs in training are placed for quiet time. Each dog rested in a hard rubber crate with a large metal door grill opening, commonly used in kennels.

Study Tools
To accurately measure and monitor the physiological responses of dogs in this study, several specialised tools and techniques were employed. These tools ensured precise data collection and analysis of auditory and physiological parameters.

- **Pet Tunes Pro Speaker:** Pet Acoustics Pet Tunes Pro speaker was set up in the center of the kennel room, four feet off the ground to disburse the 360-degree sound interventions for the dogs resting.
- **Decibel and Frequency Monitoring:** The volume level of the speaker was set between fifty and eighty decibels (dB) which is considered safe and non-stressful for dogs. The frequencies were monitored with a frequency app during each intervention.
- **Response Indicators:** Non-Invasive biometric collars to record each dogs' responses to auditory stimuli (PetPace™ Smart collars) were placed on six dogs at a time, during the data collection phase of the study.
- **Software for Data Analysis:** Response patterns as biometric graphs for each dog were supplied with Tableau



Data Software. This provided a visual data platform which analysed pulse rates, Heart Rate Variability (HRV), activity level, posture and respiration rates. (Sample Chart)

Video Documentation: Video was taken throughout the six-week study, capturing visual observations of the twelve dogs' behavioural responses to the three interventions. The footage was compiled into a ten-minute documentary, which can be seen on YouTube. https://www.youtube.com/watch?v=L3lRE0ZeBf8

The combination of these monitoring tools allowed for comprehensive data collection on the auditory and physiological responses of the dogs. This multi-faceted approach provided checks and balances to support the accuracy and reliability of the study's findings, providing valuable insights into the relationship between kennel stress and hearing responses of the twelve dogs.

The Interventions
The biometric study was conducted in two, three week periods. The first group of dogs wore the PetPace™ Smart collars while resting and listening in their crates during each of the three interventions; No-music, Pet Acoustics music, and classical music. With the second group of dogs, the sequence of interventions was rearranged to minimise data bias. During the second testing, the original six dogs returned to wearing their regular collars, while the new group of six dogs wore the PetPace™ biometric collars.

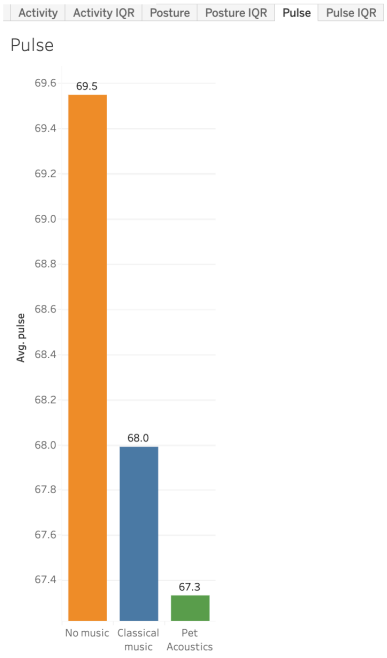
Data Collection

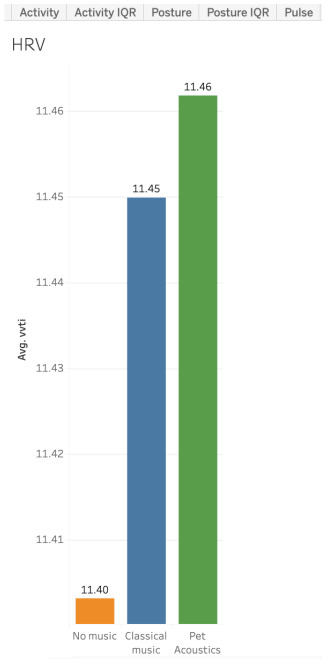
Data Analysis
Descriptive statistics were calculated and reported as aggregate data for a group of 12 dogs over six weeks.

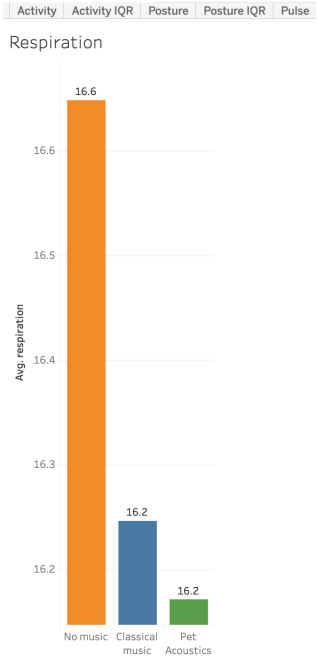
Results
For each biometric measure, overall trends and significant differences were analysed. A key finding revealed that the absence of music in the kennel led to significantly higher stress levels in all twelve dogs compared to when music was present. Among the music interventions, Pet Acoustics music was the most effective in calming the dogs, followed by classical music.

