Science Fair Project

Does the weight and breed of the dog affect their heart rate?

Introduction:

Dogs come in several different breeds, sizes, weights, and more. In this project we will be researching dogs heart rate towards the breed and weight of the dog. Dogs heart rate can change throughout the day depending of their activity and how much energy goes into that activity. We predict that dogs with low activity will have lower heart rate and more athletic energetic dogs will have higher heart rates. We also think that smaller dogs will have a lower heart rate and larger dogs will have higher heart rate.

Small dogs 10-25 lbs

Medium dogs: 25-60 lbs

Large: 60-100 lbs

XL dogs: 100+ lbs

Hypothesis:

Our teams hypothesis is:

The size, weight, and breed of a dog will affect Their heart rate. If a dog's size and weight are small, its heart rate will be higher than a larger dog’s heart rate.

Their heart rate will be faster, because during the time they are resting or doing an activity, smaller dogs will have faster heart beats due to the fact that body size affects how fast a dog’s heart needs to beat. Smaller dogs need their hearts to beat faster, while larger dogs do not need as many heartbeats.

Investigative Methods/Procedure

Materials:

1. Dog
2. Leash
3. Group digital notebook
4. Personal notebook
5. Timer
6. Fingers

Procedure:

1. Have someone set a timer for 15 seconds while you check your dog's heart rate.
2. Count the number of beats you feel in those 15 seconds
3. Multiply the number by four
4. Record info in group and personal notebook.

Get to know the dogs!

Lily: “large dog”

Breed: lab, border collie,

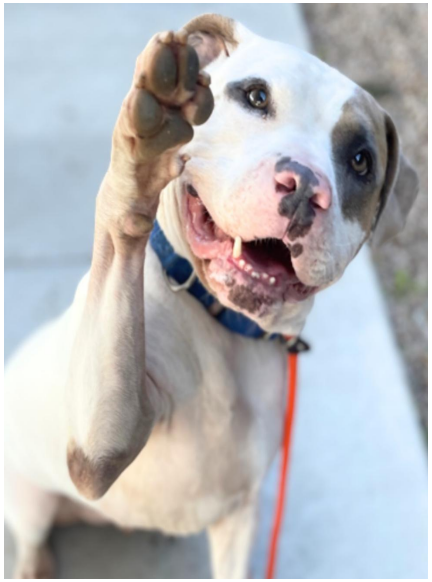
mini pit

Weight: 74 lbs

Age: 2

Average heart rate: 87 bpm

Other info: very athletic, energetic and playful



Big boi: “ larger dog”

Breed: Pitbull terrier, Staffordshire terrier, American XL bully.

Weight: 91 lbs

Age:5

Average heart rate: 60-72 bpm

Other info: Lethargic, food oriented, sweet and chunky.

Luna: “ medium dog”

Breed: Lab, Border Collie, Pit Bull

Weight: 62.2 lbs

Age: 4

Average heart rate: 55- 60 bpm

Other info: Layarounder, influenced by the other dogs around her.

Gizmo: “small dog”

Breed: Frenchie

Weight:: 22 lbs

Age: 4

Average heart rate: 95 bpm

Other info: Loving, always thinks about food, cuddly.

Background information and Rationale

Background Information: The research we have developed is that dogs are even more obese that we seem to realize. About 59% of dogs are struggling with obesity which marjory health problems such as, cancer, diabetes melitus, heart disease, hypertension, Urinary Bladder stones, and Hypothyroidism. According to the National Library of Medicine, “obese male dogs have decreased cardiac function and impaired HRV compared to non-obese dogs.” Obesity in dogs in can also be based a dogs breed and can affect their heart rate . Researchgate.net says, that “An association between heart rate (HR) and bodyweight has been reported in dogs and it is common belief that small breeds of dog exhibit higher HR than large breeds.” Small dog that is thirty -pounds or less heart can vary from 100-140 beats per minute while a bigger dog that is over thirty-pounds can vary from 60-100 beats per minute meaning that smaller dogs have a genetically faster heart rate. However, if a dog is obese there could be many problems with their heart, such as Any dog who has a very high respiratory system can lead major health problems like anema, congestive heart failure, and other respiratory issues which is one of the of dogs having obesity. Obesity can also affect a dogs heart rate. According to https mdpi.com, they state that, This study investigated the effect of obesity on oxidative stress, HRV, and cardiac function in obese and non-obese dogs. The nine-scale body condition score (BCS) system was used to determine obesity.
Obesity in dogs can also be affected by how their owners treat them. Eleanor Raffan, lead researcher at Cambridge, explained: "This work shows how similar dogs are to humans genetically. Studying the dogs meant we had reason to focus on this particular gene, which has led to a big advance in understanding how our own brain controls our eating behaviour and energy use." This is because both dogs and humans have a gene called DENND1B which causes severe obesity. Eara.eu explains that the reason dogs are obese is “Dogs, ... live in more controlled environments, making it easier for scientists to separate genetic influences from lifestyle factors.

