

# Effect of different types of classical music played at a veterinary hospital on dog behavior and owner satisfaction

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## OBJECTIVE

To determine the effect of different types of classical music played during a veterinary visit on dog behavior and owner satisfaction.

## DESIGN

Prospective randomized controlled study.

## ANIMALS

74 dogs examined at a veterinary teaching hospital.

## PROCEDURES

Dogs examined for a wellness visit, presurgical health evaluation, or non-urgent illness were exposed to 1 of 3 treatments (modified classical music, the same music in its original format, and no music [control]) while in the examination room. Owners completed a standardized survey regarding the dog's behavior and their satisfaction with the visit. Clinicians completed a separate standardized survey regarding the dog's behavior. Information regarding monetary charges, procedures performed, diagnoses, and physiologic variables was obtained from the electronic medical record after the appointment.

## RESULTS

Owners rated their dog's anxiety level in the waiting room greater than that in the examination room regardless of treatment. Mean anxiety and aggression scores of dogs during the physical examination as rated by owners were significantly greater than those assigned by clinicians. Visit satisfaction for owners exposed to original classical music was significantly greater than that for owners not exposed to music.

## CONCLUSIONS AND CLINICAL RELEVANCE

Results suggested placing a pet and its owner into an examination room instead of a waiting room immediately after clinic arrival may ameliorate pet anxiety during the veterinary visit. Playing classical music at a low volume can be a simple and cost-effective way to improve owner satisfaction with the veterinary visit. Further research is necessary to determine the effects of music on pet anxiety. (*J Am Vet Med Assoc* 2017;251:195–200)

Visiting a veterinary office can be a stressful event for animals, and efforts are underway to educate veterinary staff on how to help ameliorate the negative effects of a veterinary visit on pets.<sup>1</sup> Research indicates dogs develop measurable amounts of anxiety during veterinary visits<sup>2</sup>; thus, decreasing the stress level of pets during veterinary examinations is important. Music can reduce stress in both animals and people. Unfortunately, for pets, it is difficult to discern whether that decrease in stress is a direct effect of the music or simply an extension of the pet picking up on the calming effect of the music on its owner. Music appears to have many positive effects on reducing anxiety and stress in children and adults

before and after procedures in medical settings and can influence how people feel.<sup>3–5</sup> Results of multiple studies<sup>6–11</sup> suggest that music can decrease the expression of stress-related behaviors in animals. Dogs spend less time barking and more time resting when exposed to classical music.<sup>6,7</sup> Cows voluntarily enter a shed for automated milking when music is played.<sup>8</sup> Chickens have a better rate of weight gain when exposed to classical music.<sup>9</sup> Researchers of another study<sup>10</sup> concluded that pigeons can discriminate between complex classical music compositions and generalize novel songs to categories, similar to how humans categorize the same novel excerpts.

To our knowledge, the effect of music, in terms of varying the number of beats per minute, on the physiologic response of dogs has not been researched; however, human physiologic responses mirror the tempo and rhythm of music. In humans, fairly slow music tempos of approximately 60 beats/min, similar

## ABBREVIATIONS

CD Compact disc  
TADE Through a Dog's Ear

to the heart beat, elicit relaxing effects and decrease anxiety as well as heart rate and respiration rate.<sup>12-15</sup> Music played at < 65 decibels also induces physiologic changes indicative of relaxation and a decrease in stress in humans<sup>12</sup> and may have similar effects on animals. Compared with fast-tempo music, music with slower tempos is more efficacious in decreasing aggression in chimpanzees.<sup>16</sup> On the basis of research that indicates positive effects of music on humans, designer music was created with the specific aim to enhance relaxation of animals,<sup>17</sup> and several music CDs with modified classical music compositions that emphasize simplified complexity, slow tempos, and low tones have been developed to reduce stress in companion animals.<sup>18</sup>

Scientific research on the validity and efficacy of acoustic products designed for behavior modification of companion animals is limited. In shelter dogs, classical music induced more relaxed and desirable behaviors than heavy metal rock and pop music, human conversation, or no music.<sup>6,7</sup> Cats exposed to classical music while anesthetized for ovariohysterectomy had significantly lower heart rates and smaller pupillary diameters, compared with cats exposed to other types of music.<sup>19</sup> Although music developed to decrease stress and anxiety in dogs is commercially available and marketed to dog owners,<sup>19</sup> research has not been conducted to determine the effects that music has on anesthetized dogs or awake dogs and cats in a veterinary hospital setting.