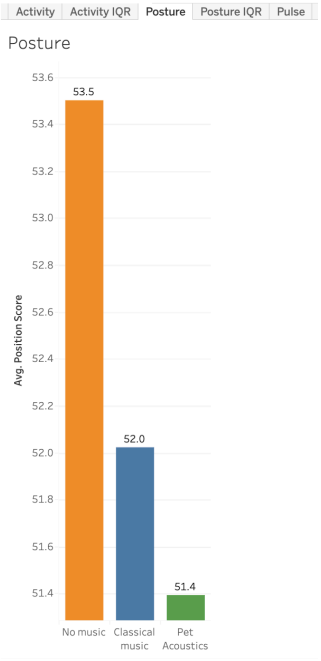
Discussion – What is learned from the study is that Pet Acoustics music offers a consistent, positive impact across all the biometrics tested. This supports canines in receiving a steady benefit that may contribute to long-term improvements in their welfare. While the immediate

Tool	Data Collected	Notes
PetPace Collar Data collected from each dog	Pulse, HRV, Posture, Activity, Respiration	Ensure data was collected every 2 to 5 minutes
Speaker Setup	Placed speaker in the center of Kennel	Music decibel and frequency levels monitored
Time Logs	Start and end times for each task	Start and end times for each task
Intervention Metrics	Week 1/6 No Music, Week 2/4 Pet Acoustics music, Week 3/5 classical music	Each intervention followed by three days of no testing to reset behaviour.









Pulse
A lowering of the pulse reflects a calmer state in a canine. The lowest average score for pulse in the Pet Acoustics condition was 67.3, with the classical music condition at 68.0, and the no music condition at 69.5.

HRV
An increase in HRV reflects a calmer state and less stress in a canine. The highest average score for HRV in the Pet Acoustics condition was 11.46, followed by the classical music condition at 11.45, and the no music condition at 11.40.

Respiration
A lowering of the respiratory rate reflects a calmer state in a canine. The lowest average respiratory score was seen in the Pet Acoustics condition was 16.0, followed by the classical music condition at 16.2, and the no music condition at 16.6.

Posture
A lowering of the posture score reflects a calmer state in a canine. The lowest average posture score was seen in the Pet Acoustics music condition at 51.4, followed by the classical music condition at 52.0, and the no music condition at 53.5.

improvements are modest, regular exposure to Pet Acoustics music could lead to significant long-term benefits in reducing chronic stress and improving overall health in canines. Inherent in the design of Pet Acoustics music are controlled volumes, tones and frequencies contoured for canine hearing comfort. When a frequency or volume creates pressure in a dog's ear, this triggers stress and agitation. Therefore, music that accommodates canine hearing sensitivities can provide measurable and repeatable calming results.

The highest stress data points occurred when no music was played in the kennel. This demonstrates that the absence of music can significantly increase stress in dogs, concluding that music is a valuable calming tool for kennel environments.

Classical music can have varying effects depending on the composition and the individual dog's response. The dynamics of the classical music was not controllable and the music was sometimes over ninety decibels and then below fifty decibels indicated on a decibel reader during the testing. Classical music inherently has a wide variety of sonorities and volume levels that create inconsistencies of sound levels. Instrument timbres and voice dynamics produced high frequencies that became pressure in some of the dog's ears which interrupted rest. It was observed that some dogs were standing and circling in their crate without resting during both classical music testing sessions.

Although classical music studies have been conducted on dogs in kennels and shelters and have shown calming benefits, this study marks the first instance where classical music is being compared to music specifically designed for canines, such as Pet Acoustics canine-designed music, revealing through biometrics, an advantage in reducing stress.

Conclusion

Intentional music and sound interventions are a powerful tool in supporting canine welfare. By reducing stress and anxiety, improving physiological health, and creating a more serene environment, music interventions can enhance the overall quality of life for dogs in kennels, shelters, and other care settings such as puppy training and general behavioural modification.