With this information, we can gather of why some dogs have lower heart rate than others based off of weight and breed, but what happens to the dogs are the similar ages? Will have similar heart when they doing activities?

Research Question

Does the weight and breed of the dog affect their heart rate?

Yes, the weight and breed of the dog affects the heart rate gradually. When looking at our data, we can see that the smaller dogs have higher heart rates, whereas the bigger dogs have lower heart rates. If you look at the data Gizmo's heart rate was about 100 bpm while Big Boi's was about 80 bpm. This proves how a "small dog that is thirty -pounds or less heart can vary from 100-140 beats per minute while a bigger dog that is over thirty-pounds can vary from 60-100 beats per minute meaning that smaller dogs have a genetically faster heart rate."

Discussion and Interpretation

The results from research and doing activities mostly supported our prediction. We predicted that smaller dogs had faster heart rates than larger dogs, and the data we took showed that pattern. Gizmo, the smallest dog, had higher heart rates, whereas Big Boi, the larger dog, usually had the lowest heart rate.

All of the dogs' shown an increase of heart rate during the ten minute walk. This shows that physical activities can cause a dog's heart rate go up and beat faster, so it can give more oxygen to their body. But, when the dogs were resting or going to sleep, their heart rates lowered, providing proof that the stuff they do strongly affects their heart rate.

The weight and size of dogs are able to help explain that. Research shows that smaller dogs naturally have faster heart rates due to their body size and metabolism. Larger dogs have slower heart rates because their hearts pump more blood with each beat. Obesity can also affect heart rate by adding some extra stress on their heart, which may also explain why some medium or large dogs have higher heart rates than expected during certain activities.

Overall, this experiment shows that a dog's size and weight do affect heart rate, but activity level and health also play important roles.

Results and Data Visualization

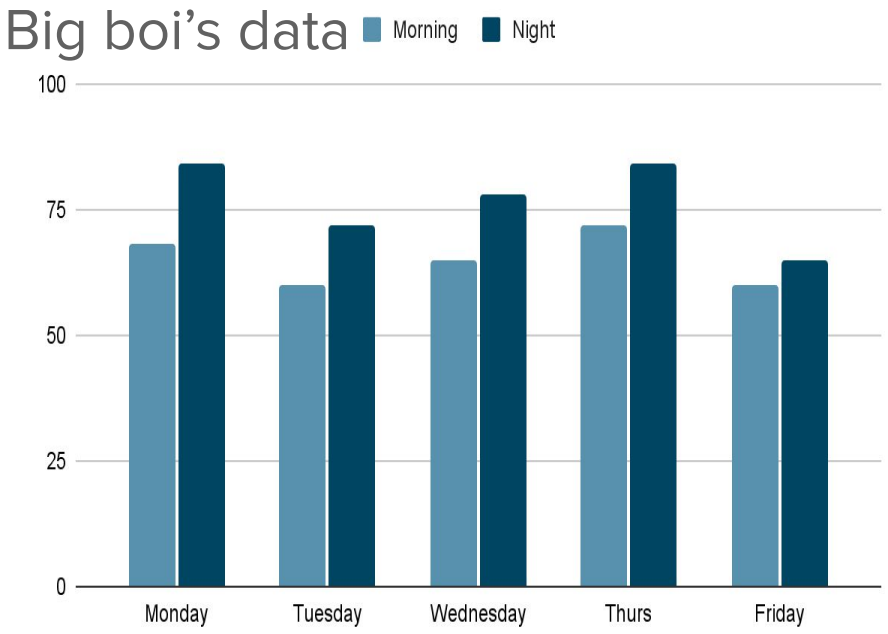
Monday	Tuesday	Wednesday	Thursday	Friday	Heart rate during walk
Lily:**M: 87 bpm N:128**	**M:112 bpm N:68**	**M: 60 bpm N:72**	**M:80 bpm N:80**	**M:88 bpm N:84**	**130 bpm**
Big boi: **M: 68 bpm N:84**	**M: 60 bpm N:72**	**M:65 bpm N:78**	**M: 72 bpm N:78**	**M:60 bpm N:**	**160 bpm**
Luna: **M:62 N:80**	**M:60 bpm N:48**	**M: 60 N: 52**	**M: 40 N:60**	**M: 60 N: 52**	**100 bpm**
Gizmo: **M: N:102 bpm**	**M: 96 bpm N:89**	**M: 96 N: 88**	**M: 100 N:84**	**M:96 N: 100**	**120 BPM**

