**Introduction**

In this laboratory, you will become familiar with auscultation (listening to the sounds of the body) and the measurement of blood pressure. The exercises involve measuring your blood pressure using a stethoscope, blood pressure cuff and sphygmomanometer. You will also assess changes in peripheral circulation and the effects of cuff location.

The modern era of blood pressure measurement started with the introduction of the mercury sphygmomanometer by Scipione Riva-Rocci (1863-1937) in 1896.

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**Learning Objectives**

By the end of today's laboratory you will be able to:

- Use a sphygmomanometer and stethoscope to measure human arterial blood pressure
- Determine systolic blood pressure using a sphygmomanometer and detection of a peripheral pulse
- Demonstrate how measurement position affects the magnitude of the arterial blood pressure

**Procedure**

To perform this experiment correctly, you must be familiar with the use of the stethoscope and sphygmomanometer.

⚠️ Caution

The sphygmomanometer conveniently combines a cuff and bulb with a pressure transducer.
• Plug the pressure transducer into pod input 1 on the PowerLab.
• Plug the Cardio Microphone into pod input 2.
• Wrap the sphygmomanometer cuff around the upper arm just above the elbow as shown.

• Click Start.
• Practice inflating the cuff to approximately 180 mmHg and slowly reducing the pressure (1-2 mmHg per second) until you are confident that you can use the sphygmomanometer correctly.
• Click Stop.

Exercise 1

In this exercise you will measure blood pressure in the traditional way, using a stethoscope to listen for Korotkoff sounds.

Procedure

• Inflate the cuff until the pressure reaches approximately 180 mmHg.
• Slowly reduce the pressure in the cuff (approximately 1 to 2 mmHg per second) while listening through the stethoscope for Korotkoff sounds.
• The systolic pressure is the pressure at which sharp, tapping sounds are first heard.
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- Continue slowly reducing cuff pressure (at 1 to 2 mmHg per second). The diastolic pressure is defined as the pressure at which the sounds disappear.
- Completely deflate the cuff once diastolic pressure is determined. Do not leave the cuff partially inflated or leave it inflated for a long time.
- For each subject, record four measurements of the blood pressure. Allow one to two minutes between measurements for recovery.
- Repeat the procedure using other students until you feel confident in measuring blood pressure.

Exercise 2

In this exercise you will use the Cardio Microphone to record arterial sound while recording blood pressure.

Procedure:

- Leave the the blood pressure cuff in place around the upper portion of the student's arm (either arm), between the elbow and the shoulder.
- Place the Cardio Microphone over the brachial artery and under the blood pressure cuff so that it is held in position by the cuff.
- Click Start.
- Inflate the cuff until the pressure reaches approximately 180 mmHg.
- Slowly reduce the pressure in the cuff (approximately 1 to 2 mmHg per second). Deflate the cuff completely once the pressure has gone below 50 mmHg.
- Click Stop.
- Repeat the procedure using other students. Remember to add a comment with the subject's name for later identification. Allow one to two minutes between procedures for recovery.
**Analysis**

- Examine your recording. The Cardio Microphone channel displays the Korotkoff sounds as spikes. These spikes can be used to determine systolic and diastolic pressure.
- Place the Waveform Cursor on the first spike following the reduction in cuff pressure. This represents the systolic pressure.
- Click on this point to enter the pressure in the value panel and add the comment "systolic pressure" to the data.
- Drag the number from the value panel into the appropriate column of the table.
- Place the Waveform Cursor on the last spike in the series. This represents the diastolic pressure.
- Click on this point to enter the pressure in the value panel and add the comment "diastolic pressure" to the data.
- In some subjects it is not possible to determine diastolic pressure using this technique.
- Repeat these procedures for all subjects in your group.

**Exercise 3**

You will observe the changes in finger pulse while measuring blood pressure, and see if pulse measurement could replace the use of the stethoscope.

**Procedure**

- Remove the Cardio Microphone plug from pod Input 2.
- Connect the BNC plug of the finger pulse transducer to the BNC socket for Input 2.
- Place the pressure pad of the finger pulse transducer against the distal segment (the tip) of the middle finger of your hand (on the same arm as the blood pressure cuff). Use the Velcro strap to attach it firmly - neither loose nor tight.
- Relax, put your hands in your lap and sit as still as possible to minimize any movement artifact.
- Click Start, the recorded pulse should look something like this.
- Add a comment with the subject's name.
- Inflate the cuff until the pressure is just above 180 mmHg. Note that the pulse signal disappears.
- Slowly deflate the cuff at a rate of 1 to 2 mmHg per second.
- Once the pressure has reached 50 mmHg, completely deflate the blood pressure cuff.
- Click Stop.

**Analysis**
Examine your recording. Place the Waveform Cursor on the first finger pulse seen as the cuff pressure was falling. This represents the return of bloodflow to the forearm.

Click on this point to enter the pressure in the Value panel and add the comment "systolic pressure" to the data.

Drag the number from the value panel into the appropriate column of the table.

**Exercise 4**

This exercise is a variation on Exercise 3, with measurements taken from a different site on the arm and with the arm in different positions.

**Procedure**
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- Wrap the cuff around the forearm, immediately above the wrist, of the same hand which has the finger pulse transducer attached.
- Ensure the subject's elbow is flexed at 90 degrees, with the wrist resting on a chair arm or desk.
- Type "arm resting, 90 " into the comment panel.
- Click Start.
- Inflate the cuff to 180 mmHg.
- Press Add to enter the initial comment for this exercise.
- Slowly deflate the cuff at a rate of 1 to 2 mmHg per second.
- Once the pressure has reached 50 mmHg, completely deflate the blood pressure cuff.
- Click Stop.
- Repeat steps 3 to 9, entering an appropriate descriptive comment each time, with the arm in the following positions:
  - Hanging down loosely by the side
  - Held straight above the head.

Analysis

Determine the systolic blood pressure from the pressure cuff and finger pulse data.

- Examine the finger pulse data. Place the Waveform Cursor on the first pulse following the reduction in cuff pressure. This represents the systolic pressure.
- Click on this point to enter the pressure in the Value panel and add the comment "systolic pressure" to the data.
- Drag the number from the value panel into the appropriate column of the table.
- Repeat steps 1-3 for each of the protocols in the exercise.