

# Homeostasis Lab Expectations

## Lesson 3: Homeostasis Lab



### Introduction

Homeostasis can be measured in various ways depending on the specific physiological parameter you are interested in. Below are some common methods for measuring homeostasis. For more information about some of these factors, use the Homeostasis Lab Additional Resources handout.

- **Heart Rate:** Heart rate can be measured using a heart rate monitor or by palpating the pulse at certain points (e.g., wrist, neck).
- **Blood Pressure:** Blood pressure can be measured using a sphygmomanometer and stethoscope or an automated blood pressure monitor.
- **Body Temperature:** Body temperature can be measured using a thermometer placed in the mouth, ear, or armpit, or with non-contact infrared thermometers.
- **Blood Glucose Levels:** Blood glucose levels can be measured using a glucometer and a fingerstick blood sample.
- **Respiratory Rate:** Respiratory rate can be measured by counting the number of breaths per minute.
- **Electrolyte Levels:** Electrolyte levels (e.g., sodium, potassium) can be measured using blood tests.
- **pH Levels:** pH levels can be measured using a pH meter or pH test strips on body fluids such as blood or urine.
- **Oxygen Saturation:** Oxygen saturation can be measured using a pulse oximeter, which clips onto a finger and measures the amount of oxygen in the blood.
- **Fluid Balance:** Fluid balance can be assessed by measuring fluid intake and output, as well as changes in body weight.
- **Hormone Levels:** Hormone levels can be measured using blood tests or other specific tests for particular hormones.

### Materials Available (will vary based on experimental design):

- Pre-workout supplement (e.g., containing caffeine, amino acids, and vitamins)
- Various protein supplements (e.g., whey protein, soy protein, casein protein)
- Water
- Blender or shaker bottle
- Exercise equipment (e.g., jump rope, step platform, or space for running in place, exercise mats)
- Heart rate monitor or manual pulse counting
- Digital thermometers
- Rating of Perceived Exertion (RPE) chart
- Blood pressure monitor
- Water bottles
- Timer

## Experimental Procedure

### Baseline Measurement Options

- Take baseline heart rate:
  - Students should sit quietly for 5 minutes.
  - Use heart rate monitors or manually count pulse for 15 seconds and multiply by 4 to get beats per minute (BPM).
  - Record the baseline heart rate.
- Measure baseline blood pressure:
  - Use an automatic blood pressure cuff to measure systolic and diastolic pressure.
  - Record baseline blood pressure.
- Measure baseline body temperature:
  - Use digital thermometers to record body temperature in degrees Fahrenheit or Celsius.
  - Record baseline temperature.
- Rate perceived exertion (RPE):
  - Have students rate their current state of exertion using the RPE chart (0 = no effort, 10 = maximal effort).
  - Record the baseline RPE score.

## RPE CHART

RATE OF  
PERCEIVED  
EXERTION

This chart is used to measure the intensity of each movement using a scale of 1-10.

10	COULD NOT PERFORM MORE REPS OR ADD WEIGHT
9.5	COULD NOT DO MORE REPS, BUT COULD ADD SLIGHTLY MORE WEIGHT
9	COULD DO 1 MORE REP
8.5	COULD DEFINITELY DO 1 MORE REP, POSSIBLY 2
8	COULD DO 2 MORE REPS
7.5	COULD DEFINITELY DO 2 MORE REPS, POSSIBLY 3
7	COULD DO 3 MORE REPS
5-6	COULD DO 4-6 MORE REPS
1-4	VERY LIGHT, LITTLE TO NO EFFORT

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### Pre-Workout Supplementation

- Take the pre-workout supplement:
  - Administer a small dose of pre-workout supplement (based on package instructions and teacher guidance).
  - Students should drink water with the supplement.
- Wait 30 minutes:
  - Allow 30 minutes for the pre-workout supplement to take effect.
  - Students can stay seated or lightly walk around during this time.

## **Experimental and Control Groups**

- Control Group
  - Students will not consume any supplement and complete an exercise session.
- Experimental Group
  - Students will consume a pre-workout or protein supplement and complete an exercise session.

## **Exercise Session**

- Both groups will perform the same moderate-intensity exercise routine for a set period (e.g., 15-20 minutes).
- They should use the same exercise equipment and follow the same instructions.
- An example exercise circuit is shown below (work at a moderate intensity):
  - 1 minute of jumping jacks
  - 1 minute of squats
  - 1 minute of push-ups
  - 1 minute of mountain climbers
  - 1 minute of high knees
  - Rest for 2 minutes, then repeat the circuit 2-3 times (at moderate intensity)

## **Safety Precautions**

- Ensure students are in good health and have no known medical conditions that may interfere with the activity.
- Get parental permission before administering pre-workout supplements.
- Offer a placebo to ensure fair testing (optional).
- Have water available and ensure students are hydrated before and after the workout.
- Monitor students closely during physical activity for signs of fatigue or discomfort.

## **Post-Workout Measurements**

- Immediately after workout (use the same parameters as the baseline measurements):
  - Measure heart rate.
  - Measure blood pressure using the automatic cuff.
  - Measure body temperature with the thermometer.
  - Rate perceived exertion (RPE) using the same scale.

## **Cool Down**

- Allow students to cool down by walking or stretching for 5-10 minutes.
- Optionally, remeasure their heart rate, blood pressure, and/or temperature after the cool-down to see if physiological parameters are returning to normal.