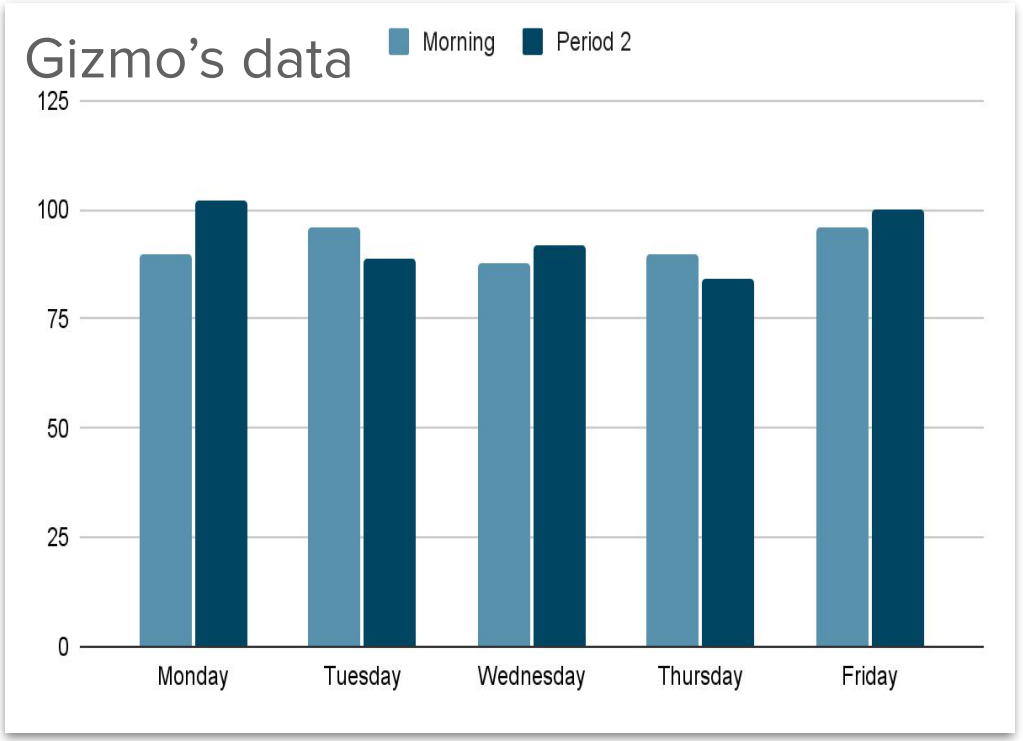
Key:
m= morning
n= night
All measured data:
beats per minute (bpm)

