

Lesson 9 – “Yo-got” a heart beat!

Overview

In this lesson, UQUEST scientists will learn about **manipulation** and **experimentation**.

Manipulation is the process of purposefully changing a variable in an experiment. Manipulation is important because it allows scientists to explore how changing a variable (independent variable) can affect another variable (dependent variable). Experimentation is the practice of manipulating a variable and observing the results on another variable. Experimentation is essential in science because it allows the examination of cause-and-effect relationships. Through manipulation and experimentation, scientists examine the causes of the variability observed in the world around us. Manipulation and experimentation are also useful in daily life. For example, while cooking, manipulation and experimentation can be used to understand how to make food tastier by manipulating ingredients.

In this lesson, UQUEST scientists will conduct an experiment to examine the effect of manipulating yoga type on heart rate. UQUEST scientists will do a restorative “slow” yoga sequence (slow, deep stretches) followed by a power “fast” yoga sequence (fast-paced quick stretches). They will compare the effect of slow/restorative yoga versus fast/power yoga on their heart rate. UQUEST scientists will measure their heart rate with a pulse oximeter, log their heart rate in the two conditions and then create a bar graph in their lab notebooks. We will discuss that certain kinds of stretching may elevate heart rate, whereas some types of yoga may help one relax.

Science Objectives:

UQUEST scientists will:

- Understand that manipulation is the process of changing a variable.
- Understand that experimentation involves manipulating one variable to examine the effect it has on another variable.
- Understand that experimentation is not the same as an observational study
- Learn how to measure their heart rate.

Health Messages:

- Yoga is a healthy and a fun form of exercise.

Reinforcement of previous messages:

- Variability (Lesson 2) - People vary in how they react to different styles of yoga.
- Measurement (Lesson 5) - Scientists can create tools (stethoscopes) to measure variables (e.g., heart rate).
- Independent and dependent variables (lesson 7)

Vocabulary:

- **Experiment:** The practice of manipulating a variable and observing the results on another variable.
- **Manipulation:** The process of changing a variable in an experiment.
- **Pulse:** A measure of how fast your heart is beating.

Materials:

- UQUEST kit
- Yoga mats
- Stethoscopes
- Pulse oximeters
- Speakers for instrumental yoga music. Example:
<https://www.youtube.com/watch?v=2RTZNLL0wss>

Preparation:

At UM:

- Learn how to properly measure heart rate, including how to accurately locate pulse, in order to instruct the UQUEST scientists.

At OYC:

- Prepare the tables

Introductory Script (~3 mins):

Welcome UQUEST scientists.

Remember the lab notebook is an important tool that scientists use to record their observations and the results of their experiments.

Let's open up your lab notebooks to the second page. Like all scientists, UQUEST scientists pay attention to the world around them. They create an environment that helps them to learn about the world. They listen to each other. They communicate with each other. And they treat each other with respect.

Let's review the values of a UQUEST scientist. Each UQUEST scientist reads OUT LOUD one value.

1. **Pay attention** when others are talking.
2. **Speak in a low voice.** Do not scream.
3. **Respect each other.** Do not push or shove each other.

Be sure to praise the students when they do well and tell them why

Relaxation (~2 mins)

Before we begin the lesson, we'd like to start off by doing a relaxation activity. When scientists are relaxed, they do better science.

For today's relaxation activity we will play Simon Says: Stretch.

- Guide the UQUEST scientists, through a game of Simon Says, to stretch for ~1 minute. They can stand or stay seated.

