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Music's Effect on Dogs' Heart Rates

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Summary

The goal of this project was to determine the effect of different types of music on a dog's heart rate. Six different dogs were tested in their own homes. Each experiment was performed in a quiet room with the dog's owner present along with the two scientists performing the testing. Five different types of music were used in the experiment. Using a stethoscope, we measured the resting heart rate prior to testing and again immediately following the test. A five-minute break was taken between each test, and two trials were completed for each test conducted. The result was a statistically significant difference in heart rate for rock and rap music (increase) and for jazz music (decrease). A caveat to this study was the relatively small number of dogs tested (six); therefore, future research with a larger sample size should be conducted to confirm these results. This information could help calm dogs in potentially stressful situations, such as the veterinary office or when traveling.

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Introduction

The purpose of this project was to observe the influence of music on a dog's heart rate. Previous research has been done on the effects of music on human behavior, including the effect of music on heart rate (1). Additionally, studies have been completed that researched the effect of different types of music on the behaviors of dogs, including research by Kogan, Schoenfeld-Tacher, and Simon (2) and that of Sills and Todd (3). Because music has been found to affect human behaviors and heart rates, this research aimed to determine the impact of music on the heart rate of dogs. We expected to see a lower heart rate when classical music was played and an increase in heart rate when rock and rap were played.

Previous studies by Kogan et al. showed that various types of music can have an effect on dogs. Their experiment focused on the dogs' behaviors when exposed to varying types of music, including whether or not the body of the dog shook in the presence of music, if the dog barked, and whether the dog was asleep or moving around. The results showed that classical music calmed the dogs down and made them bark less and sleep more. Heavy metal music agitated the dogs and caused them to exhibit anxious behaviors. Contrary to both classical and rock music, pop music did not exhibit any reaction from the dogs. These results had therapeutic implications for the treatment of distressed or ill dogs (2).

Another study by David Sills and Amber Todd was conducted in which the heart rate of humans was measured in response to music that was being played. A group of twenty-four students was tested with six different kinds of music. The subjects' heart rates were recorded before and after the music was played. Results showed that classical music lowered the students' heart rates and rock increased their heart rates. Results varied with all the other types of music (3).

Since previous work has indicated that music can affect a human's heart rate and that music can affect the behavior of dogs, we were interested in combining these ideas to see if the music would have an effect on

Dog	5-min. rest bpm	Classical bpm	5-min. rest bpm	Rock bpm	5-min. rest bpm	Country bpm	5-min. rest bpm	Rap bpm	5-min. rest bpm	Jazz bpm
1	T1 60 T2 60	T1 60 T2 60	T1 80 T2 60	T1 100 T2 100	T1 70 T2 70	T1 70 T2 60	T1 70 T2 60	T1 90 T2 90	T1 70 T2 70	T1 70 T2 70
2	T1 140 T2 130	T1 160 T2 140	T1 160 T2 140	T1 180 T2 160	T1 180 T2 160	T1 170 T2 160	T1 160 T2 160	T1 160 T2 160	T1 150 T2 150	T1 130 T2 150
3	T1 130 T2 120	T1 120 T2 120	T1 120 T2 120	T1 120 T2 130	T1 140 T2 140	T1 110 T2 120	T1 110 T2 110	T1 130 T2 130	T1 120 T2 120	T1 110 T2 110
4	T1 120 T2 120	T1 120 T2 120	T1 110 T1 110	T1 130 T2 130	T1 110 T2 110	T1 90 T2 90	T1 100 T2 100	T1 130 T2 130	T1 90 T2 90	T1 85 T2 85
5	T1 100 T2 100	T1 90 T2 90	T1 100 T2 90	T1 110 T2 110	T1 100 T2 100	T1 100 T2 100	T1 90 T2 90	T1 100 T2 100	T1 100 T2 100	T1 90 T2 90
6	T1 130 T2 120	T1 110 T2 100	T1 120 T2 100	T1 120 T2 110	T1 100 T2 110	T1 130 T2 130	T1 120 T2 120	T1 130 T2 130	T1 130 T2 120	T1 125 T2 120

Table 1. Music's Effect on a Dog's Heart Rate. Beats per minute (bpm) for trial 1 (T1) and trial (T2) for each dog. Types of music and resting periods indicated at the top. Dog 1: 8-yr-old, female (F) black labrador retriever; Dog 2: 10-yr-old, F golden doodle. Dog 3 10-yr-old, F labradoodle. Dog 4: 1-yr-old, F golden lab. Dog 5: 4-yr-old, male (M) golden retriever. Dog 6: 9-yr-old, M German short-haired pointer.