Music decreases the anxiety of parents associated with medical care of their children<sup>20</sup> and may have a similar effect on pet owners during veterinary appointments, which could translate into an increase in owner satisfaction with the veterinary experience. The positive effect of music on pet owners may also indirectly influence their pets, or vice versa, through the bond they have with their pet. In dogs undergoing venipuncture, positive human interaction decreases resting plasma cortisol concentrations, indicating a low stress level.<sup>21</sup>

The aims of the study reported here were to determine the effects of 2 specific types of classical music on the behavior of dogs in a veterinary examination room and assess the effect of that music, or lack thereof, on owner satisfaction with the veterinary appointment. Our hypotheses were that the frequency of stress-related behaviors in the veterinary examination room would be similar between dogs exposed to modified classical music compositions and dogs exposed to the original classical music compositions and between dogs exposed to either type of music and dogs exposed to no music, and that owner satisfaction with the appointment would be greater for dog owners exposed to music in the examination room than owners not exposed to music in the examination room.

## Materials and Methods

### Animals

All animal-related procedures were reviewed and approved by the University of California-Davis Insti-

tutional Animal Care and Use Committee, and the surveys administered to dog owners and clinicians were reviewed and approved by the University of California-Davis Institutional Review Board. All dogs with an appointment scheduled with the Community Practice Service at the University of California-Davis School of Veterinary Medicine Veterinary Medical Teaching Hospital between July 2 and August 11, 2012, were evaluated for study eligibility. Dogs that were accompanied by their primary caregiver and examined by a veterinary student and veterinarian for a wellness visit, presurgical health evaluation, or nonurgent illness evaluation were eligible for study enrollment. Dogs that were not accompanied by their primary caregiver, were specifically scheduled for euthanasia or examined for emergency care, or were examined by a veterinary technician only (ie, were not evaluated by a veterinary student and veterinarian) were excluded from the study. Dogs potentially eligible for study enrollment were selected from the hospital's computer database the evening prior to the scheduled appointment, and the owner and clinician surveys, each affixed with a unique sticker with patient-identifying information, were inserted into the medical record.

### Study design

Each of 3 examination rooms had a CD player placed on the top of the cabinets (approx 2 m [6.5 feet] above the floor). During a pilot phase, clinicians were asked to adjust the volume of the CD player to an acceptable level at which they could adequately auscultate the thorax of the patient and have an undisturbed conversation with the owner. Once determined, that decibel level was kept the same in all 3 rooms by taping the volume control dial of each CD player so that it could not be adjusted. The volume level was measured by placing a decibel reader on the examination table in each room and ranged from 43 to 73 decibels for the entire duration of the CD depending on the song. Each room was assigned to 1 of 3 conditions, or treatments (modified classical music<sup>a</sup> [TADE], unmodified classical music [original], or no music [control]). The assigned treatment was rotated among the 3 rooms on a weekly basis.

The CD used for the TADE treatment and the CD used for the original treatment contained the same songs in the same order. The songs (in track order) and composers were as follows: Sonata in A D.959 Andantino by Schubert, Scherzo in E op. 54 by Chopin, Prelude in C WTC Bk. 1 No. 1 by Bach, Winter Largo by Vivaldi, Sonata Op. 53 "Waldstein" Adagio molto by Beethoven, Waltz in A flat by Brahms, Sonata in B flat minor by Chopin, Sonata in A No. 11 K. 331 1st movement *Andante grazioso*-theme and 6 variations by Mozart, and Vocalize by Rachmaninoff. The CD player was turned on every morning before patient appointments began, and the CD was played in the same order on a repeated loop.