Instructions for Guides

1. Introduction (~5 minutes)

- a. **Guide shows a stethoscope to scientists.** *Have you ever seen a stethoscope before? Where? What was it used for?*
- b. **Hand out one stethoscope to each scientist. Demonstrate putting on the stethoscope:**
 1. *The ear pieces "point" to your nose*
 2. *Put the large part of the drum towards your chest*
 3. *NOTE: if the stethoscope isn't working, try twisting the tube to cover or uncover the little hole in the middle of the drum*
 4. **For ~5-10 minutes, scientists have fun using the stethoscope to measure their pulse.**
- c. *Could you hear something? What is that called?*
 1. *That's your heart beat. When your heart beats, blood is pushed from your heart to the rest of your body. The heart beat creates a heart rhythm, called your pulse. Your pulse tells you how fast your heart is beating.*
- d. **Hand every scientist a pulse oximeter.**
- e. *Another way to measure your pulse is with a pulse oximeter.*
- f. **Instruct scientists to put pulse oximeter on their own finger, wait a few seconds and then show which number on the device shows the pulse rate. The bottom number is the pulse; the top number is the oxygen saturation. We are not looking at the top number.**
 1. **Scientists write this number down on page 9C next to "heart rate at baseline."**

2. Activity (~20-25 minutes)

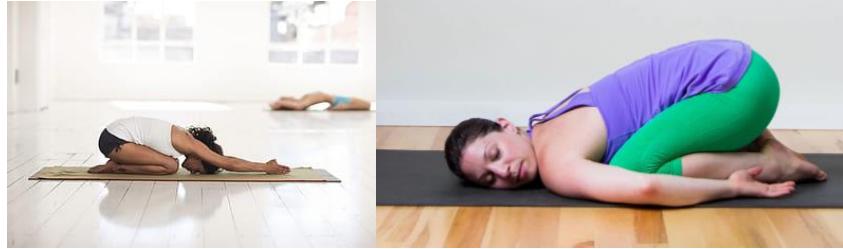
- a. **Introduce experimentation and manipulation**
 1. *Our heart rate changes all the time, depending on what we are doing or how we are feeling. Certain behaviors and situations can affect our heart rate. For example, yoga is a healthy and fun form of exercise that can affect your heart rate. There are many types of yoga.*
 2. *An **experiment** is the practice of manipulating, or changing, a variable and observing the results on another variable. So, an experiment is the practice*

of changing the independent variables and observing the results on the dependent variable.

3. *Today, we are going to conduct an **experiment** to measure how different kinds of yoga practices may affect heart rate. We are going to do this by **manipulating** -- changing-- the kind of yoga we do and observing the effect on our heart rate.*
4. *Remember when we made elephant toothpaste?*
 1. *We did **experiments** by manipulating, or changing, the independent variable. In the elephant toothpaste **experiment**, we **manipulated** if the water was hot or cold to make the toothpaste. What was the dependent variable?*
 - a. *Elephant toothpaste thickness*
5. *In today's **experiment**, we want to know which yoga type makes your heart beat faster.*
 1. *We will first do 3 restorative yoga poses, which is very calm and involves slow stretching and relaxation.*
 2. *Then we will do power yoga sequence two times, which involves quick movements while breathing.*
 3. *After you do each type of yoga, you will measure your pulse using the pulse oximeter and write your pulse on page 9C of your lab notebook.*
 4. *Let's make a hypothesis. Which yoga type will make your heart beat faster? Restorative or power? Circle your answer in page 9B of your lab notebook.*

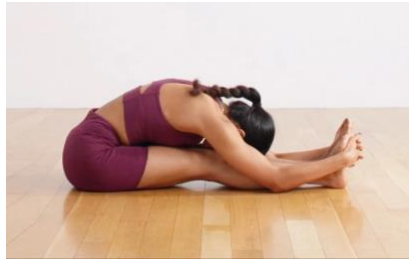
b. Restorative Yoga

1. **Ask all the scientists in the class to go to a yoga mat.**
2. **Remember to have the pulse oximeters close to the mats.**
3. **Script for restorative pose #1:**
 1. *Okay everyone. Before we begin our first pose, it is very important to know that none of the yoga poses should hurt you or cause you any pain. If you feel any pain or discomfort while we do yoga, please stop doing yoga and lay down on your mat.*
 2. *The first yoga pose we are going to do is called **child's pose**. First, sit on your heels on your yoga mat. Then take your knees apart to the edges of the mat and touch your toes together at the back of the mat. Slowly bring your torso down to rest a cheek on the front of the mat and place your arms either down alongside the mat or in front of you. Relax your body deeply. Breathe in.... breathe out.... We are going to stay in this pose for about one minute (**set a timer for ~one minute**), continuing to relax your body deeply. The entire time, try to think about your breathing. Breathe in.... out..... breathe in.... out....*