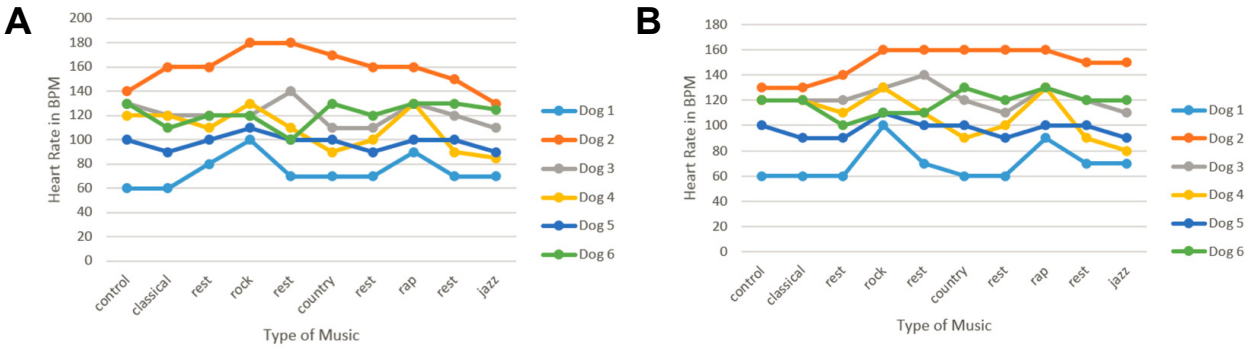

Figure 1. The Effects of Music on Canine Heart Rate. The heart rate of six dogs was measured before and after different types of music were played. Data is displayed as heart rate in beats per minute (BPM). Two trials were performed: A) In Trial 1, the types of music were played in the order listed; B) In Trial 2, the order of the different types of music was rearranged.

the heart rate of dogs that could be quantified rather than simply observed qualitatively as in the Kogan study (2). To investigate this, we chose five types of music: classical, jazz, country, rock, and rap. During each trial, a resting heart rate was taken, then each type of music was played with a rest period between types. The classical music was selected because of its slow tempo and more subtle and quiet sound. The country and jazz music had a medium tempo. The rock and rap music had fast and intense beats that were intended to be exhilarating and disruptive. The tempos for each song were as follows: 52 bpm (beats per minute) for classical, 95 bpm for country, 109 bpm for jazz, 133 bpm for rock, and 92 bpm for rap. The heart rates of six different dogs were measured with a stethoscope after a five-minute resting phase and then immediately after listening to the music. Based on the previous findings, we hypothesized that the music would have an effect on the dogs' hearts rates, and predicted that classical music would calm the dogs and slow their heart rates, while rock and rap would cause stress and increase their heart rates.

The results of our study show that jazz music lowered the average heart rate of the dogs while rock and rap music increased the average heart rate. This information could be used to help create a calm atmosphere for dogs in stressful situations.

Results

Table 1 displays the results from trial one (T1) and trial two (T2), the breed of the dog, the age of the dog, and the gender of the dog. The type of dog, its age and sex, and the heart rate in beats per minute (bpm) were recorded for each test. Prior to testing, the dog's resting heart rate was taken using a stethoscope to serve as a control. The first type of music was played for 30 seconds, and then the dog's heart rate was taken immediately afterwards. There was a five-minute resting period between each type of music. Two trials were conducted on each dog and the order of music was rearranged between the two trials. In order to ensure the direct effect of each type of music, each dog's resting heart rate was taken after a five-minute wait period between each type of music. These resting-period beat-per-minute counts were used as the control for the type of music immediately following the resting period. It is notable that these resting heart rates fluctuated somewhat during each trial, verifying that a new control should be measured before each type of music is tested.

