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Data Analysis of the Influence of Various Forms of Music on the Heart Rate of a Dog and Human

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Abstract

This research's goal is to give a better understanding of the heart rate of dogs & humans, and how hearing affects the heart rate. According to the medical experts of Small Door Veterinary, nearly 10% of pet dogs develop heart failure causing more and more dog owners to be concerned about this issue. Also, research and studies from the doctors in Mount Elizabeth have shown how stress is one popular reason why people suffer from heart problems to anxiety (Abel, Kelvin and En, 2023).

One example of what people do to relieve stress is by listening to music. Researchers at Stanford University have noted that music is something anyone can use and is a great stress-reduction tool (News Center, 2007).

Colorado State College of Veterinary Medicine study has also revealed that easy listening music has a soothing, therapeutic effect on dogs and may mitigate stress (Classical Music Calms Shelter Dogs, New Colorado State University Study Says | News & Media Relations | Colorado State University, 2012).

Our participants listened to 2 sets of music in each genre. Then checked the average heartbeat rate by using the PISCO nursing practice stethoscope. After an analysis on the average of the two music in each genre, it shows that songs that fall into the category of pop or rock increased the heartbeat of the dog compared to the average heartbeat after listening to calm genres such as jazz.

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Introduction

Animal behaviorists such as Dr. Verdino, Dr. Cornelius, and Dr. Wells stated that certain sounds and music do have a calming effect on dogs, like they do on humans. At Oklahoma State University, Dr. Katrina Meinkoth, a veterinarian, researched the effects of music on dogs at an animal shelter. She researched studies from different professors and found out that classical and soft music have a soothing effect on dogs. She discovered this by testing dogs in animal shelter environments and noticing the calmer behavior of dogs with relaxing music. Dr. Meinkoth stated that learning more about auditory effects on dogs will help us have a better understanding of the needs of our pets.

Additionally, a study by Dr. Hans-Joachim Trappe and Dr. Gabriele Voit, tested the effects of classical music on humans. In the experiment, 60 subjects were assigned to groups that listened to a variety of classical music artists. Scientists then measured the subjects' serum cortisol concentrations, their heart rate, as well as their blood pressure. The scientists noticed that listening to artists such as Mozart and Strauss significantly lowered the subjects' blood pressure, and serum cortisol concentrations decreased in all groups. In another experiment by Bowman et al., scientists tested different genres of music on dogs. They noted that classical music had been known to reduce stress in kenneled dogs, but they also noted that there was rapid habituation to this effect, which means that the dogs would become accustomed to it over time, reducing its effect. The study found that dogs were less likely to bark while music was playing. Also, Heart Rate Variation (HRV) reduced, which indicated decreased stress.

The heart rate of people was assessed in another study conducted by David Sills and Amber Todd, in which the participants' responses to music were recorded. Additionally, a study by Dr. Hans-Joachim Trappe and Dr. Gabriele Voit, tested the effects of classical music on humans. In the experiment, 60 subjects were assigned to groups that listened to a variety of classical music artists. Scientists then measured the subjects' serum cortisol concentrations, their heart rate, as well as their blood pressure. The scientists noticed that listening to artists such as Mozart and Strauss significantly lowered the subjects' blood pressure, and serum cortisol concentrations decreased in all groups. In another experiment by Bowman et al., scientists tested different genres of music on dogs.

They noted that classical music had been known to reduce stress in kenneled dogs, but they also noted that there was rapid habituation to this effect, which means that the dogs would become accustomed to it over time, reducing its effect. The study found that dogs were less likely to bark while music was playing. Also, Heart Rate Variation (HRV) reduced, which indicated decreased stress. During musical frissons (like shivers and piloerection), both heart rate and respiratory rate increase. They also found that heart rate and respiratory rate tend to increase in response to music when compared with silence, and HR seems to decrease in response to unpleasant music more than pleasant music. (Koelsch & Jäncke, 2015) In addition, another study investigated the music's capacity to excite and calm upon Galvanic skin response (GSR) and heart rate. The music was separated into exciting, neutral, and calming, according to the scale of GSR.