4. Script for restorative pose #2:

1. Now we are going to do **forward seated fold**. Begin seated with your legs straight in front of you. Flex your feet and press your heels away from you. Inhale and sit tall. Exhale and hinge at your hips to lean forward. Lengthen your spine rather than round your back. Walk your hands as far forward as your back and hamstrings allow you to comfortably stretch. If you can reach your feet, loosely rest your hands on the outer edges. We are going to stay here about 1 minute (**Set a timer for ~one minute**). Keep your feet flexed with your knees and toes pointing toward the ceiling. With each inhalation, lift and lengthen your chest slightly..... with each exhalation, release a little more fully into the forward bend. If your hands are resting on your feet, let your elbows bend out to the sides. **After one minute:** To come out, release your feet as you slowly come back to sitting on an inhalation.



5. Script for restorative pose #3:

1. Now, for the final restorative yoga pose, we are going to do a pose called Sukhasana. Please sit criss cross apple sauce on the mat and put your yoga fingers (middle finger and thumb touching) gently on your knees. Focus on finding relaxation and doing deep breathing. We are going to stay in this pose for about 1 minute.... Continue to breathe in.... breathe out.... deep breath in.... deep breath out.....



6. *Okay, now without moving too much, put the pulse oximeter on your finger. When you have the number, remember it, stand up, and go write it down on page 9C of your lab notebook.*

c. Power Yoga

1. Ask scientists to return to yoga mat.

<https://www.youtube.com/watch?v=qIGRZS-YMWo>

00:36 – 3:11

2. Script for power yoga

1. *Now for the power yoga, we are going to do a yoga sequence called sun salutation. Remember that none of the yoga poses should hurt you or cause you any pain. If you feel any pain or discomfort while we do yoga, please stop doing yoga and lay down on your mat.*
2. *We are going to begin with the first pose. Stand up super tall with your back straight and your feet firmly planted to the ground.... Now.... bring the palms of your hands together at the center of your heart..... inhale deeply.... look up..... and reach your arms up to the sky as high as you can and gently arch your back.*
3. *Now breathe out while you lean forward and pretend your arms are the tentacles of a jellyfish. Place your palms flat on the ground and take a deep breath in..... Keep your hands firmly planted on the ground and put your right foot back, resting your knee and planting your foot on the ground.....*
4. *Keeping your hands to the ground, move your left leg back and raise your hips as high as you can finishing in downward dog....*
5. *Now lower your whole body to the floor and lie face down with the palms of your hands on the ground. Feel your breath and as you breathe in, push your hands through the ground and lift your head and chest at the same time - breathe out through your mouth and teeth - making the sound of a snake sssssssssss.*
6. *Let's go back to downward dog pose – raise your hips as high as you can..... Take a big jump forward towards your hands and breathe in one big breath. Keep your arms down by the mat and again, pretend your arms are the tentacles of a jellyfish.*

7. *Now, while you breathe in, slowly lift your arms and stretch your legs and arms really well. Now, let's go back to the first pose with the palms of your hands together at the center of your heart. Take a deep breath.*
8. *Now we are going to repeat all those steps one more time but a little bit faster. Re-read script from 2 through 7.*
9. *Same as before, put the pulse oximeter on your finger. When you have the number, remember it, stand up, and go write it down on page 9C of your lab notebook.*

