CIRCULATORY SYSTEM LAB 08-09
HEART SOUNDS, PULSE, BLOOD PRESSURE, and CARDIOVASCULAR FITNESS

Objectives: To study three manual methods of obtaining information about the circulatory system.
To use computer technology to determine your level of cardiovascular fitness.

Procedures:

A. HEART SOUNDS

Using the stethoscope, explore your chest region to determine the locations at which the heart sounds are loudest and clearest. The successful use of a stethoscope requires a QUIET atmosphere, so please refrain from talking too loudly in lab today. If necessary, use the back room. Listen to the heart sounds, trying to note the difference between the two heartbeats. Be sure to keep the stethoscope disc stationary so that the sounds of rubbing on your clothing do not interfere with the heart sounds. Answer the following:

1. What area was the best location for listening to the heart sounds?
2. Describe the sounds that you hear for each of these characteristics:
   Rhythm – Describe the sequence and timing of the sounds
   Strength – how loud are they? Are they equal or is one louder than the other?
   Regularity – how steady is the pattern? Is it's rate staying the same or varying?
3. What physically causes these sounds?

B. PULSE

The pulse of an Individual can be felt by placing a finger on a superficial artery. From the pulse, we can determine heart rate, regularity of heartbeats and strength of the heartbeat. The pulse rate (heart beat) varies widely from one individual to another, as well as within an Individual under varying conditions.

1. Measure your pulse rate and record it on the data sheet. (Count for a full 60 seconds, don't estimate)
2. What artery in the wrist is the most commonly used pulse artery? What neck artery is also commonly used?
3. Exactly what is causing the pulses that are you feeling?
4. Why must you avoid using the thumb when taking someone's pulse?

C. BLOOD PRESSURE

Guidelines: BP must be taken at the brachial artery while the person is seated with their arm resting on a table at heart level. Unless otherwise instructed, make sure you are calm during the test.

1. Using the sphygmomanometer, have a partner record your blood pressure (record the average of 2 trials).
   Average resting BP _____

Below are the AVERAGES for your age group based on data from about 100 Anatomy Students over the past 2 years. They accurate to + or – 10.
Resting: 108/65 10 Sec. After Exercise: 136/75 1 min after Exercise: 120/70

2. Exercise for 1 minute by doing squats. Record your BP 10 sec after you finish. Rest for 1 minute and take it again. Record on the data sheet.

3. Compare your data to the "averages". What do you think that this says about your circulatory fitness?

4. What factors in <u>your life</u> might have had an elevating or lowering effect on the values you recorded today?

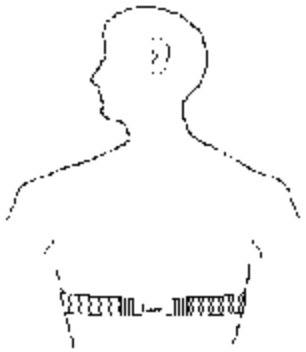
D. Heart rate and physical fitness

Important: Do not attempt this experiment if physical exertion will aggravate a health problem. Inform your instructor of any possible health problems that might be affected if you participate in this exercise.

PROCEDURE

1. Wet each of the electrodes (the two grooved rectangular areas on the underside of the transmitter belt) with 3 drops of saline solution.

2. Secure the transmitter belt against the skin directly over the base of the rib cage. The POLAR logo on the front of the belt should be centered. Adjust the elastic strap to ensure a tight fit.



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1. **Hold the black reciever in one hand.**
2. **Click Start on the Logger Pro software.**
3. **<u>Stand</u> upright for <u>2 minutes</u>.**
4. **<u>Lie down</u> on the lab table for <u>2 minutes</u>. (completely relax)**
5. **<u>Stand upright quickly</u> at the end of the <u>2 minutes</u>. Your HR should spike, then return to normal.**
6. **<u>Stand</u> upright for <u>2 minute</u> to allow your HR to return to normal.**
7. **<u>Squat</u> in place <u>5 times</u>. Go down on a 1 second count to a point where your knees are bent at a 90 degree angle. Then stand back up on a 1 second count. (Down and up takes 2 seconds – do not go faster or slower or you data will be useless)**
8. **<u>Rest</u> for <u>1 minute</u> to allow your HR to go back down to normal.**
9. **<u>Squat</u> for <u>2 minutes</u> straight. Use the same slow, deliberate technique as you used before.**
10. **At the end of the 2 minutes of squats, <u>stand and rest</u> for an additional <u>2 minutes</u> while the computer records your recovery rate. The data collection will stop automatically at the end of those 2 minutes.**