## Data collection

For each selected dog after the initial history was obtained and a physical examination was completed by a senior veterinary student on the Community Practice Service rotation, the student was to hand the owner a consent form that included an explanation of the study. Not all owners were handed a survey. Owners were assured that all data collected would remain confidential, and those that were willing to participate in the study signed the consent form.

Each owner who agreed to participate in the study was then provided a paper survey that consisted of standardized open- and closed-ended questions. The survey questions were designed to collect information regarding the dog's demographic information, owner's assessment of the dog's behavior while in the waiting room and examination room before and during the physical examination, and owner's level of satisfaction with the visit. Responses for the questions on the owner's assessment of the dog's behavior and level of satisfaction with the visit were rated on Likert scales. Ratings for the dog's anxiety and aggression levels ranged from 0 to 5, where 0 = no visible signs of fear or aggression and 5 = extremely fearful (hiding and cowering) or aggressive (snapping, attempting to bite, or biting). Owners were not provided with any additional instruction on how to rate their pets' behavior. Ratings for owner satisfaction with the visit ranged from 1 to 5, where 1 = extremely dissatisfied and 5 = extremely satisfied.

At the end of the appointment for each dog enrolled in the study, the attending clinician completed a separate standardized survey. The survey included questions regarding whether the dog was muzzled and the clinician's assessment of the dog's anxiety and aggression levels. Clinicians rated the anxiety and aggression of each dog by use of the same Likert scales used by owners. After the appointment, additional information collected from the completed electronic medical record included total monetary charges, procedures performed, and diagnoses, as well as the heart rate, respiratory rate, and body temperature recorded during the physical examination.

## Statistical analysis

Statistical analyses were performed with a computerized statistical software program.<sup>b</sup> Nonparametric Kruskal-Wallis and Wilcoxon signed rank tests were used to compare the behavioral scores of dogs among the 3 treatments and between owners and clinicians. The Fisher exact test was used to evaluate muzzle use among the 3 treatments. All tests were 2-tailed, and values of  $P < 0.05$  were considered significant.

## Results

### Dogs

Over an 11-week period, study surveys were placed in the medical records of 207 dogs identified

as potentially eligible for study participation, and the owners of 109 (53%) of those dogs consented to participate in the study and completed the survey. Of the 109 dogs with completed owner surveys, 74 (68%) met the criteria for study inclusion. Twenty-one, 23, and 30 dogs were exposed to the TADE, original, and control treatments, respectively. The dogs were evaluated by 3 attending clinicians. Clinician 1 evaluated 29 patients, clinician 2 evaluated 32 patients, and clinician 3 evaluated 13 patients. None of the measured outcomes differed significantly among attending clinicians or examination rooms, so the data were compiled.

### Effect of music on behavior and physiologic variables of dogs

On the basis of owners' responses, dogs were significantly ( $P = 0.04$ ) less anxious while in the examination room prior to the physical examination than in the waiting room. Owners' ratings of their dogs' anxiety and aggression before and during the physical examination did not differ significantly among the 3 treatments.

The mean anxiety level of dogs during the physical examination when rated by owners was significantly ( $P < 0.001$ ) greater than that rated by the clinicians (**Table 1**). The mean levels of anxiety and aggression during physical examination as rated by the clinicians did not differ significantly between the dogs exposed to the TADE treatment and those exposed to the original treatment; therefore, those data were combined (ie, music treatments) for comparison with those for dogs exposed to the control (no music) treatment. The mean levels of aggression ( $P = 0.236$ ) and anxiety ( $P = 0.598$ ) during the physical examination as rated by the clinicians for dogs exposed to the music treatments did not differ significantly from those for the dogs exposed to the control treatment.

Only 3 dogs were muzzled during the study. The likelihood that a dog was muzzled did not differ significantly on the basis of type (TADE or original) of music to which it was exposed or whether it was or was not exposed to music.