Heart rate variability with repetitive exposure to sedative or excitative music was examined. A total of thirteen undergraduate students was exposed to sedative music (SM), excitative music (EM), and no music (NM) on different days with four sessions of one condition a day. The study showed that SM and NM each showed high relaxation and low tension subjectively. Yet, EM decreased perceived tension and increased perceived relaxation as the number of sessions increased (Iwanaga, Kobayashi, & Kawasaki, 2005).

METHOD

Eight distinct canines and three human participants were evaluated in the comfort of their own homes. During each test for my three canines and three human participants, we placed them in the same environment to keep the readings as accurate as possible. Each dog (also human participants) was situated in a quiet room with little to no distractions so they would be focused on the music.

Eight different styles of music were evaluated in each of the three trials. The resting heart rate was measured using a stethoscope before the test and again shortly after the test was completed. Between each exam, there was a five-minute resting period. During the rest period, the participants and the dog remained in the room and were very peaceful. Three minutes and thirty seconds of music were played on a cell phone at the greatest level possible.

To begin, we tested each dog (also human participant) individually and we played eight different forms of music: rock, pop, jazz, soul, sad, K-pop, country, and electronic music. Between each music genre, the dogs (also human participants) had a cool down period of five minutes; this was to make sure that the effects from the previous music genre didn't affect the next genre.

To record the bpm of heart rates, we used a timer on my phone, played the music from my computer, and used a stethoscope to count the heart beats. We put the timer in intervals of 20 seconds and multiplied the number of beats per second by three to get one minute. We found it easiest to record in intervals of 20 seconds because I found myself losing track of the bpm during the duration of a full minute.

Although it was difficult to hear the heart beats at first, adjusting the place and position of the stethoscope helped. The heart rates were measured while playing music and during the resting period. The experiment consisted of two trials with a different song for each music genre to see if the specific song affected the bpm or the music genre in general. The average readings of the tests showed that there wasn't much change between the trials of the same music type. The results of the test were recorded in a list and then made into graphs to show the change in heart rate.

The eight forms of music that were employed were Rock Music (Bohemian Rhapsody by Queen, Every Breath You Take by The Police), Pop Music (Poker Face by Lady Gaga, Since You Been Gone by Kelly Clarkson), Jazz Music (Summertime by Ella Fitzgerald & Louis Armstrong, What a Wonderful World by Louis Armstrong), Soul Music (Midnight Train to Georgia by Gladys Knight & The Pips, A Natural Woman by Aretha Franklin), Sad Music (Somebody That I Used to Know by Gotye, State Lines by Novo Amor), Country Music (Take Me Home, Country Roads by John Denver), K-Pop Music (Blood Sweat & Tears by BTS, Gangnam Style by Psy), and Electronic Music (Faded by Alan Walker, Don't Let Me Down by The Chainsmokers).

Genre	Trial 1	Trial 2
Rock Music	Bohemian Rhapsody by Queen	Every Breath You Take by The Police
Pop Music	Poker Face by Lady Gaga	Since You Been Gone by Kelly Clarkson
Jazz Music	Summertime by Ella Fitzgerald & Louis Armstrong	What a Wonderful World by Louis Armstrong
Soul Music	Midnight Train to Georgia by Gladys Knight & The Pips	A Natural Woman by Aretha Franklin
Sad Music	Somebody That I Used to Know by Gotye	State Lines by Novo Amor
Country Music	Take Me Home, Country Roads by John Denver	Before He Cheats by Carrie Underwood
K-Pop Music	Blood Sweat & Tears by BTS	Gangnam Style by Psy
Electronic Music	Faded by Alan Walker	Don't Let Me Down by The Chainsmokers

Table 1. Music Played to Participants

Species	A	W	H	Y	F/M	Character
A: Labradoodle	3	33	28	3	M	Energetic
B: Miniature Poodle	2	12	12	2	F	Docile
C: Miniature Poodle	2	15	13	2	M	Active
D: Golden Retriever	4	471	20	4	F	Energetic
E: Golden Doodle	2	66	59	2	M	Energetic