Table A: Standing Heart Rate			
Beats/min	Points	Beats/min	Points
60–70	12	101–110	8
71–80	11	111–120	7
81–90	10	121–130	6
91–100	9	131–140	4

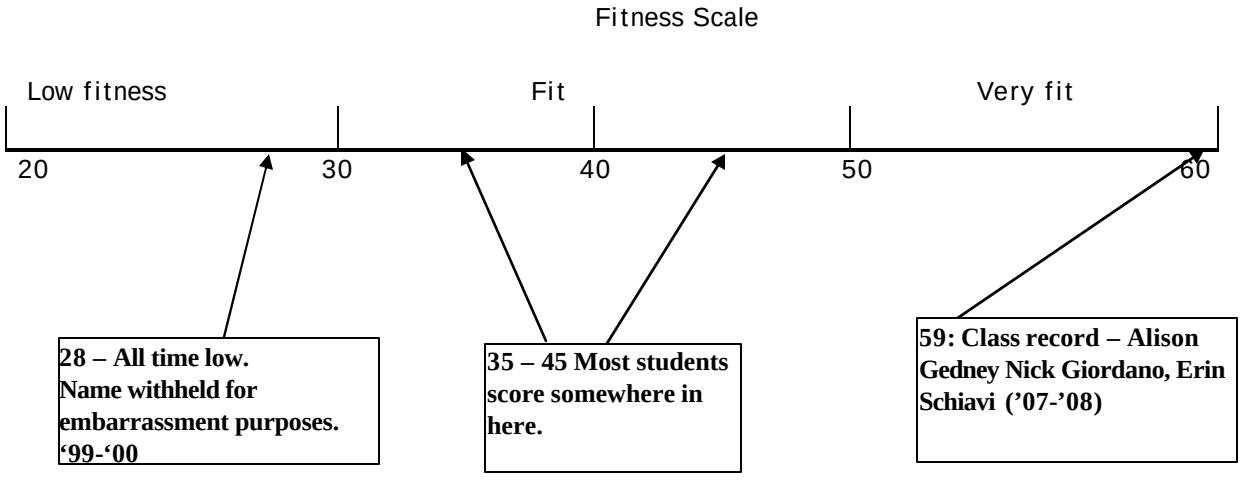
Table B: Reclining Heart Rate			
Beats/min	Points	Beats/min	Points
50–60	12	81–90	8
61–70	11	91–100	6
71–80	10	101–110	4

Table C: Reclining to Standing					
Reclining rate	Heart rate increase after standing				
beats/min	0–10	11–17	18–24	25–33	34+
50–60	12	11	10	8	6
61–70	12	10	8	6	4
71–80	11	9	6	4	2
81–90	10	8	4	2	0
91–100	8	6	2	0	0
101–110	6	4	0	0	0

Table F: Recovery Rate (to within 10 BPM of Resting)	
Time (sec)	Points
0–30	14
31–60	12
61–90	10
91–120	8

Table G: Endurance					
Standing rate	Heart rate increase after exercise				
(beats/min)	0–10	11–20	21–30	31–40	41+
60–70	12	12	10	8	6
71–80	12	10	8	6	4
81–90	12	10	7	4	2
91–100	10	8	6	2	0
101–110	8	6	4	1	0
111–120	8	4	2	1	0
121–130	6	2	1	0	0
131+	5	1	0	0	0

Total all the fitness points recorded in Table 6. Determine the personal fitness level using the scale below. Answer the Questions about your fitness level found on your Data Sheet.



E. Monitoring EKG

An electrocardiogram, or EKG, is a graphical recording of the electrical events occurring within the heart. A typical EKG tracing consists of five identifiable deflections. Each deflection is noted by one of the letters P, Q, R, S, or T. The P wave is the first waveform in a tracing and represents the depolarization of the heart's atria. The next waveform is a complex and consists of the Q, R, and S deflection. The QRS complex represents the depolarization of the heart's ventricles. The deflection that represents the repolarization of the atria is usually undetectable because of the intensity of the QRS waveform. The final waveform is the T wave and it represents the repolarization of the ventricles.