The mean  $\pm$  SD body temperature for dogs that were exposed to the music treatments ( $38.5 \pm 0.95^\circ\text{C}$  [ $101.3 \pm 1.7^\circ\text{F}$ ]) did not differ significantly from that for dogs exposed to the control treatment ( $38.6 \pm 0.95^\circ\text{C}$  [ $101.5 \pm 1.7^\circ\text{F}$ ]). Similarly, the mean  $\pm$  SD heart rate for dogs that were exposed to the music treatments ( $115 \pm 28$  beats/min) did not differ significantly from that for dogs exposed to the control treatment ( $113 \pm 27$  beats/min).

### Effect of music on owner satisfaction

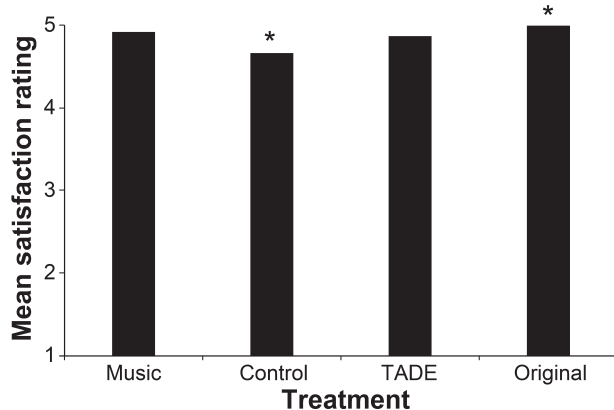
Mean ratings for owner satisfaction with communication with veterinary students or clinicians, waiting room atmosphere, and examination room atmosphere did not differ significantly among the 3 treatments. Similarly, for the subset of dogs ( $n = 47$ ) that had been previously examined at the vet-

**Table 1**—Summary statistics for the levels of anxiety and aggression for 74 dogs while they were in a waiting room and before and during the physical examination when exposed to classical music (music treatment; n = 44) or no music (control treatment; 30) as rated by the owner and attending clinician.

Variable	Rater	Music treatment		Control treatment		All dogs	
		Mean ± SD	Median (range)	Mean ± SD	Median (range)	Mean ± SD	Median (range)
Anxiety in waiting room	Owner	1.89 ± 1.51	2 (0–4)	1.72 ± 1.36	1 (0–4)	1.82 ± 1.45	2 (0–4)
Aggression in waiting room	Owner	0.24 ± 0.68	0 (0–3)	0.52 ± 1.12	0 (0–4)	3.35 ± 0.88	0 (0–4)
Anxiety before examination	Owner	1.42 ± 1.49	1 (0–5)	1.41 ± 1.18	1 (0–4)	1.41 ± 1.37*	1 (0–5)
Aggression before examination	Owner	0.21 ± 0.70	0 (0–3)	0.31 ± 0.76	0 (0–3)	0.25 ± 0.72	0 (0–3)
Anxiety during examination	Owner	2.03 ± 1.54	2 (0–5)	2.07 ± 1.24	2 (0–4)	2.0 ± 1.4	2 (0–5)
	Clinician	1.38 ± 1.53	1 (0–5)	1.11 ± 1.29	1 (0–4)	1.28 ± 1.4†	1 (0–5)
Aggression during examination	Owner	0.47 ± 1.11	0 (0–3)	0.24 ± 0.74	0 (0–3)	0.38 ± 0.98	1 (0–5)
	Clinician	0.21 ± 0.73	0 (0–4)	0.87 ± 1.69	0 (0–5)	0.42 ± 1.21	0 (0–5)

All dogs were examined by the Community Practice Service of the University of California-Davis School of Veterinary Medicine Veterinary Teaching Hospital between July 2 and August 11, 2012, for a routine wellness visit, presurgical health evaluation, or nonurgent illness evaluation by 1 of 3 clinicians. The ratings did not differ significantly among the 3 clinicians, so the data were compiled. Each dog was exposed to 1 of 3 treatments (modified classical music [TADE], unmodified classical music [original], or no music [control]) while in the examination room. Each treatment was assigned to 1 of 3 examination rooms, and the assigned treatment was rotated among the 3 rooms on a weekly basis. Both the owners and clinicians evaluated the level of a dog's anxiety and aggression on the same Likert scale that ranged from 0 to 5, where 0 = no visible signs of fear or aggression and 5 = extremely fearful (hiding and cowering) or aggressive (snapping, attempting to bite, or biting).