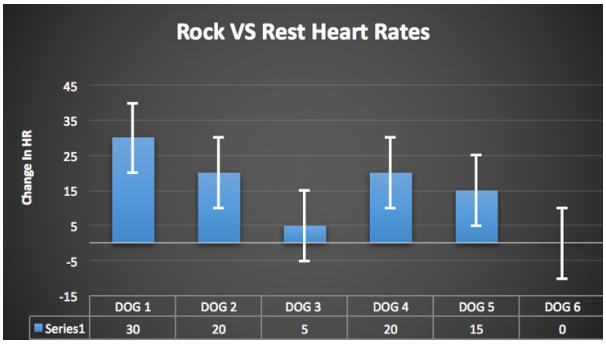

Figure 2. Rock music versus resting heart rates. Resting heart rate and heart rate while listening to rock music were compared. The graph represents the average difference from two trials and bars represent the standard deviation. An independent t-test was performed. The resulting t-value of 3.343102 and p-value of 0.020238 suggest that there was an increase between the average pre-listening heart rate and the average post-listening heart rate.

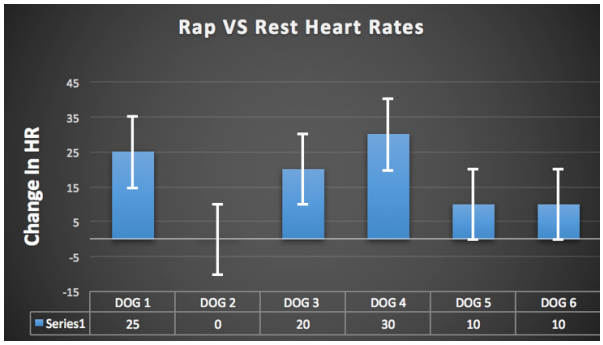

Figure 3. Rap music versus resting heart rates. Resting heart rate and heart rate while listening to rap music were compared. The graph represents the average difference from two trials and bars represent the standard deviation. An independent t-test was performed. The resulting t-value of 3.480531 and p-value of 0.017649 suggest that there was an increase between the average pre-listening heart rate and the average post-listening heart rate.

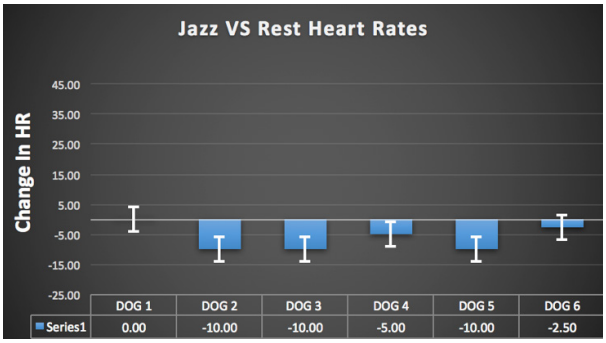

Figure 4. Jazz music versus resting heart rates. Resting heart rate and heart rate while listening to jazz music were compared. The graph represents the average difference from two trials and bars represent the standard deviation. An independent t-test was performed. The resulting t-value of 3.478042 and p-value of 0.017696 suggest that there was a decrease between the average pre-listening heart rate and the average post-listening heart rate.

Figure 1 illustrates the fluctuating heart rates of the six different dogs tested. Not only can the changes in heart rate of an individual be observed, but also the heart rate of one dog compared to another can be easily studied. An increased heart rate when listening to rock music was observed during both trials for Dogs 1, 2, 4, and 5. An increased heart rate when listening to rap music was observed during both trials in Dogs 1 and 4. A decreased heart rate was found in trial 1 with jazz music for Dogs 2, 3, 4, 5, 6 and in trial 2 for Dogs 3 and 4. In trial 1 the classical music decreased the heart rate for Dogs 3, 5, and 6 and in trial 2 the heart rate was decreased in Dogs 1, 2, and 5. Country music showed no trend in either trial.

