

Stress

Objective:

To explain in a words or with diagrams the major neural and endocrine responses of the body to psychological and physical stress, at the level of 85% proficiency for each student.

In order to achieve this objective, you will need to be able to:

1. Measure and record heart rate and blood glucose before, and after physical stress
2. Measure and record heart rate and blood glucose before, and after psychological stress.
3. Describe the role of the autonomic nervous system in the stress response and its relationship to the endocrine system.
4. Analyze data regarding the effects of stress on human behavior and physiology.

Materials:

Group Materials:

- Watch/clock with second timer
- Nonin® Pulse Oximeter
- Blood glucose meters
- Glucose strips
- Lancets – contact activated safety
- Alcohol wipes or Cotton balls and isopropyl alcohol

Lab Materials:

- Sharps container
- Biohazard bag

Methods:

We will work in groups of four with two students participating as subjects in each group. One subject will participate in a physical stress – running. The second student will participate in a psychological stress – activity to be announced. The subjects will obtain measurements of their pO₂, heart rate, and blood glucose.

In this lab Lancets are used to obtain blood samples.

- Students are permitted to handle only their own blood.
- “Finger-stick” devices (Lancets) must be placed in the Sharps Container after use.
- Cotton balls, and items exposed to blood must be placed in the Biohazard Bag

Safety concerns are outlined here:

- U.S. Food and Drug Administration
<http://www.fda.gov/MedicalDevices/ProductsandMedicalProcedures/HomeHealthandConsumer/ConsumerProducts/Sharps/default.htm>

A Nonin Pulse Oximeter is used to measure baseline pO_2 and heart rate, as shown below.



Procedures for using safety lancets, obtaining blood samples, and using the glucose meters will be described in class.

Accepted procedures for handling “finger-stick” devices (including safety lancets) and using them to obtain blood samples are outlined in:

- Lab_Appendix_A from my website
www.dgward.com/pdf/physo101/Lab_Appendix_A_finger-stick.pdf

An Accu Chek Aviva blood glucose meter is used to measure blood glucose. Excerpts from the user’s manual are reproduced in:

- Lab_Appendix_B from my website
www.dgward.com/pdf/physo101/Lab_Accu_Chek_Aviva.pdf

Physical Stress

For each subject, baseline measurements of pO₂, heart rate, and blood glucose are first made. Each subject will:

1. Run in place (or around the building) for three minutes.

At five (5) minutes and fifteen (15) minutes after running, pO₂, Heart rate, and blood glucose will be measured again.

Psychological Stress

For each subject, baseline measurements of pO₂, heart rate, and blood glucose are first made. Each subject will:

1. Place all books and notes under their desks or away and out of sight.
2. **Wait for further instructions about the stress activity.**

At five (5) minutes and fifteen (15) minutes after the psychological stress activity, pO₂, Heart rate, and blood glucose will be measured again.

Results

Table 1 - Physical Stress Activity

Time	Baseline	5 min after stress	15 min after stress
pO₂			
Heart Rate			
Blood Glucose			

Table 2 - Psychological Stress Activity

Time	Baseline	5 min after stress	15 min after stress
pO₂			
Heart Rate			
Blood Glucose			

Discussion

1. Why does your heart beat faster when you get excited?
2. Why do your hands sweat when you are afraid or nervous?
3. How do you feel when you are under pressure?
4. State in words how stimulation of the sympathetic system affects all of the organs simultaneously.
5. What physiological changes are the heart rate and pO_2 monitors measuring? Explain.
6. What physiological changes are the blood glucose meters measuring? Explain.
7. Does a relationship exist between pO_2 , heart rate, blood glucose, and the stress activity? Why or why not?
8. Are the changes for each event consistent for all members of the class? Why or why not?