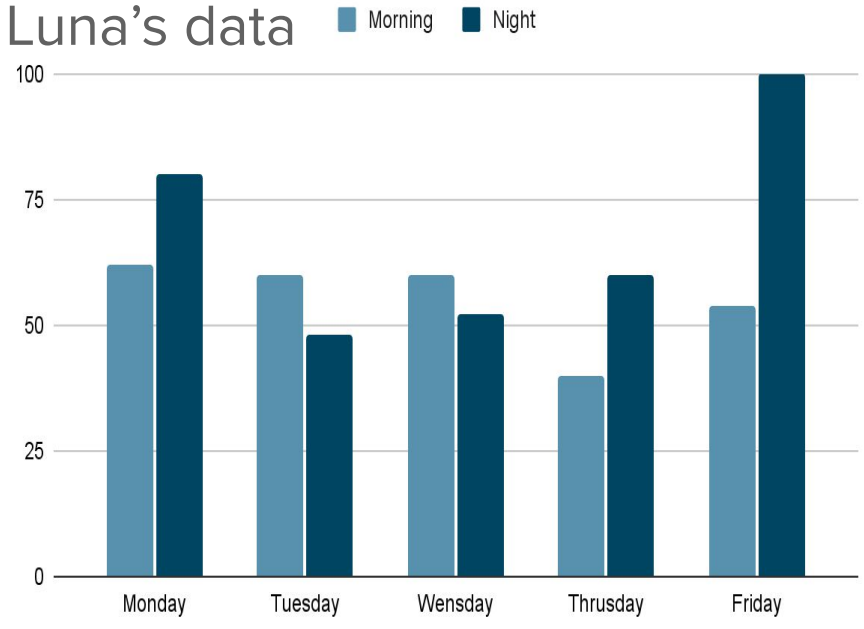
Conclusions and Ideas for Future Research

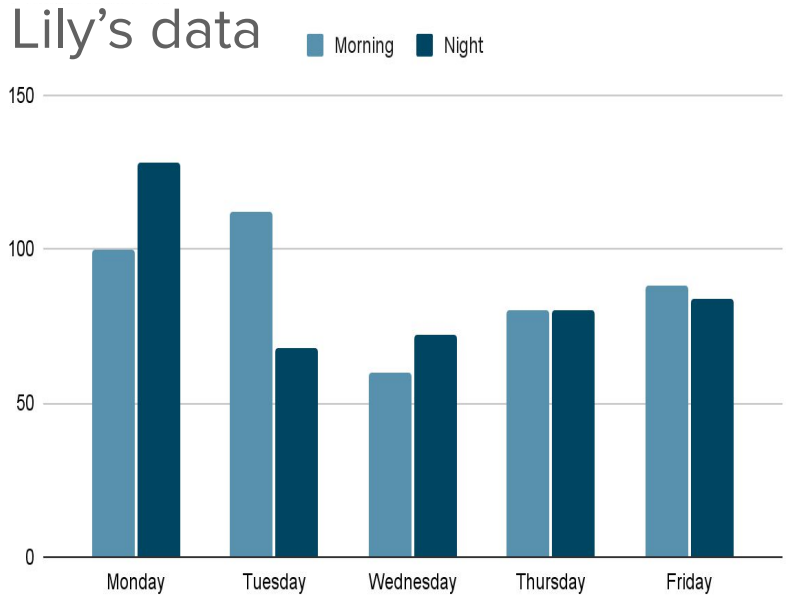
We found out that a dog's heart rate does depend on the weight, breed, and athleticism of the dog. We know this because Lily and Luna are very fit dogs, and their heart rate was generally lower than Big boi and Gizmo's heart rate —- dogs who are not very fit and athletic. For future research, we could go into how many hours our dogs exercise a day. In conclusion, we figured out than smaller dogs or lighter weight dogs who will have a higher heart, their heart can also be influenced, based on how active they are or how old they are. Based on the data Big Bio (who is the largest dog weight wase) is had a higher heart rate than Luna who is a bigger(ish) dog. This is because Big Boi the average weight for his breed which makes him have a higher rate rate.