Figures 2 -6 show average change in heart rate from the resting heart rate for each type of music tested. Both rock and rap music demonstrated a statistically significant increase in the average heart rate (**Figures 2 and 3**). Jazz music significantly decreased heart rate (**Figure 4**). Neither country music nor classical music significantly changed heart rate (**Figures 5 and 6**).

Discussion

The goal of this project was to determine the effect that different types of music have on a dog's heart rate. Previous research on the effects of music on canine behavior showed that classical music calmed the dogs down, heavy metal music made them agitated, and pop music did not exhibit any reaction (2). This supports the hypothesis that different types of music will have an influence on canine heart rate.

We expected to see a lower heart rate when classical music was played and an increase in heart rate when rock and rap were played. The results of this experiment appear to support the hypothesis regarding the effect of rock and rap music; however, the hypothesis that classical music would reduce heart rate was not supported. In their study, Kogan et al. used slightly different tempos than the tempos played in this experiment. Kogan et al. used a classical piece with the average tempo of 121 bpm, a heavy metal song with the average tempo of 131 bpm and a pop song with the average tempo of 95 bpm. In this study, the classical piece had a tempo of 52 bpm and the heavy metal song had a tempo of 133 bpm. The classical song that was played during this experiment had a tempo of 52 bpm which is significantly lower than the average tempo of the classical songs played by Kogan et al. This difference could explain why there was not a decrease in heart rate by the dogs in response to the classical music in this experiment, but there was a change in behavior (becoming more relaxed) in the Kogan experiment. The average tempo of the rock music that Kogan et al. used was 131 bpm while the one used in this experiment was 133 bpm. These tempos are only 2 beats different from one another which could explain why the results in this experiment matches those in Kogan's. Every dog exhibited a heart rate increase from the prior resting period when exposed to rock music and the increase was enough to be statistically significant. Every dog but Dog 2 exhibited an increase in heart rate when exposed to rap music, and even with no change in Dog 2, the average overall increase was enough to be statistically significant. When exposed to

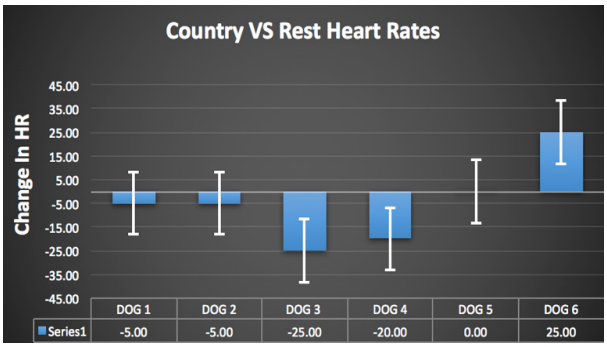

Figure 5. Country music versus resting heart rates. Resting heart rate and heart rate while listening to country music were compared. The graph represents the average difference from two trials and bars represent the standard deviation. An independent t-test was performed. The resulting t-value of 0.695608 and p-value of 0.517672 suggest that the country music did not affect the heart rate average.

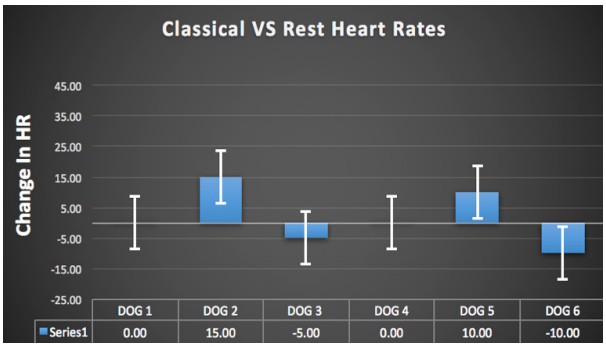

Figure 6. Classical music versus resting heart rates. Resting heart rate and heart rate while listening to classical music were compared. The graph represents the average difference from two trials and bars represent the standard deviation. An independent t-test was performed. The resulting t-value of 0.438529 and p-value of 0.679303 suggest that the classical music did not affect the heart rate average.

