V. DATA ANALYSIS

**FAST TRACK DATA ANALYSIS**

1. Enter the **Review Saved Data** mode and choose the correct file.
   - Note Channel Number (CH) designations:
     - Channel Displays
     - CH 1 ECG
     - CH 40 Pulse
   - Note measurement box settings:
     - Channel Measurement
     - CH 1 Delta T (time interval)
     - CH 1 BPM (rate)
     - CH 1 P-P
     - CH 40 P-P

**DETAILED EXPLANATION OF DATA ANALYSIS STEPS**

If entering **Review Saved Data** mode from the Startup dialog or lessons menu, make sure to choose the correct file.

The data window should resemble Fig. 7.13.

![Fig. 7.13 Example data](image)

The measurement boxes are above the marker region in the data window. Each measurement has three sections: channel number, measurement type, and result. The first two sections are pull-down menus that are activated when you click on them.

**Brief definition of measurements:**

- **Delta T:** Displays the amount of time in the selected area (the difference in time between the endpoints of the selected area.)
- **BPM:** The **Beats Per Minute** measurement first calculates the difference in time between the beginning and end of the selected area (seconds/beat,) and divides this value into 60 seconds/minute.
- **P-P (Peak-to-Peak):** Subtracts the minimum value from the maximum value found in the selected area.
- **Rate Mean:** If CH 40 Heart Rate data was recorded, use the Rate Mean measurement, which is designed specifically for rate data and calculates accurate statistical means using one value only for every cardiac cycle. This avoids any unintentional weighting due to time variation in heart rate, unlike the amplitude "Mean" measurement.

The selected area is the area selected by the I-Beam (including endpoints.)

**Note:** The append event markers mark the beginning of each recording. Click on (activate) the event marker to display its label.

**Useful tools for changing view:**

**Display menu:** Autoscale Horizontal, Autoscale Waveforms, Zoom Back, Zoom Forward

**Scroll Bars:** Time (Horizontal); Amplitude (Vertical)

**Cursor Tools:** Zoom Tool

**Buttons:** Overlap, Split, Show Grid, Hide Grid, +, -

**Hide/Show Channel:** Alt + click (Windows) or Option + click (Mac)

2. **Zoom** in on a small section of the seated and relaxed data.

Data Analysis continues…
3. Using the I-Beam cursor, select the area between two successive R waves (one cardiac cycle).

4. Repeat the above measurements for each of the data recordings.

5. Using the I-Beam cursor, select the area between two successive pulse peaks (one cardiac cycle).

6. Repeat the above measurements for each of the data recordings.

7. Select individual pulse peaks for each recording and determine their amplitudes.

Try to go from R wave peak to R wave peak as precisely as possible (Fig. 7.14).

Use the P-P (CH 40) measurements.

Note: It is best to take measurements on data immediately following the start of the recording (after marker) because the body’s homeostatic regulation of blood pressure and volume occurs quickly. The increase or decrease in your results will be dependent on the timing of your data relative to the speed of physiological adjustments.

Data Analysis continues…
8. Using the I-Beam cursor, select the interval between the R-wave and pulse peak.

10. Save or Print the data file.
11. Quit the program.

Record two time intervals (ΔT) one from "Seated and Relaxed" data and "Seated, right hand above head" data.

![Fig. 7.17 R-wave to next pulse peak](image)

An electronically editable Data Report can be found in the journal (following the lesson summary,) or immediately following this Data Analysis section. Your instructor will recommend the preferred format for your lab.

**END OF DATA ANALYSIS**

**END OF LESSON 7**

Complete the Lesson 7 Data Report that follows.
ECG & PULSE

- Mechanical Action of the Heart, Peripheral Pressure Pulse, and Plethysmography

DATA REPORT
Student Name: ________________________________
Lab Section: ________________________________
Date: _______________________________________

I. Data and Calculations

Subject Profile
Name: ________________________________
Age: __________ Gender: Male / Female
Height: ______________ Weight: ______________

A. Comparison of ECG with Pulse Plethysmogram

Complete Table 7.1 with data from three cycles from each acquired recording and calculate the Means.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Selected Area</th>
<th>Measurement</th>
<th>Cycle 1</th>
<th>Cycle 2</th>
<th>Cycle 3</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arm Relaxed</td>
<td>R-R Interval</td>
<td>DeltaT CH 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Heart Rate</td>
<td>BPM CH 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pulse Interval</td>
<td>DeltaT CH 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pulse Rate</td>
<td>BPM CH 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temp. Change</td>
<td>R-R Interval</td>
<td>DeltaT CH 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Heart Rate</td>
<td>BPM CH 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pulse Interval</td>
<td>DeltaT CH 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pulse Rate</td>
<td>BPM CH 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arm Up</td>
<td>R-R Interval</td>
<td>DeltaT CH 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Heart Rate</td>
<td>BPM CH 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pulse Interval</td>
<td>DeltaT CH 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pulse Rate</td>
<td>BPM CH 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

B. Relative Volume Changes

Complete Table 7.2 with data from each acquired recording.

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Arm Resting</th>
<th>Temperature</th>
<th>Arm Up</th>
</tr>
</thead>
<tbody>
<tr>
<td>QRS Amplitude CH1 P-P</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relative Pulse Amplitude (mV) CH40 P-P</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
C. Calculation of Pulse Speed
Distance between Subject's sternum and shoulder? ______________ cm
Distance between Subject's shoulder and fingertip? ______________ cm
Total distance? _______________ cm

Data from ‘Arm relaxed’ recording of the recording (measure with I-Beam)
Time between R-wave and Pulse peak? _______________ secs
Speed? _______________ cm/sec

Data from ‘Arm up’ recording of the recording (measure with I-Beam)
Time between R-wave and Pulse peak? _______________ secs
Speed? _______________ cm/sec

II. Questions

D. Referring to data in table 7.1, are the values of heart rate and pulse rate similar for each condition? Yes / No
   Explain why the values might differ or be similar.

E. Referring to Table 7.2 data, how much did the amplitude of the QRS complex change between conditions?
   Extreme temp - Arm Resting? ___________ mV
   Arm up - Arm Resting? ___________ mV

F. Referring to Table 7.2 data, how much did the pulse amplitude change between arm positions?
   Extreme temp - Arm Resting? ___________ mV
   Arm up - Arm Resting? ___________ mV

G. Referring to Table 7.2 data, does the amplitude of the QRS complex change with the pulse amplitudes? Why or why not?

H. Describe one mechanism that causes changes in blood volume to your fingertip.

I. Referring to data from section C of this report, how would you explain the difference in speed, if any?

J. Which components of the cardiac cycle (atrial systole and diastole, ventricular systole and diastole) are discernible in the pulse tracing?
K. Would you expect the calculated pulse wave velocities of other students to be very close if not the same as yours? Why or why not?

L. Explain any amplitude or frequency changes that occurred with arm position.

III. OPTIONAL Active Learning Portion

A. **Hypothesis**

B. **Materials**

C. **Method**

D. **Set Up**

E. **Experimental Results**

End of Lesson 7 Data Report