

INVESTIGATING THE DIVING REFLEX

We are all familiar with somatic reflexes like the withdrawal reflex. It depends on an anatomical arrangement called a reflex arc consisting of a receptor, a sensory neuron, a center (2 synapses and an interneuron), a motor neuron and an effector. Locate the effector in Figure 1. This reflex also requires an **effective stimulus**. What is it? Would a thorn in a rose bush work as well?

A “diving reflex” has been identified not only in diving mammals but in non-divers as well. It is a visceral reflex that results in a slowing of the heart and peripheral vaso-constriction (to skin and skeletal muscle).

The result a drop in blood flow and blood pressure except in the body’s core. This reflex can be elicited in *Homo sapiens* by immersing the face in a few liters of water in a pan.

Can you elicit the reflex and determine the nature of the effective stimulus? Does it require cool or cold water? Is temperature the critical factor? Is wetting of the face required? What is wetting?

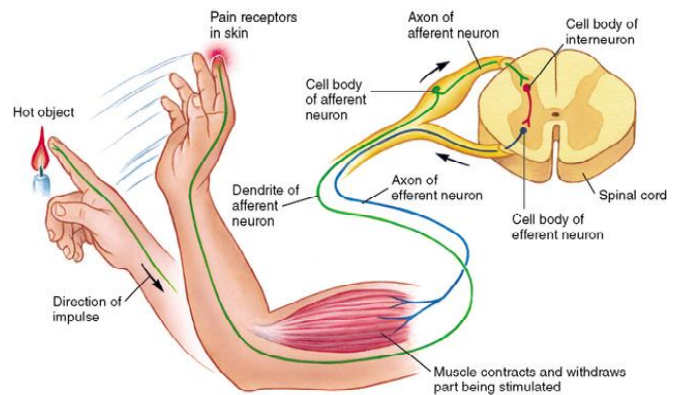


Figure 1

To monitor and record changes in heart rate you will use a Hand-Grip Heart Rate Monitor, a LabPro interface and a LoggerPro file “03Heart Rate Vital sign” on a computer.

Using a Hand-Grip Heart Rate Monitor

I. Grasp the handles of the Hand-Grip Heart Rate Monitor. Place the fingertips of each hand on the reference areas of the handles (see Figure 2).

II. The left hand grip and the receiver are both marked with an alignment arrow. When collecting data, be sure that the arrow labels on each of these devices are in alignment (see Figure 3) and that they are not too far apart. The reception range of the plug-in receiver is 92 cm, or 3 feet.

1. With the subject sitting quietly, click **Collect** to begin data collection. There will be a 15 second delay while data are collected before the first point is plotted on the upper graph. Thereafter, a point will be plotted every 5 s.
2. Determine that the sensor is functioning correctly. The readings should be consistent and within the normal range of the individual, usually between 55 and 90 beats per minute. If the readings are reasonable, click **Stop** and continue to Step 7.
3. Collect data to observe the effect of *submerging your foot in an ice water bath*. **Note:** Read over this step prior to beginning data collection to familiarize yourself with the process.

- a. Click **Collect**.
- b. If the baseline is not stable, repeat Steps 5–6. If the baseline is stable, plunge your foot into the ice water bath at 40 s.
- c. Remove your foot from the ice water bath 30 s after immersion (when data have been collected for 70 s) and rest it on the towel.
- d. Remain seated and allow data collection to continue for the full 240 s data-collection period.
5. Click and drag over the area of the graph where the resting (“baseline”) heart rate is displayed. Click the Statistics button, . The Statistics box will appear with the statistics calculated for the selected region. Record the mean resting heart rate, to the nearest whole number, in Table 1.
6. Move the Statistics brackets to highlight the total time of data collection. The values in the statistics box will be recalculated to reflect this change. Record the maximum and minimum heart rates, to the nearest whole numbers, and the corresponding times at which these rates are graphed, in Table 1.

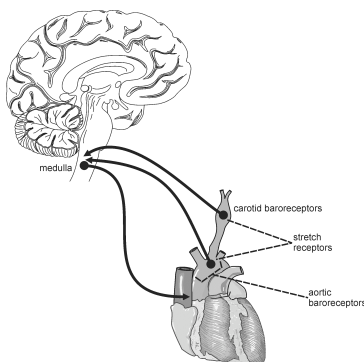


Figure 2

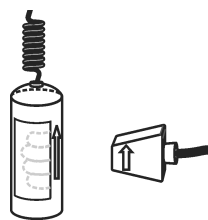


Figure 3

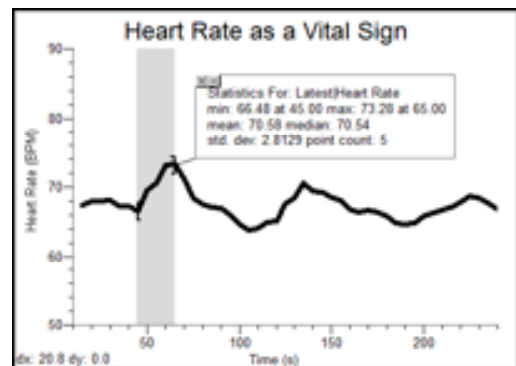


Figure 5

Figure 1a A visceral reflex arc