3. Documentation (~10 minutes)

- a. *Now let's graph our data. As we learned in past quests, bar graphs are graphs used to compare groups.*
- b. *In our example, there are 2 bars because our experiment only had 2 types of yoga.*
 1. *The two types are on the x-axis. What are the two types of yoga?*
 1. *Restorative and power.*
- c. **Each UQUEST scientist will make their own bar graph in their lab notebook using their heart rate data that they collected during the experiment.**
 1. *Look at page 9D of your lab notebook. First, you will graph your heart rate after doing restorative yoga.*
 2. *Second, you will graph your heart rate after doing power yoga.*
- d. *What do you see in your bar graph? Do you see any patterns? Do you observe a difference in your heart beat between the two types of yoga?*
- e. *Was your hypothesis on page 9B correct?*

4. Discussion (~10 minutes)

- a. *Now let's discuss what we did today. I will ask some questions, and if you answer, you get a sticker. At the end, the stickers can be traded in for a special prize. Let's GO!*
 1. **Award sticker for every question answered.**
- b. **Note:** *below are example questions. You can ask additional questions not listed!*
- c. **What did we do today?**
 1. *Today we conducted an experiment by manipulating the type of yoga and observing the effects on heart rate.*
- d. **What two activities did we do today?**
 1. *In today's experiment, you did two different activities that affected your heart rate.*
- e. **What is an experiment?**
 1. *An experiment is the practice of manipulating, or changing, a variable and observing the results on another variable.*
