Engage: How do you measure heart rate recovery?

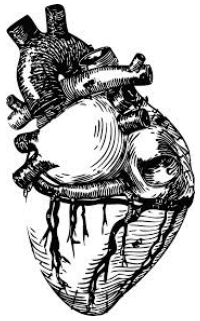
Name_____ Class_____ Date_____

> *"We cannot change what we are not aware of, and once we are aware, we cannot help but change?"*
>
> Sheryl Sandberg
>
> Chief Operating Officer, Facebook

Background: Cardiovascular disease (heart disease and stroke) is the number one killer of adults in the United States. Nearly 800,000 people die of cardiovascular disease each year; that is one in every three deaths. Americans suffer 1.5 million heart attacks and strokes each year. The most important risk factors for cardiovascular disease include tobacco use, a sedentary lifestyle, high blood pressure, and high cholesterol. As risk factors accumulate (e.g., inactivity + high blood pressure), there is a cumulatively greater increase in the risk for cardiovascular disease. About half of Americans (47%) have at least one of these risk factors. In addition, about 1 in 3 adults or approximately 86 million people have at least one form of cardiovascular disease. Cardiovascular disease costs the United States $320 billion a year in treatment, medication, and lost productivity. This represents one in every six health care dollars spent. It is estimated that this cost will rise to $818 billion and lost productivity to $275 billion by 2030.

1. What are the main components of the cardiovascular system?

2. What are the primary functions of the cardiovascular system?



Human Heart

3. The responsibility for the health of your cardiovascular system is largely an individual choice. Explain how that individual choice impacts the larger population health issue of cardiovascular disease in the United States.

What is heart rate recovery?

Heart rate recovery refers to the speed at which your heart rate returns to the baseline pulse rate after a period of exercise. It is a useful indicator of overall cardiovascular health in that healthier individuals experience a more rapid return to the resting heart rate. When you exercise, the sympathetic nervous system (fight or flight mode) activates and the parasympathetic nervous system (rest and digest mode) withdraws. This causes an increased heart rate, increased blood pressure, and decreased blood flow to the digestive organs. When you stop exercising, the opposite process occurs: a decreased heart rate and a return of the body to homeostasis or steady state. Studies show the speed at which our heart rate declines after exercise is attributed to how quickly the nervous system shifts from sympathetic to parasympathetic. Delayed or impaired parasympathetic activation is an important indicator of cardiovascular health and fitness. Heart rate recovery is slowed in patients suffering from cardiovascular disease and is accelerated in well trained athletes. In essence, the less efficient your heart is, the more it has to beat (beats per minute) to move blood through the body to sustain a given amount of work (e.g. jogging 4 mph). Regular cardiovascular exercise strengthens the heart muscle allowing your heart to increase the volume of blood it pumps with every beat. Heart rate recovery is one method used to measure cardiac efficiency.

Materials:

Timer

Space to do moderate exercise

Diagram of an EKG

4. You will be working in groups of two, three, or four. Select a volunteer from the group. The volunteer should be healthy and not suffering from any respiratory, cardiovascular, or musculoskeletal conditions. The volunteer should also be dressed in a manner that facilitates a brief period of moderate exercise.

5. Measuring heart rate recovery requires the volunteer to do moderate exercise until they reach their target heart rate. The target heart rate is approximately 70% of the estimated maximum heart rate (220-age). Example: if you are 15 years old, your target heart rate would be (220 – 15) x 0.70 = 144 bpm (beats per minute). Record your target heart rate in the space below and in Table 1.

   Target Heart Rate = _____

6. Your instructor will demonstrate how to measure your heart rate by finding a pulse point (either on the neck or the wrist). Count the number of heartbeats you feel in 15 seconds then multiply that number by four to get your resting heart rate (beats per minute). Record your resting heart rate in the space below and in Table 1. Resting heart rate is also an indicator of cardiac efficiency. Efficient and fit hearts tend to have lower resting heart rates.

   Resting Heart Rate = _____

7. To measure your heart rate recovery, you have to perform moderate exercise until your heart rate reaches the target heart rate you recorded in step 5. You can run in place, jog, do jumping jacks, jump rope, go up and down stairs, do burpees… time and space will dictate the types of available exercise.

You will generally have to exercise for 3 to 5 minutes to reach your target heart rate. Check your heart rate using the steps outlined in step 6 above. As soon as you have reached your target heart, stop exercising, sit down, and measure your heart rate. Record this information in Table 1 below. Rest for two minutes then measure your heart again. Record this information in Table 1. To calculate your heart rate recovery, subtract your heart rate after two minutes rest from your heart rate immediately after exercise. Record this value in Table 1.

Table 1: Calculating Heart Rate Recovery

Volunteer Initials	Age	Gender	Fitness Level* 1, 2, 3	Resting Heart Rate	Target Heart Rate	Heart Rate After Exercise-A	Heart Rate, at 2 minutes-B	Heart Rate Recovery: A - B

* 1 = Competitive athlete in training, 2 = exercise three or more times per week, 3 = average fitness.

Heart rate recovery is generally defined in terms of your biological age (e.g. the relative fitness or efficiency of your heart) compared to your calendar age. Below are some comparative guide-lines. Check the description that best matches the data generated by the research volunteer:

If your heart rate recovery is –

- ☐ *Less than 22, your biological* ***** *age is older than your calendar age.*
- ☐ *22 – 52, your biological age is about the same as your calendar age.*
- ☐ *53 – 58, your biological age is slightly younger than your calendar age.*
- ☐ *59 – 65, your biological age is moderately younger than your calendar age.*
- ☐ *66+, your biological age is much younger than your calendar age.*

*Biological age (also referred to physiological age) refers to how old a person seems to be from a physiological perspective. e.g. Assume you are a 15 year old and your heart rate is 142 bpm immediately after exercise. Two minutes after exercise, your heart rate is 123 bpm. Your heart rate recovery would be 142 bpm – 123 bpm = 19. According to the above chart, your biological age is older than a typical 15 year old. In other words, your heart reacts like a heart from someone older than 15.

8. Confer with several other groups and record the data from their research volunteer in Table 1.

9. Refer to the data in Table 1 to completely and concisely address the following questions. Be sure to defend your responses with examples from the data.

a) Does there appear to be a relationship between age and heart rate recovery?

b) Does there appear to be a relationship between gender and heart rate recovery?

c) Does there appear to be a relationship between fitness level and heart rate recovery?

d) Does there appear to be a relationship between resting heart rate and heart rate recovery?

10. How would beginning, or increasing the intensity and duration of, an exercise program affect heart rate recovery? Why?

Teacher Comments: