# The HEART of a HORSE

## Objective:

Equestrians will understand the role of the heart in overall health and performance by identifying the function of the heart, comparing human heart, and practicing how to monitor and interpret heart rate in both themselves and horses. Through hands-on activities, they will gain a practical understanding of how exercise influences heart rate and how to apply this knowledge to improve performance and health for both themselves and their horses.

## Supplies:

- A way to play music or metronome (free metronome apps are useful)
- An 8-10 lb object (ie: gallon jug, smaller english saddle, a barn cat that likes to be held or any other similar item in the 9-11lb. range
- An item in the 1/2lb range (ie: apple, or grooming tool, rolled pair of socks)
- Stopwatch
- 1 gallon jug
- 2 (5 gallon buckets)

Oxygen Delivery Relay

- index cards
- blue dot stickers or bingo stampers
- red dot stickers or bingo stampers

Optional but nice to have

- Stethoscope
- Hand pump bike/ball
- Bluetooth speaker
- Red food die, red paint (to make water red)



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# The HEART of a HORSE

## The Lesson

Preview the equestrians to see what they already know about horse's hearts

**Overview:**

A heart is a muscular organ that pumps blood throughout the body, providing oxygen and nutrients while also removing waste products. It's central to the circulatory system and plays a crucial role in maintaining life by ensuring that blood circulates to all tissues and organs. In horses, as with other mammals, the heart has four chambers: two atria (upper chambers) and two ventricles (lower chambers).

The heart's pumping action is controlled by electrical impulses that ensure the chambers contract and relax in a synchronized manner, allowing blood to flow efficiently. Horses have a unique electrical conduction system (type B) that allows for rapid increases in contractility, enabling quick responses to flight situations.

The heart's primary function is to maintain a steady flow of blood, supporting metabolism, thermoregulation, and overall body function.

- Key points:
  - It's a muscle have everyone (make a muscle)
  - Pumps blood through the body (if possible use a bike or ball pump to demonstrate intake and output of a pump)
  - Supports metabolism, temperature and body function

**Where is it?**

Located in the chest, slightly to the left side, just behind the ribs. It sits between the lungs, protected by the ribcage, and it's about the size of a melon. This position allows the heart to pump blood efficiently throughout the horse's body while being safely protected from injury.

- Have your equestrians identify the location of their heart and the horse's heart.
- Play "Pin the Heart on the Horse" (printable included)



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# The HEART of a HORSE

**How big is a horse heart?**

A horse's heart is quite large compared to its body size which gives it great endurance! On average, a horse's heart weighs about 1% of the horses weight (8 to 11 pounds).

In terms of size, it can be roughly the size of a basketball in an adult horse.

The size of the heart can vary depending on the horse's size, breed and physical condition.

- Have you equestrians pass around something that represents the weight or size of a horse heart (ie: gallon jug, smaller english saddle, a barn cat).
- Now relate the horse's heart to the human heart. Of the above, what is similar, what is different? Human Heart weighs .5 - .8 lbs. (weight of an apple, a hoof pick or light grooming tool). A humans' heart is closer to .5% of their overall weight.

**The amazing capacity!**

Horse's hearts pumps 35 liters (9.25 gallons) per minute at rest

- Using a gallon jug, have the equestrians share the task of filling (2) 5 gallon water buckets to represent the 9.25 gallons of blood a horse pumps in a minute at rest.
- Compare a human heart which pumps 5 liters or a little over a gallon a minute at rest.

It is estimated that during intense galloping, a horse's heart can pump approximately 150 liters (roughly 33 gallons) of blood per minute - thats more than 6 of these 5 gallon buckets full in 1 minute!!

Why would this amount change so much?

- Let's find out!



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# The HEART of a HORSE

**The Heart Beat**

- Who can find their own heart beat? Where? How? Do your equestrians feel their heart, do they check their pulse? Let's learn about why pulse and the heart rate connected?

A heartbeat is a two-part pumping action that takes place due to the heart muscles contracting and relaxing. This process is drawing blood to re-oxygenate then push back the oxygenated blood throughout the body to be used.

When your heart beats, it pushes blood through your arteries. This creates a small pulse or throb you can feel, especially in places like your wrist or neck. The pulse happens every time your heart beats, so by counting how many pulses you feel in a minute, you can figure out how fast your heart is beating, which is your heart rate.

**How do we check a horse's heart rate?**

**How to Take a Horse's Heart Rate** - https://www.youtube.com/watch?v=CxqUobWLMao

- Note: It can be difficult to hear a horse's heartbeat with a stethoscope due to its deep location behind the thick ribcage and chest muscles. Additional challenges can be background noise and improper stethoscope placement.

**Check A Horses Pulse** is most commonly done at the following locations:

- Facial pulse - https://www.youtube.com/watch?v=imFr6xUDA1k
- Digital pulse - https://www.youtube.com/watch?v=i5tJmcv0cBo
- Radial pulse - Inside of the back of the knee

Give you equestrian an opportunity to experience, practice and possibly recording their findings using the methods above.



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# The HEART of a HORSE

**Activity**
Using a metronome or music as a guide for pace do the following equestrian exercises to build strength and endurance to help with riding.

To find music that matches specific BPM:

- Websites such as websites like: https://getsongbpm.com/ and https://tunebat.com/
- Search in your music provider "120bpm"

**Resting Heart Rate:**

Start by having your equestrians check and record their own resting heart rate. This will typically fall in the whose resting heart rate is usually around 60-100 bpm https://www.youtube.com/watch?v=AHHr8qNU9QY

Compare horse and human

A horse's **resting heart rate** is typically between **28-40 beats per minute (bpm)** for a healthy adult horse, much lower than humans. It's essential for riders to know what's normal for their horse because an elevated resting heart rate could indicate stress, illness, or struggling fitness.

- Use a metronome or song (or both) to perform standing single leg deadlifts with an aim to match the BPM to a horse's resting heart rate. Songs with this slow of a beat are mostly lulabys. I use Daiko Drum - Chilled Cat 40 bpm - https://www.youtube.com/watch?v=a1IilZr-o_Q

  - Single Leg Dead Lift - https://youtube.com/shorts/iRKxRm0zLgA?si=PFsKLz1XyDeZXWZU
  - Variation - https://youtu.be/T4NSlltE_5Q?si=aky3pvIWM_36DTQO
  - Use this variation to make a game of passing an object around https://youtu.be/ep4ia78FTBQ?si=iKGpAgND1mbmyyEO
  - These exercises work
    - Glutes: These muscles are crucial for maintaining a stable seat and controlling hip movement while riding.
    - Hamstrings: These posterior thigh muscles help support a riders balance and leg aids.
    - Balance: Integral in riding for safety and accurate use of aids


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# The HEART of a HORSE

**Active Heart Rate**

**Active Heart Rate**: A horse's **active heart rate can range from 150-220 beats per minute (bpm)**. Higher heart rate is going to be associated with higher physical demand such as racing or jumping. While the heart rates can vary based on the horse's fitness and environmental temperature a generalized measure would be a horse walking would be around 80 bpm. Trotting would likely fall in the 70-120 bpm, cantering around 120-185 bpm and galloping: 185-220 bpm

- Use a metronome and/or song to have your equestrians perform side lunges aiming to match the BPM to a horse's active heart rate

- Side Lunges - https://youtube.com/shorts/9EXlCFI0JSE?si=9sewrWBuA5k6z0US
- Variations - https://youtube.com/shorts/Cpe7ct3dwTM?si=cREKtGQt1Lujy-Bl
  - Side lunges work several key muscle groups that are also important for horseback riding:
  - Glutes: These muscles are crucial for maintaining a stable seat and controlling hip movement while riding.
  - Quadriceps: The front thigh muscles are engaged during side lunges and are essential for gripping the saddle and maintaining leg position while riding.
  - Hamstrings: These posterior thigh muscles are activated in side lunges and play a vital role in leg aids.
  - Adductors: Side lunges specifically target the inner thigh muscles, which are important for maintaining leg contact with the horse.
  - Core muscles: Side lunges engage the transverse abdominis, obliques, and other core muscles, which are critical for maintaining balance and posture in the saddle.