Table 2. Participants (Dogs)

*A: Age / W: Weight (lbs.) / H: Height (inches) / Y: Years have raised /

	Age	Weight	Height	F/M	Character
F	12	88kg	175cm	M	Energetic
G	50	65kg	167cm	F	Active
H	50	75 kg	178cm	M	Athletic

Table 3. Participants (Humans)

*A: Age / W: Weight (lbs.) / H: Height (inches)



Picture 1. Experiment



Picture 2. Experiment

RESULTS

The first 5-min-rest bpm of dogs A, B, C, D, and E averaged 52 bpm. However, after playing **rock music**, the mean heart rate went up to 77 bpm, resulting in a mean difference of 22 bpm between the 5-min-rest and the heart rate when the genre of music started playing. After the next cool down period of 5 minutes, the mean bpm of the dogs' decreased to 64 bpm.

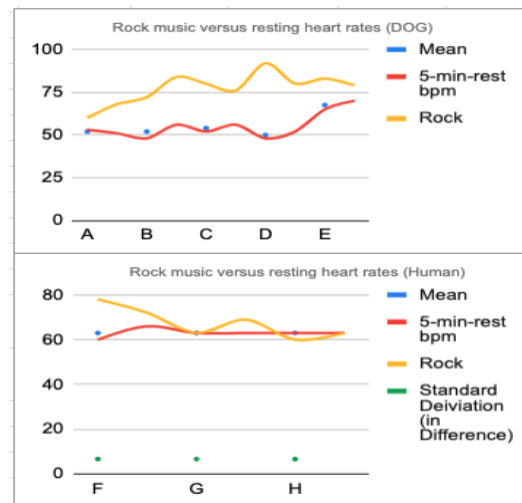


Figure 1. Rock VS. Heart Rates

Playing **pop music** caused the mean bpm to increase to 75 bpm, resulting in a mean difference of 12 bpm. The following mean bpm of the 5-minute rest measured 58 bpm.

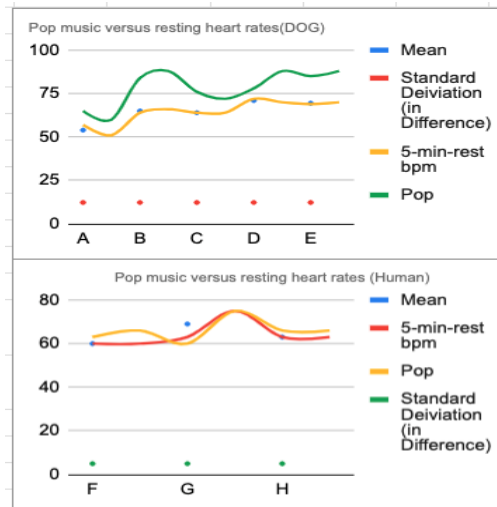


Figure 2. Pop VS. Heart Rates

As **jazz music** started playing, the average bpm went up to 74 bpm, resulting in an average of 16 bpm difference. After another 5 minutes of resting, the average bpm became 61 bpm. All dogs that listened to jazz music showed an increase in heartbeat, with a mean of 16.2 bpm and a standard deviation of 8.0. The bpm after listening to Soul music was a mean of 69.5 with a standard deviation of 10.9. All dogs that listened to Soul music showed an increase in heartbeat, with a mean of 10.8 bpm and a standard deviation of 7.9.