Because an EKG is a recording of the heart's electrical events, it is valuable in diagnosing diseases or ailments that damage the conductive abilities of the heart muscle. When cardiac muscle cells are damaged or destroyed, they are no longer able to conduct the electrical impulses that flow through them. This causes the electrical signal to terminate at the damaged tissue or be directed away from the flow of the signal. The termination or redirection of the electrical signal will alter the manner in which the heart contracts. A cardiologists can look at a patient's electrocardiogram and determine the presence of damaged cardiac muscle based on the time interval between electrical events.

In this activity, you will use the EKG sensor to make a three-second graphical recording of your heart's electrical events. From this recording, you will determine the time interval associated with each of the previously mentioned EKG waveforms.

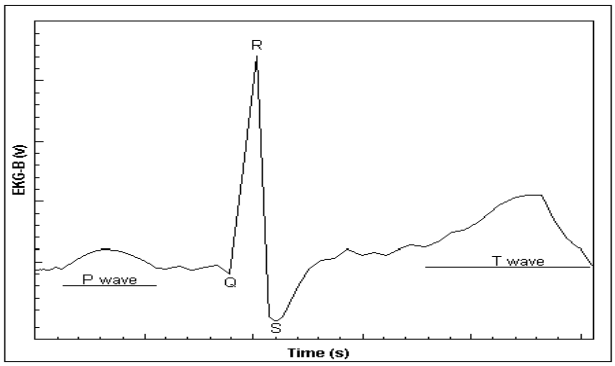


Figure 1

PROCEDURE

1. Attach three electrode tabs to your arms, as shown in Figure 2. A single patch should be placed on the inside of the right wrist, on the inside of the right upper forearm (below elbow), and on the inside of the left upper forearm (below elbow).
3. Connect the EKG clips to the electrode tabs as shown in Figure 2. Sit in a reclined position in a chair or lay flat on top of a lab table. The arms should be hanging at the side unsupported. When everything is positioned properly, click Collect to begin data collection.

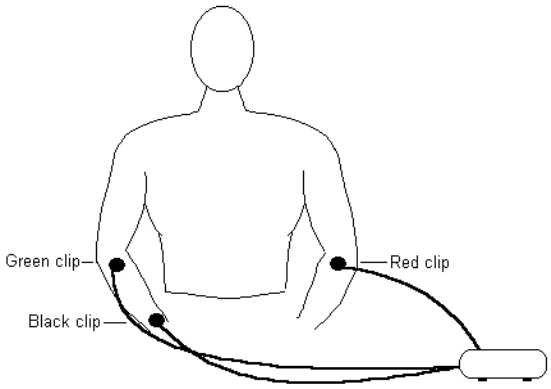


Figure 2

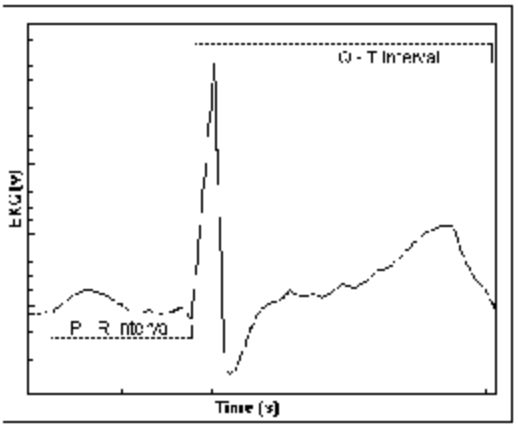
4. When data has been collected, click the examine button,  , to analyze the data. As you move the mouse pointer across the screen, the x and y values are displayed in the Examine window that appears. Identify the various EKG waveforms using Figure 1 and determine the time intervals listed below. Record the time intervals in Table 1.

   ?P-R interval: time from the beginning of P wave to the start of the QRS complex.

   ?QRS interval: time from Q deflection to S deflection.

   ?Q-T interval: time from Q deflection to the end of the T wave.

   ?Heart Cycle: time from beginning of the P wave to the end of the T wave.



5. Determine a method for calculating heart rate in beats/min using the EKG data. Using this method, calculate the heart rate and record the heart rate value in Table 1.

6. Use the software to analyze your EKG. Identify and label the various waveforms.