Now have your equestrians re-take their own heart rate and compare their results to their resting heart rate.


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# The HEART of a HORSE

**Why does the heart speed up?**

When you or a horse exercises, the muscles need more oxygen to keep working. The heart beats faster to pump more blood, which carries the oxygen your muscles need to keep going. This helps provide the energy to keep moving. The harder you or your horse works, the faster your heart beats to help you stay strong and keep up!

**Activity - Oxygen Delivery Relay**

- **Set up**: Red dot stickers/bingo stamper, blue dot stickers/bingo stamper and 1 index card per person (minus 2). Put a few dots of both red and blue on each index card. The person who is the "lungs" will get a bunch of red dots/bingo stamper. The remaining blue can be scattered around the area (making muscle stations).

- **How to do it**:
  - One person is the "heart" and another person is the "lungs". The remaining people are the "Blood".
  - The "Heart" and "Lungs" will stand together with the lungs holding all the extra red dots representing the oxygenated blood.
  - The people acting as "Blood" will each hold an index card go where a blue dot is. They will do a simple 1-2 second exercise of your choice and collect a blue dot on their card representing the blood as loosing some oxygen. They then return their card to the "heart" who will pass it to the "lungs" to collect another red dot to re-oxygenate the blood before passing it back to the "heart". The heart then returns the card to the "blood" to go back to a muscle station. Then repeat.
  - To provide the experience of the heart beating faster, start with one "blood" person and then add in more requiring the heart to work faster.

**Explanation**: As the muscles work harder and faster, the heart needs to beat more quickly to deliver more oxygen to them. The faster heart rate helps ensure that oxygen reaches the muscles quickly, allowing them to keep moving efficiently.



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# The HEART of a HORSE

**The Heart's Role in Performance - Why we need to know about the horse's heart!**

**Cardiovascular Fitness** - Horses with strong, efficient hearts are better equipped to handle strenuous activity. Just like any athlete, consistent, moderate exercise builds the horse's cardiovascular system and improves overall heart health. Regular conditioning can help the horse develop better stamina and endurance, leading to a lower resting heart rate and better recovery after intense work.

**Rest Periods** - Riders should always allow for adequate rest between periods of strenuous exercise. Horses, like humans, need time to recover, and rest allows the heart to heal and return to normal after exertion. Typically, after moderate work, your horse's heart rate should return to 100 bpm within two minutes and should be below 60 bpm ten minutes after exercise has ceased.

**Horse's Heart and Temperature Regulation -** Horses don't sweat as efficiently as humans, so their **heart and circulatory system** work harder to regulate body temperature during exercise. When horses work hard, their bodies create a lot of heat, and blood is pumped to the **skin** to release the excess heat. This makes the heart's ability to regulate blood flow even more important. During hot weather, especially, a horse's heart has to work harder to maintain proper temperature regulation. If a horse becomes too hot (overheats), it can cause cardiac stress and lead to heatstroke or muscle breakdown.

**Dehydration** - If a horse is dehydrated they have thicker blood. This thicker blood puts extra strain on the heart and can lead to poor circulation.

**Aging Horses -** As horses age, they may develop heart conditions, including valvular insufficiency (where the heart valves don't close properly) or cardiac arrhythmias. It's important for riders of older horses to be aware of their horse's heart health and get regular veterinary check-ups, especially if the horse begins to show signs of fatigue or exercise intolerance.



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# The HEART of a HORSE

**Fun Facts:**

**Endurance Racing** is a long-distance competition that tests the stamina and fitness of both horse and rider. These races typically cover distances ranging from 40 km to 160 km (25 to 100 miles) over varied terrain. The primary goal is not just to finish first, but to complete the course with the horse in good health and condition

After completing each loop of the race, horses enter the Vet Gate, which includes a recovery area where horses get a chance to lower their heart rates. Their heart rate must reduce to 64 beats per minute or lower within a set time in order to continue.