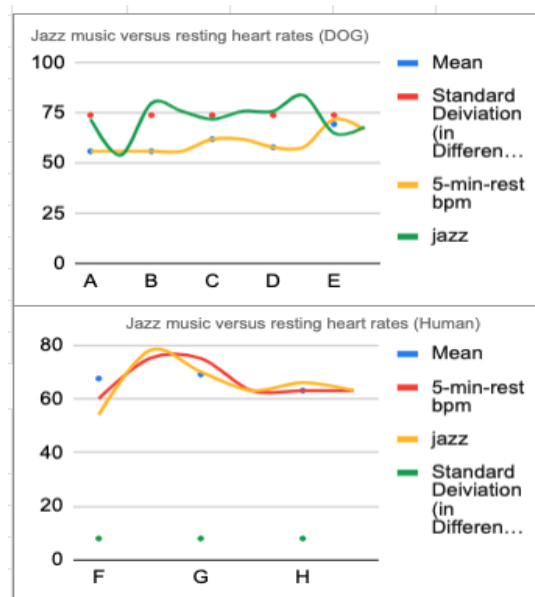


Figure 3. Jazz VS. Heart Rates

When **soul music** started playing, the average bpm went back up to 70 bpm, resulting in a mean difference of 9 bpm. After 5 minutes of resting, the average bpm reduced to 55 bpm.



Figure 4. Soul VS. Heart Rates

As **sad music** began playing, the dogs' mean bpm rose to 66 bpm, resulting in an average difference of 12 bpm. After the 5-min-rest period, the mean bpm dropped to 57 bpm with a standard deviation of 7.6. All dogs that listened to Sad music showed an increase in heartbeat, with a mean of 10.8 bpm and a standard deviation of 5.1.

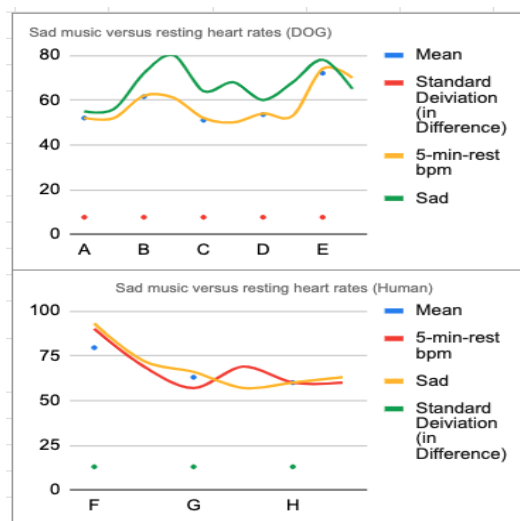


Figure 5. Sad VS. Heart Rates

After playing **country music**, the average bpm rose to 68 bpm, resulting in a mean difference of 10 bpm. After letting the dogs rest for 5 minutes, the mean bpm went down to 57 bpm. All dogs that listened to Country music showed an increase in heartbeat, with a mean of 11.6 bpm and a standard deviation of 3.9.

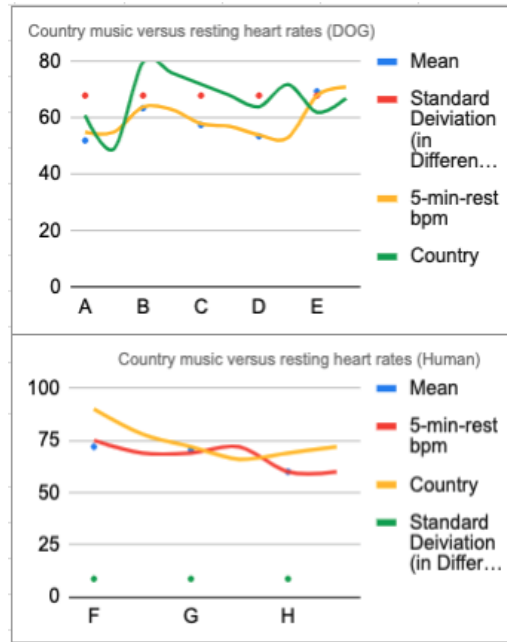


Figure 6. Country VS. Heart Rates

After turning on **K-pop music**, their average bpm measured 72 bpm, resulting in an average difference of 15. The last mean 5-minute rest period measured 57 bpm. The bpm after listening to K pop music was a mean of 71.6 with a standard deviation of 13.0. Most dogs that listened to K pop music showed an increase in heartbeat, except for one case where the heartbeat stayed the same. The mean increase of heartbeat was 14.3 bpm with a standard deviation of 8.7. The bpm at rest was a mean of 57.4 with a standard deviation of 4.3.