Using Music for Dogs in a Kennel Can Offer Several Benefits:

Reduced Stress and Anxiety: Calming music can help reduce stress and anxiety levels in dogs, which is especially beneficial in a kennel environment where dogs might feel unsettled due to unfamiliar surroundings and separation from their owners.

Improved Sleep Quality: Music can create a soothing environment that encourages dogs to relax and sleep more soundly. Better sleep contributes to overall well-being and health.

Behavioural Improvement: Playing calming music can help decrease barking, restlessness, and other anxious behaviours in a kennel. This can lead to a more peaceful and quieter nvironment for all the dogs.

Enhanced Recovery: For dogs recovering from surgery or illness, a calm environment facilitated by music can promote faster healing and recovery.

Easing Separation Anxiety: Music can provide comfort and a sense of familiarity, helping dogs cope with the absence of their owners and reducing separation anxiety.

Enrichment and Mental Stimulation: Different types of music can serve as a form of enrichment, providing mental stimulation and preventing boredom.

Improved Human-Dog Interaction: A calm and relaxed environment created by music can enhance interactions

between kennel staff and dogs, making handling and care easier and more pleasant.

About Pet Acoustics: Pet Acoustics is a global award-winning company that specialises in creating music specifically designed for animals. Recognising that animals have different auditory sensitivities compared to humans, Pet Acoustics tailors its products to meet these unique needs. The company's offerings include a range of music products designed to calm and soothe various types of pets, such as dogs, cats, horses, birds, rabbits, and small animals.

These products are often compatible with SD cards preloaded with specific types of calming music, ensuring that pets are exposed to sounds that are harmonious and non-threatening to their sensitive ears. Scientific studies and findings have supported the effectiveness of such music in reducing anxiety and promoting relaxation in pets for long-term health. (www.petacoustics.com)

The classical music intervention selections played in the study were: Johann Sebastian Bach – "Air on the G String" , Wolfgang Amadeus Mozart – "Piano Sonata No. 11 in A Major, K. 331, Frédéric Chopin – "Nocturne in E-flat Major, Ludwig van Beethoven – "Moonlight Sonata" Antonio Vivaldi – "The Four Seasons" (the slower movements) Franz Schubert – "Ave Maria" Debussy, La Plus Que Lente.

About Janet Marlow – Janet Marlow is an accomplished composer and researcher who is widely recognised for her pioneering work in the field of animal acoustics. She is the founder of Pet Acoustics, a company dedicated to creating music and sound products designed specifically for the auditory sensitivities of animals. Marlow's work focuses on understanding how sound affects the behaviour and well-being of pets, and she has developed specialised music to help reduce stress and anxiety in animals.

Her research has led to the creation of products such as Pet Tunes and Pet Tunes Pro which are tailored to the unique hearing ranges of different animals, including dogs, cats, horses, birds and rabbits. Marlow's innovative approach combines her extensive background in music with her passion for animal welfare, resulting in practical solutions that improve the quality of life for pets and their carers. Through Pet Acoustics, Janet Marlow continues to advance the understanding of how sound influences animal behaviour and health.

PetPace, Ltd. is a company that specialises in creating innovative solutions to improve pets' quality of life, health, and overall well-being. Founded by veterinarians, this company utilises machine learning algorithms to design a smart collar capable of monitoring pets' daily vitals and habits. The PetPace™ Smart collar 2.0 is a patented, non-invasive, collar equipped with an array of sensors and backed by sophisticated algorithms that can accurately monitor a range of animals' biometrics, including vital signs, behaviour, and location. Multiple non-invasive, all-passive sensors are incorporated inside each PetPace collar, including:

- Thermometers – for temperature detection
- Acoustic sensors – for pulse, HRV, and respiration acquisition
- 6-D accelerometers – for activity, calories, and posture calculation
- GPS – for location tracking (www.PetPace.com)