**Wearable Heart Monitors** are available for horses. Here is a video showing how one is used. https://www.youtube.com/watch?v=QRYwVFPRSfs

**5 Hearts of a Horse**

This term refers to horses' actual heart and the function of the frog and digital cushion on/in each of a horse's hooves.

- Digital Cushion: A spongy tissue located beneath the coffin bone in the back part of the hoof. It absorbs shock and helps pump blood back up the leg with each step, supporting circulation since hooves don't have muscles to do so.
- Frog: A rubbery, triangular structure in the middle of the hoof that helps absorb shock and distribute pressure. It presses against the digital cushion with each step, aiding the pumping action to push blood up the leg.

Together, the frog and digital cushion work like a pump, helping to circulate blood through the lower limbs, ensuring healthy circulation through the lower limbs.



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# The HEART of a HORSE

**The heart rate is measured in beats per minute (or bpm). Circle the bpm below that represent a healthy horse at rest.**

**15 18 20 24 25 28 30 35 40 45 50 55 60 61**

If I was trying to listen to a horses heart, I would use a stethoscope in the girth area behind the **Left / Right** shoulder.

**Why is it challenging to hear a horse's heartbeat even with a stethoscope?**

A) The horse's heart is located deep within its chest.

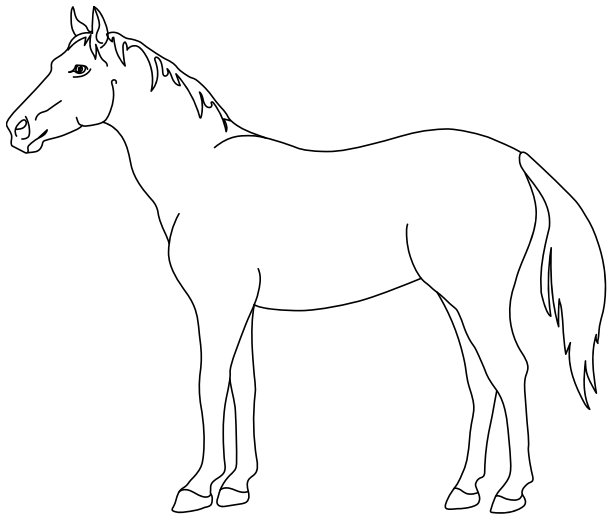
B) The horse's heart rate at rest is faster than humans, making it hard to detect the individual beats.

C) The horse's ribcage and thick muscles dampen the sound.

D) The environment (such as noise or movement) can interfere with the sound hearing the sound.

E) Answers A, C and D.

**Mark ALL the areas on the horse where you would be able to identify the horse's heart rate.**



**Circle the reasons a horse might have an elevated heart rate:**

| | | |
|---|---|---|
| Sleeping | Overheating | Stressed or Scared |
| A Foal | Foraging | Excitement |
| Pain | Exercising | Mutual Grooming |

**Why should horse riders, owners and caretakers know about a horse's heart and heart rate?**

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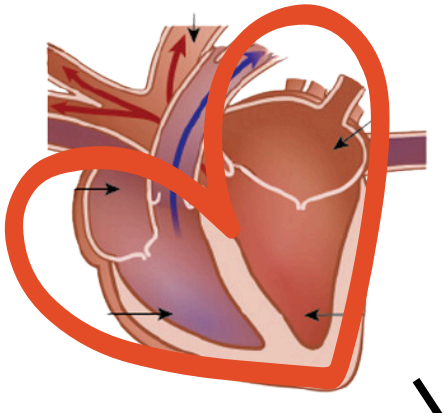
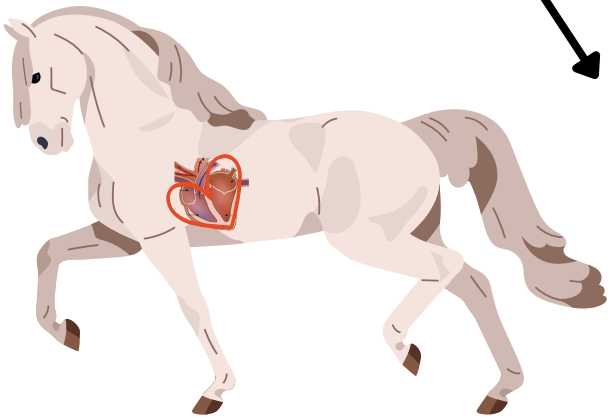
# The Heart of a Horse