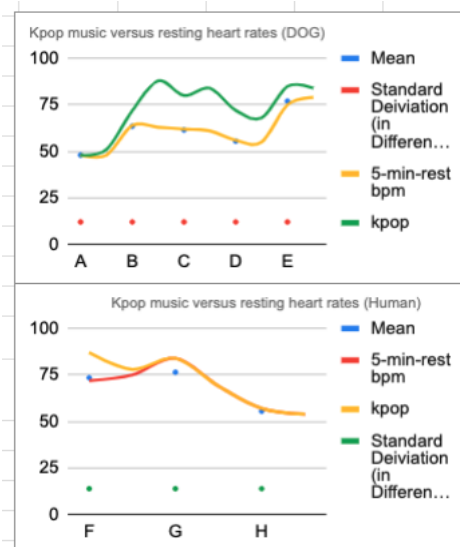


Figure 7. K-Pop VS. Heart Rates

After **electronic music** turned on, the average bpm measured 76 bpm, resulting in a mean difference of 18 bpm. All the dogs that listened to electronic music showed an increase in heartbeat,

with a mean increase of 18.1 bpm with a standard deviation of 12.2.

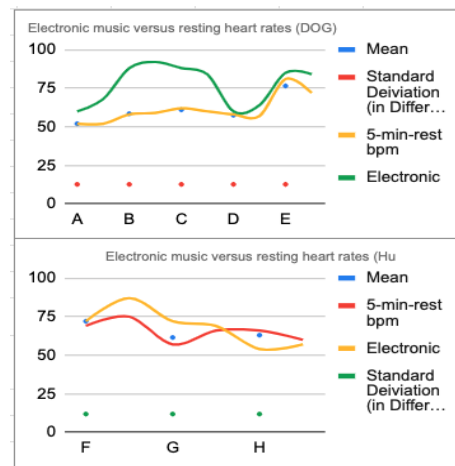


Figure 8. Electric VS. Heart Rates

Overall, listening to music showed an increase in heartbeat regardless of the type. After listening to music, the mean was 72.2 with a standard deviation of 10.5. Rock music was the type of music that showed the most increase and soul music was the one that showed the least. Out of the four dogs, dog B showed the most increase in heartbeat with a mean of 21.4 bpm and dog A showed the least with a mean of 7.4 bpm. In soul music, dogs 2 and every other dog showed significant difference ($P < 0.05$). In Electronic music, only dog 2 and 4 showed significant difference with a P-Value of 0.019. Comparisons of the difference of the heart rate between rest and stimulation of music among type of music, showed significant difference with a P-value of 0.023.

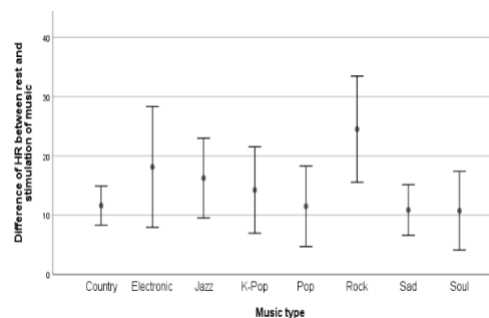


Figure 9. Relationship of the difference of HR between Rest Period and Simulation of Music & Music Type

The overall mean bpm at rest was 57.5 bpm with a standard deviation of 3.3. The bpm after listening to rock music was a mean of 76.5 bpm with a standard deviation of 9.9. All dogs that listened to rock music showed an increase in heartbeat, with a mean of 24.5 bpm and a standard deviation of 10.7. The bpm after listening to pop music was a mean of 75.1 bpm with a standard deviation of 12.9. Most dogs that listened to pop music showed an increase in heartbeat, except for one case where the heartbeat dropped 2 bpm. The mean increase of heartbeat was 11.5 bpm with a standard deviation of 8.1. The bpm after listening to jazz music was a mean of 73.8 with a standard deviation of 8.9.

