Learning Objectives:

* Collect EKG and heart rate data at rest and after exercise
* Analyze EKG and heart rate data
* Connect anatomical knowledge and physiological knowledge to data

Grading: Each question in parts 3 and 4 is worth 1 point

Procedure: Follow the instructions below to record your own EKG using the [AliveCor KardiaMobile device](https://store.kardia.com/products/kardiamobile) and the app (download from Apple or Android store).

**Part 1: Data collection at rest**

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1. Open the Kardia app. Close any ads or updates.
2. Click on record your EKG. If the device needs paired please follow the prompts.
3. Set EKG device on a flat surface and put your fingers on the EKG device as shown at the right.
4. Stay still and breathe normally and after 30 seconds your EKG will be finished.
5. After the EKG select “No it was a guest”
6. Scroll down to select the Download PDF option. Click Skip.
7. Click the share icon in the upper right corner and email yourself a copy of your EKG. Click Done.
8. Click the green X in the upper right corner.
9. Have everyone in your group repeat steps 2 to 8 to record their own EKG.

**Part 2: Data collection after exercise**

1. Do some sort of aerobic exercise for one minute (jumping jacks, jog, etc).
2. Repeat steps 2 to 8 from part 1 to record your EKG.
3. Have everyone in your group repeat steps 2 to 8 from part 1 to record their own EKG.

**Part 3: Calculation of cardiovascular physiology parameters**

1. Calculate your cardiac output at rest and after exercise. Assume a typical stroke volume for adult males (91 ml) and for adult females (75 ml) and that stroke volume did not change during the brief exercise.
2. Explain how your cardiac output changed after exercise. Why did it change?
3. Calculate your ESV at rest. Assume a typical EDV for adult males (167 ml) and adult females (119 ml).
4. Calculate your ejection fraction at rest.
5. Explain how changes in preload, contractility, and afterload can affect ejection fraction.

*Reference for CV properties:* [*https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2657902*](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2657902)

**Part 4: Analysis of EKG data**

1. On the following pages insert a copy of your EKG at rest and your EKG after exercise.
2. How do your EKG readings differ between rest and exercise?
3. Annotate your EKG at rest. Pick one of your heart beats and label the P wave, QRS complex, and T wave.
4. Calculate your heart rate from one of your heart beats on your EKG. Find the distance between successive peaks of the QRS complex. The horizontal distance between each “dot” on the EKG readout is 1 mm and the horizontal distance between successive solid black lines is 25 mm. The rate of the readout is 25 mm/s.

Use this equation to calculate your heart rate:

HR = 25 / distance between successive peaks of QRS complex \* 60 bpm

1. How did your calculation in step 4 compare to the heart rate readout from the EKG? If it was different explain why.