- f. **What did we manipulate in today's experiment?**
 1. *When we change activities from restorative yoga to power yoga, we call this manipulation.*
- g. **What is an independent variable?**
 1. *Variable that we change.*

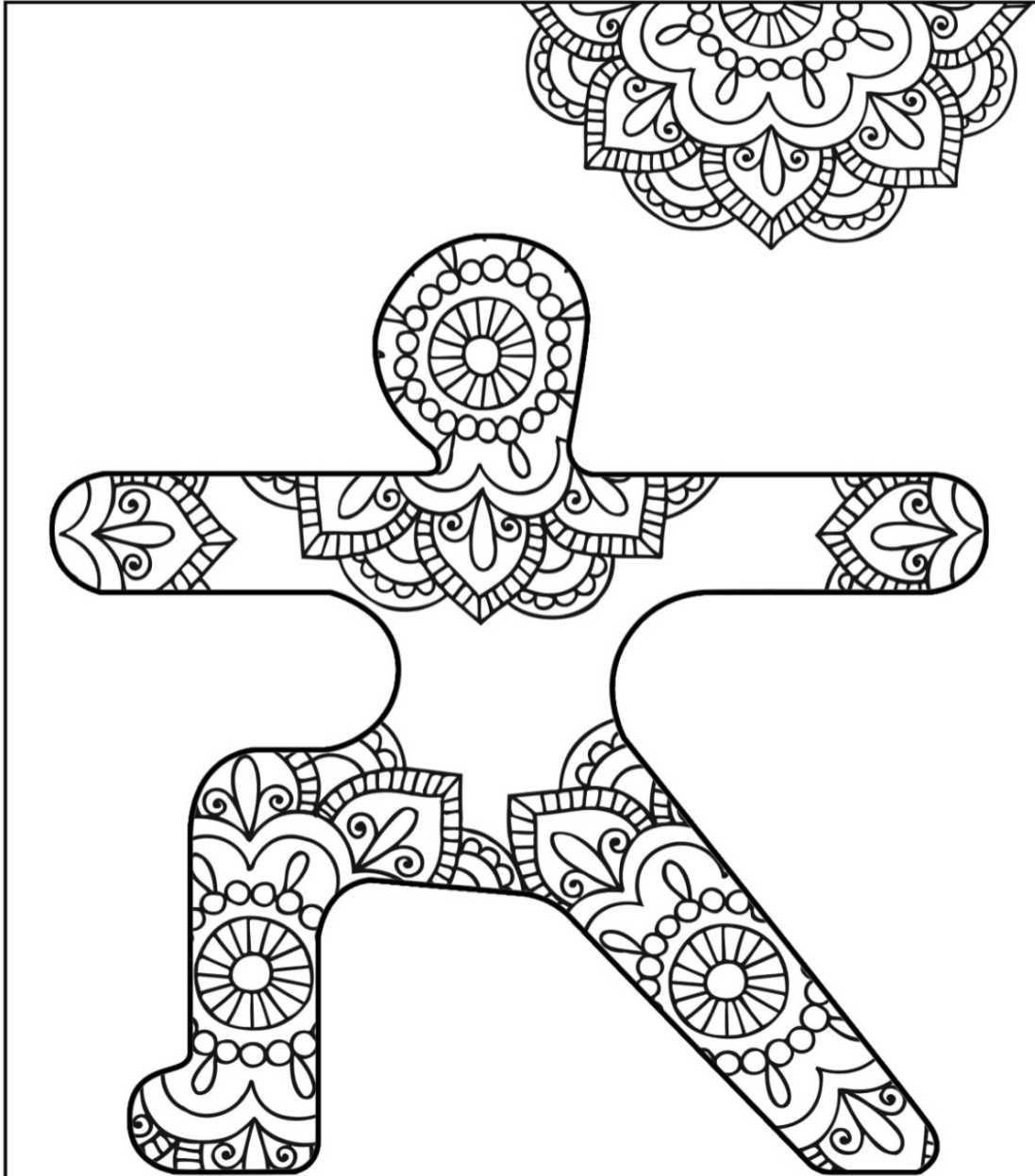
- h. **What was the independent variable of our quest today?**
 - 1. *The kind of yoga practice: restorative or power yoga*
- i. **What is a dependent variable?**
 - 1. *The variable that we observe after changing the independent variable.*
- j. **What was the dependent variable of our quest today?**
 - 1. *Heart rate*
- k. **How did we observe the effects of our manipulations? In other words, how did we measure our heart rates?**
 - 1. *We measured heart rates using the pulse oximeter device.*
- l. **Was your heart rate higher after restorative yoga or power yoga?**
 - 1. *Many of us may have discovered that power yoga makes us have higher heart rates. Some of us may have discovered that yoga type does not affect our heart rate.*
 - 1. *When people have different reactions to different activities, we can call this variability.*
- m. **If your heart rate increased with the power yoga, why do you think that happened?**
 - 1. *Since your body needed to work harder to pump blood throughout your body while doing power yoga, your heart rate went up.*
- n. **What were the results of today's experiment?**
 - 1. *The type of yoga we do can affect our heart rate.*
- o. **What are the benefits of increasing our heart rate when we exercise? Why should we exercise?**
 - 1. *The heart is a muscle too and exercising can help it be strong.*
- p. **What type of yoga did you like more? Why?**

Wrap up:

- a. *What did you learn today? Write that down on the lines on page 9E.*
- b. *How much did you like today's lesson on scale from strongly agree to strongly disagree.*
- c. **Award prize at the end based on number of stickers.**

Lesson 9

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Date: _____

Hypotheses

Instructions: Circle your hypotheses.

Which yoga type will make your heart beat faster? Circle one.

Restorative yoga



Power yoga



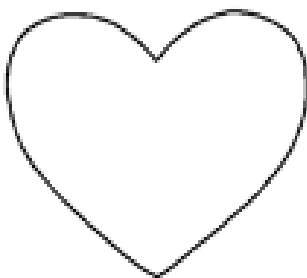
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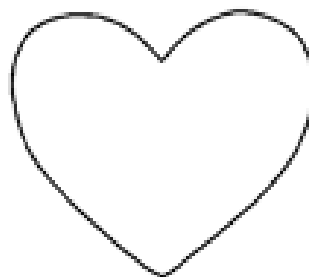
Experimentation

Instructions: Write your heart rate inside of the heart.

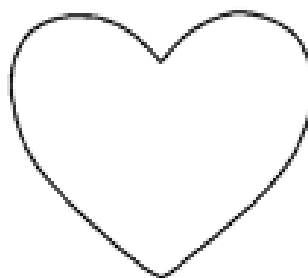
1. Heart rate at baseline



2. Heart rate after restorative yoga



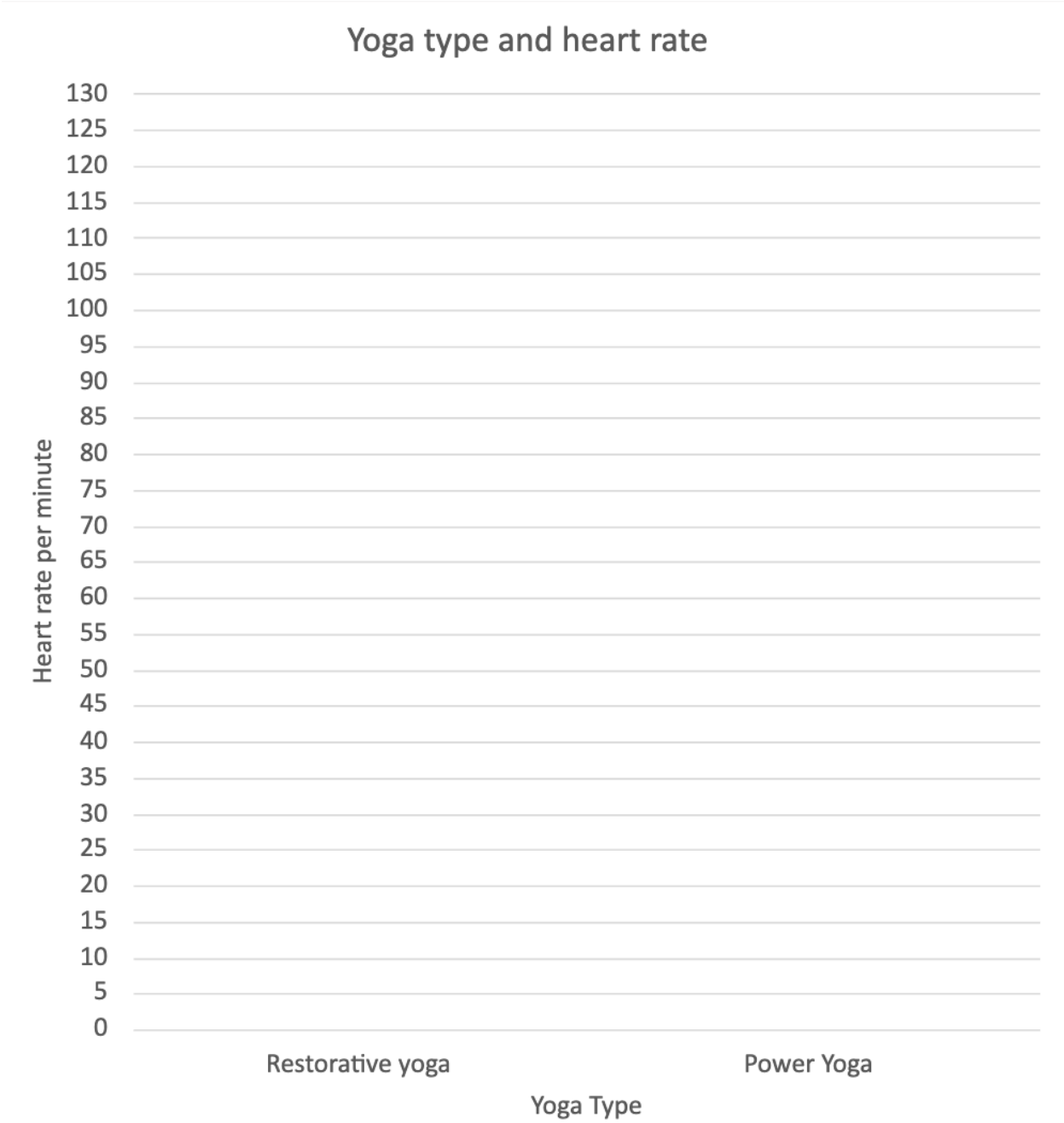
3. Heart rate after power yoga



Date: _____



Graphing



Date: _____



Lesson 9

What did I learn today?

I liked this lesson (circle one):

**Strongly
Agree**



Agree



Disagree



**Strongly
Disagree**