DISCUSSION

In conclusion, the average bpm of the 5-min-rests of the participants consistently measured mid-50s or 60s. The average heart rate when playing music steadily measured around the 70s. The average differences between the 5-min-rests and the heart rate when a genre of music started playing measured somewhat inconsistently.

Our experiment was to find an answer to if there is a change in the heart rate after listening to different genres of music. In the beginning we have assumed that energetic genres like rock and K-pop music would give a dramatic change to the heart rate opposed to calm genres like sad or jazz music. However, as shown in the results, the country music produced the most influenced reaction out of the participants and following that was K-pop music. Another outcome that surprised us was that the results of the rock music were on par with the results of the sad music. These outcomes from the study of different genres of music affecting the heart rate of the participants show that their behavior does change after listening to different types of music genres.

The results showed that there was a change in canine heartbeats according to different genres of music. Going into the experiment, we had an idea of how music would affect my dogs, and they were somewhat like the results. We believed that rock and pop music would have the most influence, as opposed to sad or jazz music. As shown in the graphs and average bpm, rock music did produce the liveliest reaction out of the canines and following that was pop music. An outcome that did surprise me was the soul music heart rates because they were almost on par with the results of pop music. In conclusion, the results from the study of different genres of music affecting the heart rate of a dog showed positive outcomes as dogs' behaviour do change according to varying types of music.

A limitation of this study was the limited sample size; consequently, more research with a bigger sample size should be done to corroborate these findings. Since we the researchers have lived with dogs throughout childhood, we have had a general understanding of how dogs react to certain environments, such as music. We expected that the dogs would have unique responses to different genres of music, but the extent to which they differed surprised us. Going into the experiment, we knew that they would have a calmer response to classical music and a lively response to more upbeat music such as pop and rock. Before the research started, we were hesitant about the results of the experiment, but eager to see the different behavioral responses of each of dogs. Our reasoning behind conducting this research was to have a better understanding of dogs and to see if they had similar behavioral responses as humans.

At the present, there is not much known about the thinking of dogs. We know that they understand certain human words with training, but no definite proof that they understand what we are saying or think at a higher intellect. Looking into dogs' minds would help recognize and respond to their problems. There are many dogs that have mental problems such as PTSD and anxiety from situations that are new or have experienced poorly in the past. For example, loud sounds such as thunder and fireworks often scare dogs. If there was a way to help dogs with these internal problems, it would be in people's best interests to help our furry friends. During the research, our fellow researchers conducted several experiments on canine behavior to see if their heart rates responded with different genres of music and on humans to compare the results.

REFERENCE

Abel, S. W. E., Leslie, T., Kelvin, T. T. J., & En, L. K. (2023, September 7). 10 conditions linked to stress. MEH. 10 Conditions Linked to Stress

Bowman, A., Dowell, F. J., & Evans, N. P. (2017, March 15). The effect of different genres of music on the stress levels of kenneled dogs. PubMed. Retrieved April 17, 2022, from <https://pubmed.ncbi.nlm.nih.gov/28093218/>

Calming the anxious pup with music - Oklahoma State University. Calming the anxious pup with music | Oklahoma State University. (2021, May 17). Retrieved April 17, 2022.

Classical Music Calms Shelter Dogs, New Colorado State University Study Says | News & Media Relations | Colorado State University. (2012, October 16).

Editorial, P. M. D. (2019, February 21). The science behind Calming Dogs with Sound. PetMD. Retrieved April 17, 2022, from <https://www.petmd.com/dog/>

News Center. (2007, August 1). Music moves brain to pay attention, Stanford study finds.

Koelsch, S., & Jäncke, L. (2015). Music and the heart. *Eur Heart J*, 36(44), 3043-3049. doi:10.1093/eurheartj/ehv430

Trappe, H.-J., & Voit, G. (2016, May 20). The cardiovascular effect of musical genres. *Deutsches Arzteblatt international*. Retrieved April 17, 2022, from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4906829/>

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