jazz music, every dog exhibited a decrease in heart rate except for Dog 1, and even with no change in Dog 1, the average overall decrease was enough to be statistically significant. Neither the classical music nor the country music resulted in a statistically significant average heart rate change in this data set. The classical music affected the dogs differently, with an average decreased heart rate for Dogs 3, 5, and 6, an average increased heart rate for Dog 2, and no change for Dogs 1 and 4. The country music also affected the dogs differently, resulting in an average increased heart rate in Dog 6, and average decreased heart rate in Dogs 1, 2, 3, and 4, and no change in Dog 5.

It is interesting to note that the resulting average effect of the rock and rap music corresponds with the results of the Kogan study, suggesting a possible relationship between dog behavior and heart rate. Surprisingly, the classical music did not result in a consistent effect, but instead, the jazz music appeared to slow the dogs' average heart rate.

A caveat to this study is that only six dogs could be tested. For more definitive results, the number should be increased with stricter controls during the tests such as ensuring that the physical environment of the testing conditions is consistent, using a common breed of dog, and selecting dogs of similar age. Each dog was tested in its own home; however, each house is different and has unique characteristics. Out of the six different dogs, there were four different breeds tested and the ages ranged from one to ten years old. These are factors that could have influenced the dogs' dispositions; therefore, these inconsistencies would need to be eliminated in order for the results to be more accurate. Also, the dogs' reactions to the stethoscope could have differed depending on their previous experiences with veterinarians or groomers. Finally, the type of music the dog was most frequently exposed to outside of this study on an everyday basis could potentially affect these test results.

Information on the effects of music on dogs' heart rates could potentially apply to situations in which dogs tend to become agitated, helping to create an environment that could help to calm a distressed dog. Places of business, such as pet supply stores that allow pets, a groomer's shop, and a veterinarian's office, are all examples of businesses that could utilize this information to help keep a calm and soothing atmosphere for animals that frequent them. Another application could be music therapy for dogs that are easily agitated. People who travel with their pets in cars or in pet carriers could also use music to help keep their pets' behavior relaxed during trips.

This experiment provides evidence that exposure to rock and rap music may increase a dog's heart rate and exposure to jazz music may decrease a dog's heart rate. A larger sample size should also be tested and the dogs' dispositions and resting heart rates without the music should be studied more carefully prior to testing the effect of the music in order to eliminate the possibility that the testing environment is causing a change in heart rate. Additionally, data regarding the dogs' everyday music exposure should be gathered and considered when analyzing results.

This experiment is unique because it combined the concepts of the previously published studies that considered the effect of music on human heart rate and the effect of music on the behavior of dogs. The new information presented here could potentially be used in dog therapy, and it could also help treat distressed or anxious dogs that have been abused. Potentially, the use of specific music types could also be applicable during dog training or for use in businesses that allow dogs. Finally, owners of dogs who exhibit anxiety during certain situations, such as thunderstorms or riding in a car, could consider using the type of music that lowers heart rate to help reduce the stressful situation.

Methods

Six different dogs were tested in their own houses. In each case, the location was a quiet room with the dog's owner sitting in the room along with the two scientists performing the testing. In each trial, five different types of music were tested. The resting heart rate was taken using a stethoscope before testing and again immediately following the test. A five-minute break was taken between each test. During the breaks, the dog stayed in the room and remained calm. The music was played on a cell phone at the highest volume for thirty seconds. The five types of music used were classical music (Canon in D by Johann Pachelbel), rock music (Thunderstruck by AC/DC), country music (Mud on the Tires by Brad Paisley), rap music (Bomfalleralla by Afasi and Filthy), and jazz music (In a Sentimental Mood by John Coltrane). This series of the five types of music with the resting periods was considered one trial. A total of two complete trials were conducted on each dog. The order of the songs for the first trial was classical, rock, country, rap, and jazz. In order to ensure that the order of songs did not make a difference on the heart rate, the order used in the second trial was rock, jazz, country, rap, and classical. .

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