Charts:


Big boi’s data
Morning
Night
100
75
50
25
0
Monday
Tuesday
Wednesday
Thurs
Friday


Gizmo’s data
Morning
Period 2
125
100
75
50
25
0
Monday
Tuesday
Wednesday
Thursday
Friday


Luna’s data
Morning
Night
100
75
50
25
0
Monday
Tuesday
Wensday
Thrusday
Friday


Lily’s data
Morning
Night
150
100
50
0
Monday
Tuesday
Wednesday
Thursday
Friday

References

- https://pubmed.ncbi.nlm.nih.gov/23662951/ this gives evidence of health effects with weight, age, breed, etc
- https://www.mdpi.com/2076-2615/10/8/1383 obesity affects heart rate
- https://www.dixieanimalhospital.com/blog/13048-what-is-normal-dog-temperature-heart-rate-and-respiration some background on a dogs respiration
- Small/Miniature/Toy Breeds (30lbs or less): 100 – 140 beats per minute. Medium to large breeds (30lbs or greater): 60 – 100 beats per minute.(What's a Normal Dog Temperature, Heart and Breathing Rate?.)
- University of Cambridge, University of Birmingham and University of Liverpool collected saliva samples from more than 200 Labradors in order to isolate their DNA to measure
- body fat levels and score their greediness – Labradors are known to overeat more than other breeds
- Eleanor Raffan, lead researcher at Cambridge, explained: "This work shows how similar dogs are to humans genetically. Studying the dogs meant we had reason to focus on this particular gene, which has led to a big advance in understanding how our own brain controls our eating behaviour and energy use."
- The DENND1B gene is linked to severe obesity in dogs and humans.
- "Dogs, … live in more controlled environments, making it easier for scientists to separate genetic influences from lifestyle factors" (which can cause obesity). (https://www.eara.eu)
- Popular sporting group breeds such as, retrievers, spaniels, and setters ,are 10% more likely to be motivated by food than other breeds. (https://stories.tamu.edu)
- https://www.redcross.org

References

- Overweight dogs can have the same health conditions as overweight people which can be Type 2 diabetes, “osteoarthritis, high blood pressure, kidney disease, and heart and respiratory disease.” (https://www.fda.gov)

- Obesity in dogs often result in harmful health problems such as:
  - Cancer
  - Diabetes mellitus
  - Heart disease
  - Hypertension
  - Urinary Bladder stones
  - hypothyroidism

  (https://vcahospitals.com/know-your-pet/obesity-in-dogs)

- “obese male dogs have decreased cardiac function and impaired HRV compared to non-obese dogs” (https://pmc.ncbi.nlm.nih.gov/articles/PMC7460129/)
- Smaller dogs have a faster heart rate than larger dogs because they have a higher surface-area-to-volume ratio (Tractive)
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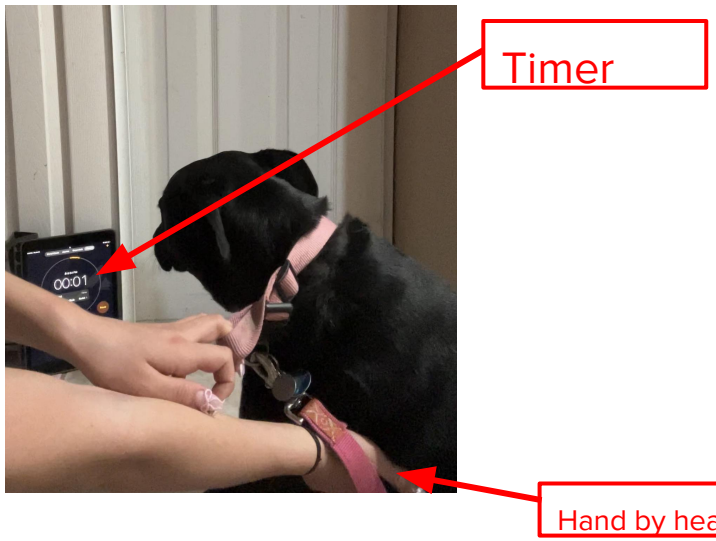
- “An association between heart rate (HR) and bodyweight has been reported in dogs and it is common belief that small breeds of dog exhibit higher HR than large breeds.” (https://www.researchgate.net)

Photos + videos:

Short video of measuring lily's heart rate

Image of lily's heart rate being measured



The end!