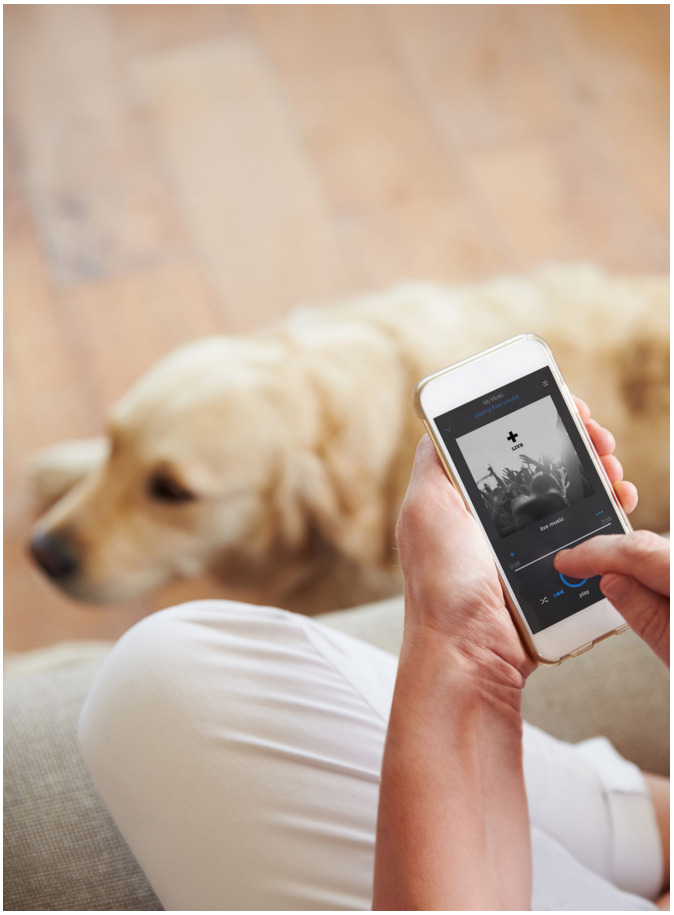
Educated Canines Assisting with Disabilities (E.C.A.D.) a nonprofit organisation, provides service dogs to individuals with disabilities to help them gain greater independence and mobility. Founded by Lu and Dale Picard, the organisation offers various programs tailored to different groups, including veterans, children with autism, and individuals residing in facilities like hospitals and nursing homes. E.C.A.D. trains these dogs to perform various tasks that aid in daily living, such as retrieving items, turning on lights, and providing physical support. (www.ecad1.org)

RESOURCES

1. Bowman, A., *et al.* (2015). "Four Seasons" in an animal rescue center; classical music reduces environmental stress in kennelled dogs. Physiology & Behavior.
2. Wells, D. (2002). Influence of various types of auditory stimulation, including classical music, on dogs in animal shelters. Belfast, Ireland.
3. Brayley, C., & Montrose, V. (2016). The effects of audiobooks on the behavior of dogs at a rehoming kennel. Applied Animal Behavior Science.
4. Bains, M., et al. (2017). Effect of different types of classical music played at a veterinary hospital on dog behavior and owner satisfaction. Journal of the American Veterinary Medical Association (JAVMA).
5. Bowman, A., et al. (2017). The effect of different genres of music on the stress levels of kennelled dogs. Physiology & Behavior.

REFERENCES

1. Blackwell, E. J., Bradshaw, J. W. S., & Casey, R. A. (2013). Fear responses to noises in domestic dogs: Prevalence, risk factors, and co-occurrence with other fear-related behavior. Applied Animal Behaviour Science, 145(1-2), 15-25.
2. Coppola, C. L., Grandin, T., & Enns, R. M. (2006). Human interaction and cortisol: Can human contact reduce stress for shelter dogs? Physiology & Behavior, 87(3), 537-541.
3. Kogan, L. R., Schoenfeld-Tacher, R., & Simon, A. A. (2012). Behavioral effects of auditory stimulation on kenneled dogs. Journal of Veterinary Behavior, 7(5), 268-275.



PET ACOUSTICS PUBLISHED STUDIES

1. Biometric Study Proves Pet Acoustics Canine-Specific Music Mitigates Stress Levels in dogs. (2022). International Animal Health Journal, 9(2).
2. Clinical Study Proves Benefits of Feline-Specific Music Through Biometric Data. (2021). International Animal Health Journal, 8(2).
3. Audiometric Study Reveals Patterns of Age-Related Hearing Loss in Dogs and Cats. (2024). International Animal Health Journal, 10(4).
4. Evaluation of the Behavioral and Productive Effect of Frequency-Modified Music in Piglets. (2022). International Animal Health Journal, 9(1).
5. Massage or Music Meant to be Relaxing, Results in Lowering Salivary Cortisol Concentration in Race Horses. (2021). International Animal Health Journal, 8(4).

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