\*Value differs significantly ( $P = 0.04$ ) from the value for anxiety in the waiting room. †Value differs significantly ( $P < 0.001$ ) from the corresponding value provided by the owner.



**Figure 1**—Mean satisfaction rating regarding time spent waiting in a veterinary examination room as reported by the owners of 74 dogs that were exposed to 1 of 3 treatments (modified classical music [TADE; n = 21], unmodified classical music [original; 23], or no music [control; 30]) while in the examination room. The music treatment represents compiled data for the TADE and original treatments. Owners rated their satisfaction on a scale of 1 to 5, where 1 = extremely dissatisfied and 5 = extremely satisfied. \*Means differ significantly ( $P = 0.002$ ) from each other.

erinary teaching hospital, owners' ratings regarding their pets' comfort and behavior between the previous visit and current visit did not differ significantly among the 3 treatments. The mean total monetary charges did not differ significantly among the 3 treatments. However, the mean satisfaction rating for time spent waiting during the veterinary visit for owners exposed to the original treatment was significantly

( $P = 0.002$ ) greater than that for owners exposed to the control treatment (**Figure 1**). Although clinician satisfaction with the visit was not evaluated statistically, all 3 clinicians remarked that they enjoyed music playing in the examination rooms.

## Discussion

Results of the present study indicated that the playing of classical music in veterinary examination rooms had some positive effects on both dogs and their owners. Satisfaction with time spent in the examination room was greatest for owners who were exposed to unmodified classical music. Also, owners rated the anxiety level for their dogs as less when they were in the examination room where most were exposed to music, compared with when they were in the waiting room and were not exposed to music.

Music has the potential to benefit both humans and animals when played in a veterinary setting.<sup>13–15,22</sup> All 3 clinicians stated they enjoyed the classical music played in the examination rooms during the study, which suggested that classical music in a hospital setting may improve work satisfaction and have other stress-reducing benefits. Similarly, owners exposed to classical music reported higher satisfaction with the veterinary visit, compared with owners who were not exposed to music. That finding may indicate that listening to music was soothing or distracting for owners while they waited, leading them to perceive that their wait time was shorter than it actually was.<sup>22</sup>

None of the dog behavior or physiologic outcomes measured in the present study differed significantly between dogs exposed to the modified classi-

cal music (TADE treatment) and dogs exposed to the unmodified classical music (original treatment). The songs selected may have originally had slow tempos, and the modification made for the TADE treatment did not create a substantial variation from the tempo of the original version. Further research is necessary to elucidate the effect of music tempo on the behavior and stress of pets in veterinary settings.

The medical records for the 3 dogs that were muzzled in the present study did not contain any documentation as to whether those patients had been muzzled during previous visits, why they were muzzled, or the type of muzzle used. Ideally, for veterinary patients that require special restraint, clinicians should record in the medical record what type of restraint was or was not beneficial and, for those that were muzzled, what type of muzzle was best tolerated by the patient.

The dog owners surveyed in the present study rated anxiety and aggression levels for their pets lowest while they were waiting in the examination room prior to the physical examination, which suggested that time spent in the examination room was less stressful for dogs than time spent in the waiting room. This may have been a response to the music played in the examination rooms or the patient being removed from a potentially busy waiting room and acclimating to the hospital environment.

Although owners exposed to classical music were generally more satisfied with their time spent waiting in the examination room than owners who were not exposed to music, satisfaction with the atmosphere or comfort of the examination room did not differ significantly between owners who were and were not exposed to music. Owner ratings of the examination room atmosphere may have been affected by the motor of the CD player clicking, which was audible during the quieter portions of the CD. Ideally, the songs on the CD should have been equalized such that the volume was similar for all songs with a fairly narrow range from minimum to maximum volume. Also, the 3 clinicians recognized the song commonly known as Mozart's Funeral March being played and expressed concerns that it might potentially elicit a negative response in owners. Conscious or unconscious negative associations or an emotional response to the music may have influenced owners' ratings. Nevertheless, all 3 clinicians remarked that they enjoyed the music playing in the examination rooms, which suggested that the playing of classical music in a veterinary clinic may make for a more pleasant work environment.