The heart is a muscle that expands and contracts

The heart pushes and pulls blood so the blood circulates to tall the parts of the body



The heart aids in digestion, regulating temperature and moving the body

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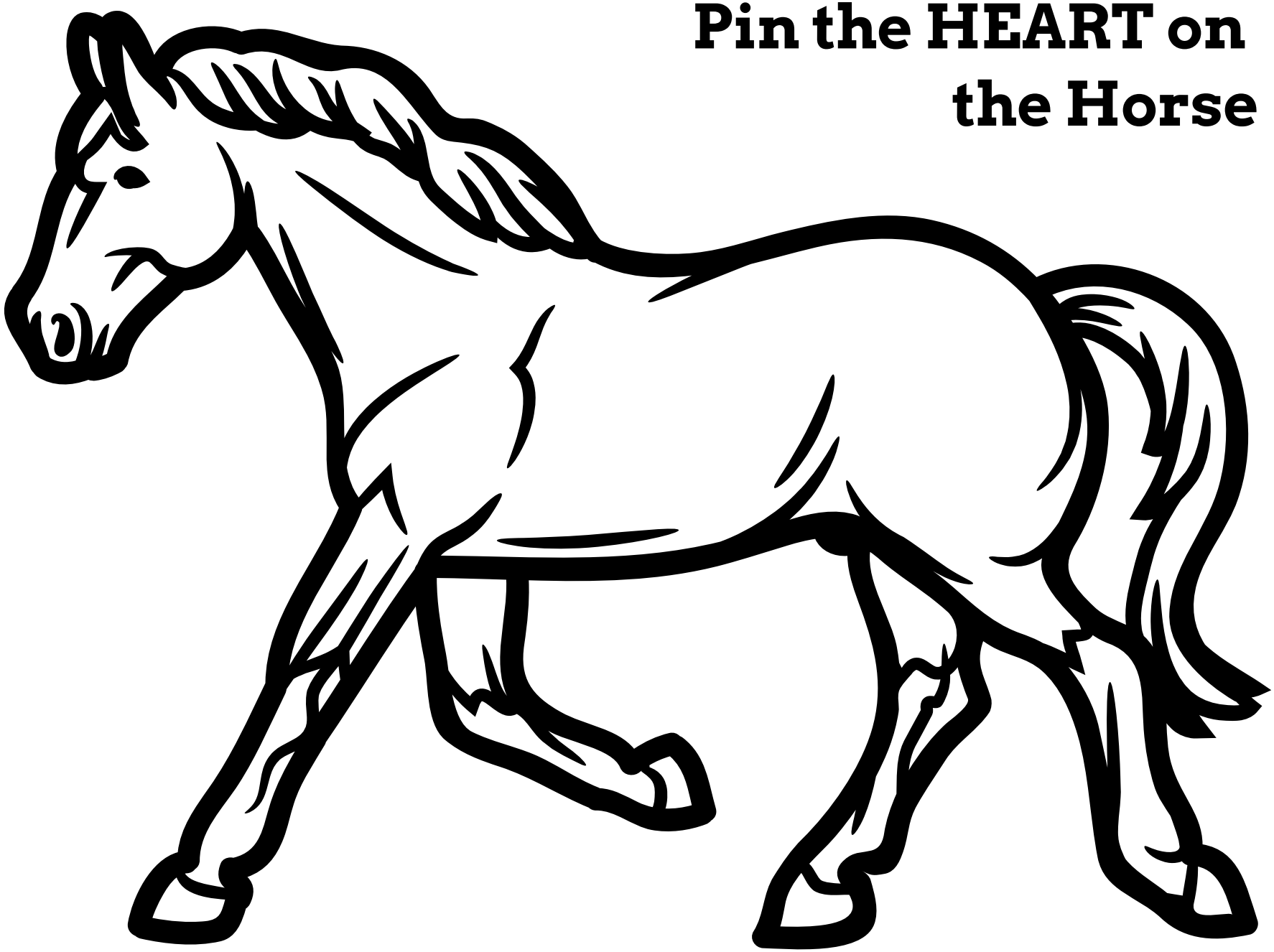
# Pin the HEART on the Horse



