Experiment B-42
Temperature Variations in the Human Body

Biology

Objectives

- To understand the difference between body core temperature and skin temperature.
- To investigate the change in skin temperature as a function of the body part.
- To compare skin temperature values of different students in the group.

Modules and Sensors

- PC + NeuLog application
- USB-200 module
- NUL-235 Infrared thermometer logger sensor

Introduction

The human body temperature is not homogenous. Unlike core temperature, which is tightly regulated (look at the NeuLog B-9 "Thermoregulation and Perspiration" experiment for more information), skin temperature varies significantly as a function of the environmental temperature (current exposure and exposure history), core temperature, and thermoregulatory vasomotion (dilation and constriction of the arteries).

Also different body parts have different temperatures; over two-thirds of the heat generated in a human at rest is created by the organs of the thoracic (chest) and abdominal cavities; the brain, contributes 16% of the total generated heat. The heat generated in the brain is about the same as that of all our skeletal muscles when they are at rest.

When the temperature of the environment is relatively low, blood vessels in the extremities (palms and feet) constrict and limit circulation to these parts of the body in order to keep the vital organs warm.

In this activity we will measure the skin temperature of various body parts and compare their values. We will use an infrared thermometer sensor which works by evaluating infrared radiation emitted by surfaces. It is used without actually touching the surface in question.

Procedure

Note:

The Infrared logger sensor is designed for educational use only and may not be used for medical diagnose.

When performing the measurements, it is best to work with a partner.

Sensor setup

1.   Connect the USB-200 module to the PC.

2.   Check that the Infrared thermometer sensor is connected to the USB-200 module.

Note:

The following software functions are explained in short. It is recommended to practice the NeuLog application functions (as described in the user manual) beforehand.

3.   Run the NeuLog application and check that the Infrared thermometer sensor is identified.

Settings

4. Click on the **On-line Experiment** icon in the NeuLog main icon bar.

5. This experiment is done in single step mode so the experiment duration and sample rate will not be set.

Testing and measurements

6. Click on the **Table** icon .

7. Aim the infrared thermometer towards your partner's fingers from about 5-8 cm and click on the **Single step** icon .

8. Proceed in this way for the other body parts on the list.

Body part	Skin temperature [°C]		
	Student 1:	Student 2:	Student 3:
Fingers			
Palm			
Lower arm			
Upper arm			
Forehead			
Abdomen			
Thigh			
Lower leg			
Toes			
Back			
Neck			

9. After each measurement, insert the body part name into the manual values column. It should be noted that clothes may affect the measured values.

10. The following table summarizes an example experiment which includes some of the body parts.

Step	IR thermometer (ID=1) [°C]	Manual Values
Step 1	21.2	Fingers
Step 2	27.5	Palm
Step 3	31.1	Lower arm
Step 4	31.7	Upper arm
Step 5	33.1	Forehead
Step 6	35.5	Abdomen

11. Save your experiment.

12. Measure the skin temperature of other members in your group and insert the values in the table above.

Challenge research

13.   Repeat the experiment, this time outside, in offline mode (offline mode instructions can be found in the NeuLog user guide or in each sensor guide at www.NeuLog.com).

Summary questions

1.   Describe your results and explain the changes of temperature within body parts.

2.   Did the values vary between students? Explain.

3.   How did the results change inside and outside of the room? Estimate the change of your core temperature within the two conditions.