The present study was not without limitations. Video recording of the dogs while in the examination rooms would have provided more discrete data, which we could have used to directly and objectively score behavior. This was attempted but unfortunately had to be discontinued because of technical difficulties. Physiologic measurements, had they been acquired by a standardized method at a standardized time during the appointment, might have also provided more

objective data for comparison among the treatments. Measurement of cortisol concentrations, although fraught with issues, may also have provided more objective data for comparison of stress levels among dogs exposed to the 3 treatments. The rating scales used by the owners and clinicians to assess dog behavior were limited in that they were subjective and respondents were not provided with uniform or clear guidance in their use, although we tried to minimize those limitations by the inclusion of a control treatment. Finally, the study population may have been too small to provide the power necessary to detect significant differences among treatments in some categories. Additional research with a larger study population than that of the present study is necessary to identify other potential positive effects of music on dog behavior and owner satisfaction in a veterinary setting.

In the present study, dog owners who were exposed to classical music while in an examination room were more satisfied with the time spent waiting than dog owners who were not exposed to music while in an examination room. On the basis of subjective ratings by the owners, dogs were less anxious in the examination room than in the waiting room. Thus, placing a pet and its owner directly into an examination room instead of a waiting room immediately after check-in at the reception desk may help ameliorate pet anxiety during the veterinary visit. Also, playing classical music at a low volume that does not interfere with the physical examination or conversation between the veterinarian and pet owner can be a simple and cost-effective way to improve overall pet owner satisfaction with the veterinary visit and make the clinic or hospital a more pleasant workplace for veterinary staff. Further research is necessary to determine the effects of music on the anxiety level of pets, including cats, in a veterinary setting.

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The authors declare that there were no conflicts of interest.

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## Footnotes

- a. Through a Dog's Ear, BioAcoustic Research & Development, Half Moon Bay, Calif.
- b. STATA, version 13.1, StataCorp, College Station, Tex.

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## From this month's AJVR

### Cardiac output measured by use of electrocardiogram-gated 64-slice multidetector computed tomography, echocardiography, and thermodilution in healthy dogs

Nicole L. LeBlanc et al

#### OBJECTIVE

To evaluate the accuracy of cardiac output (CO) estimated by use of ECG-gated multidetector CT (MDCT) and 1-, 2-, and 3-D echocardiography and by use of thermodilution.

#### ANIMALS

6 healthy hound-cross dogs.

#### PROCEDURES

ECG-gated contrast-enhanced 64-slice MDCT and 1-, 2-, and 3-D echocardiography were performed on each dog. The CO for ECG-gated MDCT was calculated as volumetric measurements of stroke volume multiplied by mean heart rate. Echocardiographic left ventricle end-diastolic volumes and end-systolic volumes were measured by use of the Teichholz method (1-D echocardiography) and a single-plane method of disks (2-D echocardiography). Real-time 3-D echocardiographic left ventricle volumes were measured with 3-D functional analysis software on right long-axis and left apical views. The CO of each dog was measured in triplicate by use of thermodilution. Mean CO values, correlations, and limits of agreement for MDCT, echocardiographic modalities, and thermodilution were compared.

#### RESULTS

CO measured by use of MDCT, 2-D echocardiography, and 3-D echocardiography had the strongest correlations with CO measured by use of thermodilution. No significant difference in CO was detected between MDCT, any echocardiographic method, and thermodilution. Bland-Altman analysis revealed a systematic underestimation of CO derived by use of MDCT, 2-D echocardiography, and 3-D echocardiography.

#### CONCLUSIONS AND CLINICAL RELEVANCE

Use of MDCT, 2-D echocardiography, and 3-D echocardiography to measure CO in healthy dogs was feasible. Measures of CO determined by use of 3-D echocardiography on the right long-axis view were strongly correlated with CO determined by use of thermodilution, with little variance and slight underestimation. (*Am J Vet Res* 2017;78:818-827)



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