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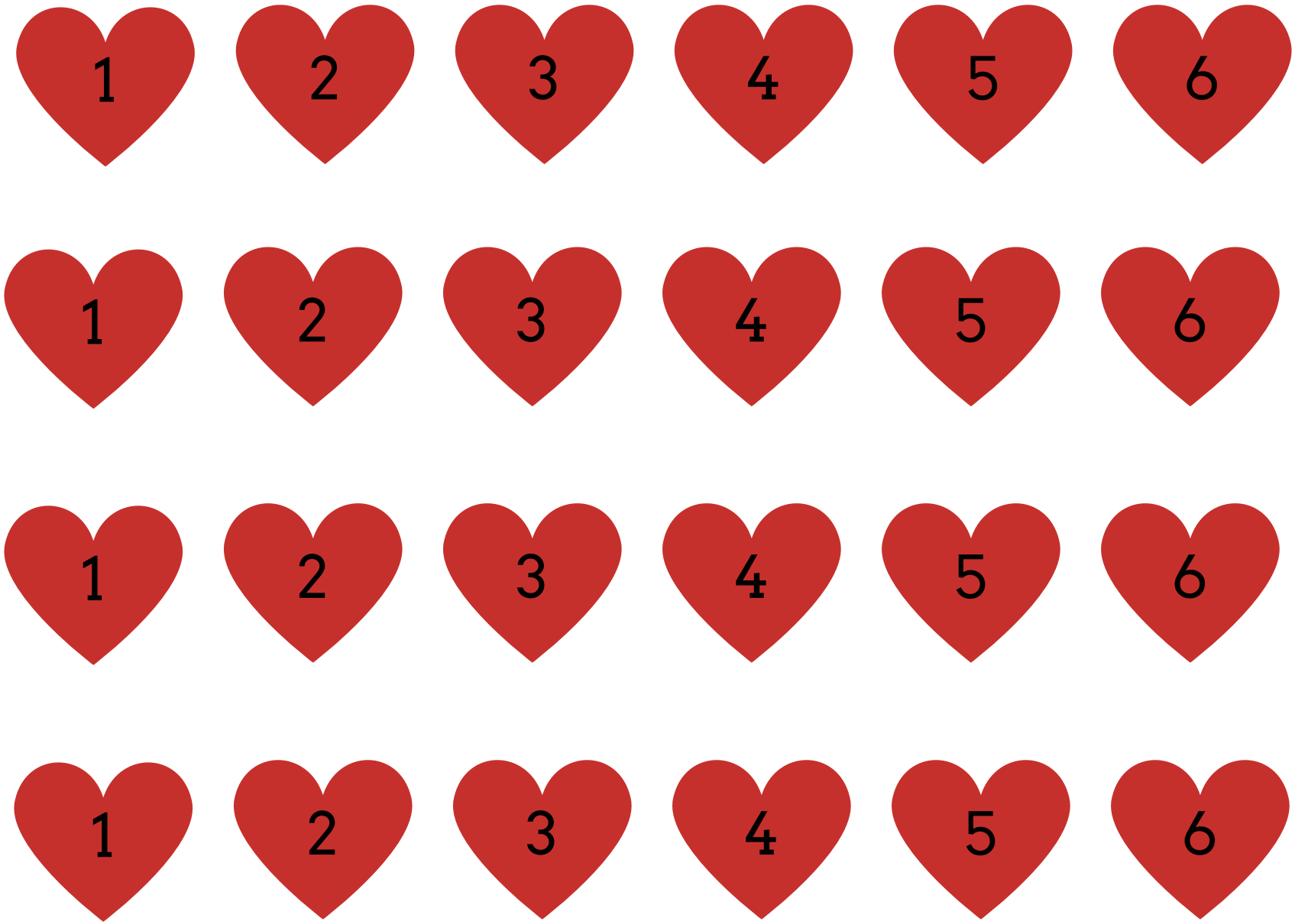
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1 2 3 4 5 6
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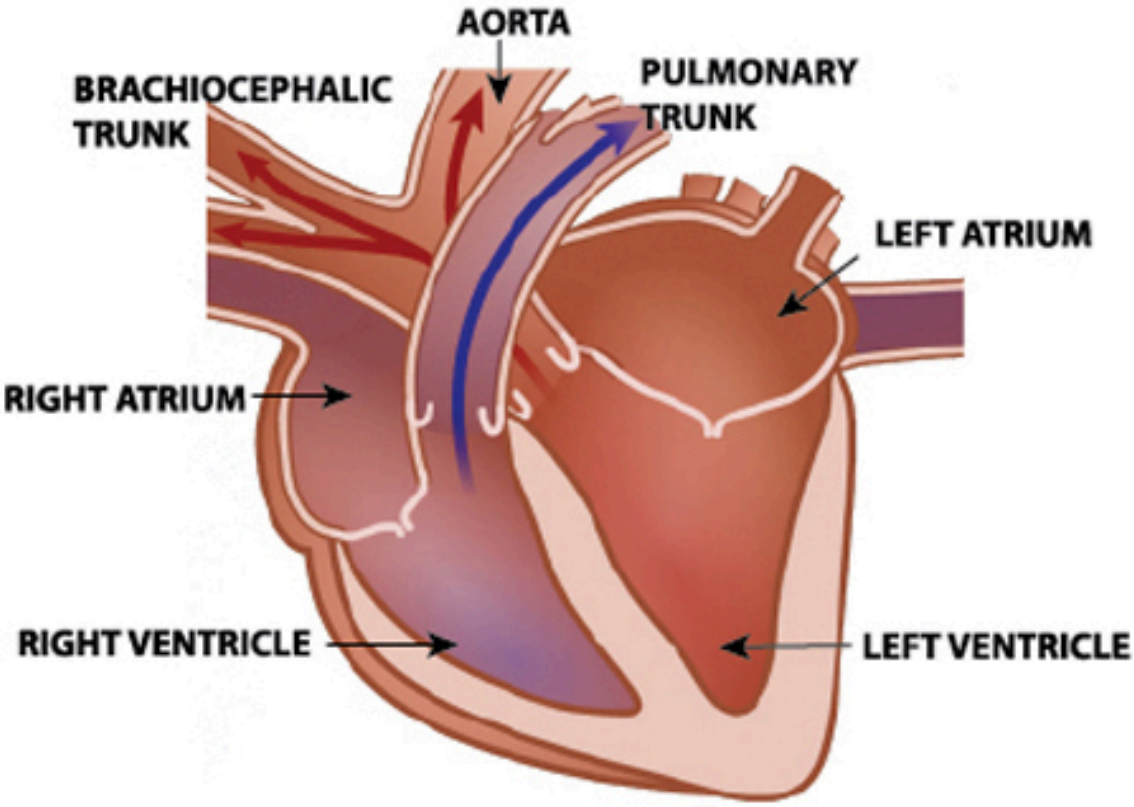
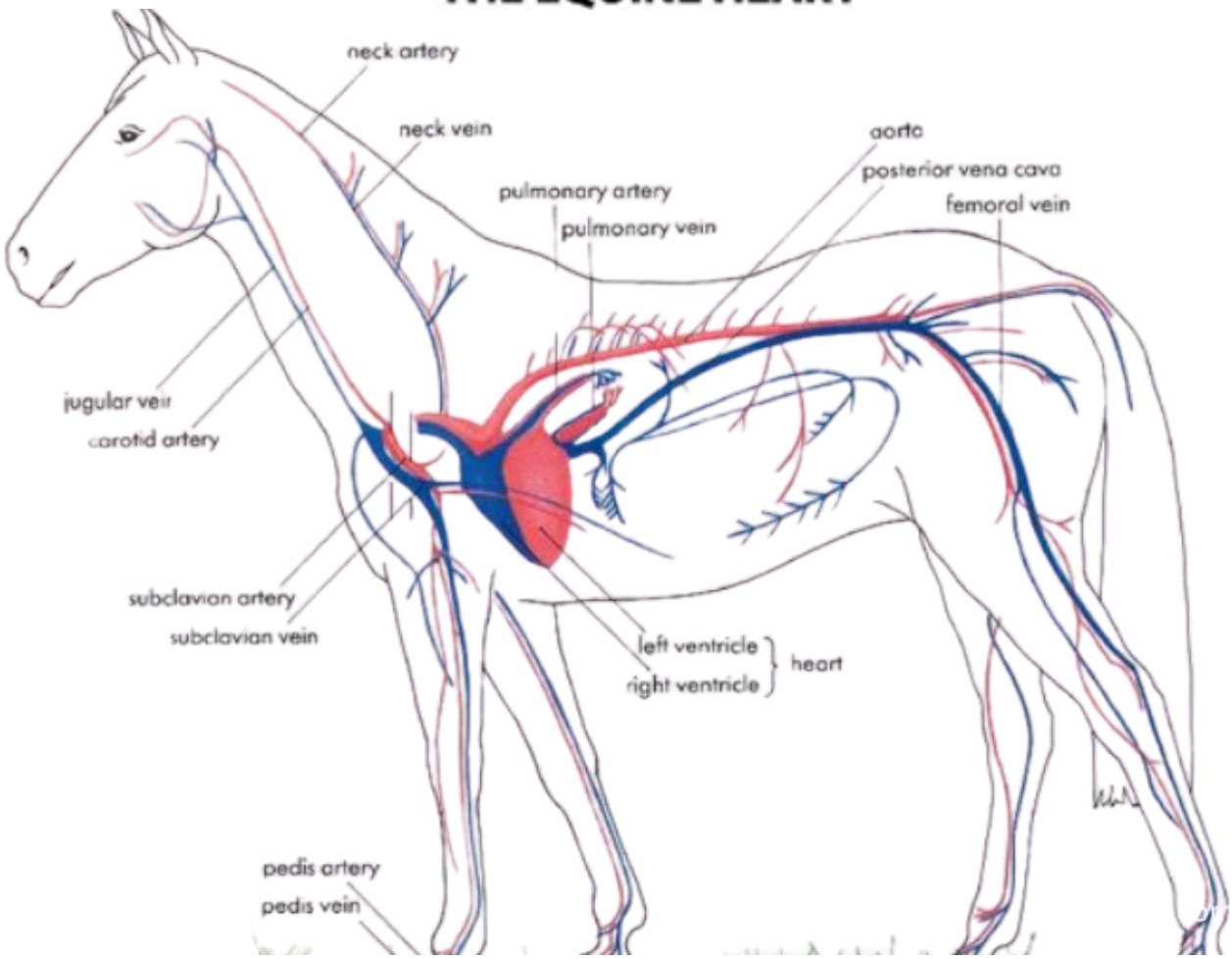



## THE EQUINE HEART



# The HEART of a HORSE

My Name: _____

My Resting Heart Rate: _____

My Active Heart Rate: _____

Horse Name: _____

Horse Resting Heart Rate: _____

## Humans

| Age | Resting BPM |
|---|---|
| Infant | 100 - 180 |
| Children | 80 -100 |
| Teens | 70 - 120 |
| Adults | 60 - 80 |

## Horses

| Age | Resting BPM |
|---|---|
| Foal | 80 - 120 |
| Older Foal | 60 -80 |
| Yearling | 40 - 60 |
| Adult | 28 - 40 |

What happened after you exercised?

_____

Why? _____

_____

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