

Experiment B-44 Muscle Strength



Objectives

- To learn about the skeletal muscles.
- To find correlations between dominant hand, gender and more to grip strength.

Modules and Sensors

- PC + NeuLog application
- USB-200 module 
- NUL-237 Hand dynamometer logger sensor 

Introduction

There are three types of muscle tissue in your body. The skeletal muscles are controlled voluntarily and are made of striated muscle tissue. The skeletal muscles are exquisitely tailored for force generation and movement.

Visceral muscles are controlled involuntary and are made of smooth muscle tissue. They are found within the walls of blood vessels, the urinary bladder, respiratory tract, etc. Cardiac muscle tissue is found only in the heart and has similar properties to each of the other two types.

Muscle cells contain filaments of actin and myosin which are two kinds of proteins. These protein filaments slide across each other as the muscle contracts. ATP is needed for muscle relaxation by returning the actin and myosin filaments to their relaxed position. Muscle contraction is triggered by an electrical impulse from a nerve cell that reaches a muscle cell.

A hand dynamometer is used for testing hand grip strength. It can be used to give a general index of a person's strength and compare the strength in the left and right hands. It is often used for evaluation of hand trauma or disease.



In this activity we will compare the grip strength of left and right hands, males and females and a characteristic chosen by you.

Procedure

Note:

The hand dynamometer logger sensor is designed for educational use only and may not be used for medical diagnose. If you suffer from a hand medical condition do not conduct this experiment.

Sensor setup


1. Connect the USB-200 module  to the PC.
2. Check that the hand dynamometer 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 hand dynamometer sensor is identified.

Settings


4. Click on the **On-line Experiment** icon  in the NeuLog main icon bar.
5. Click on the **Sensor's Module** box.
6. Click on the **Range** button.
7. Select the N button to change the sensor's mode to Newton.




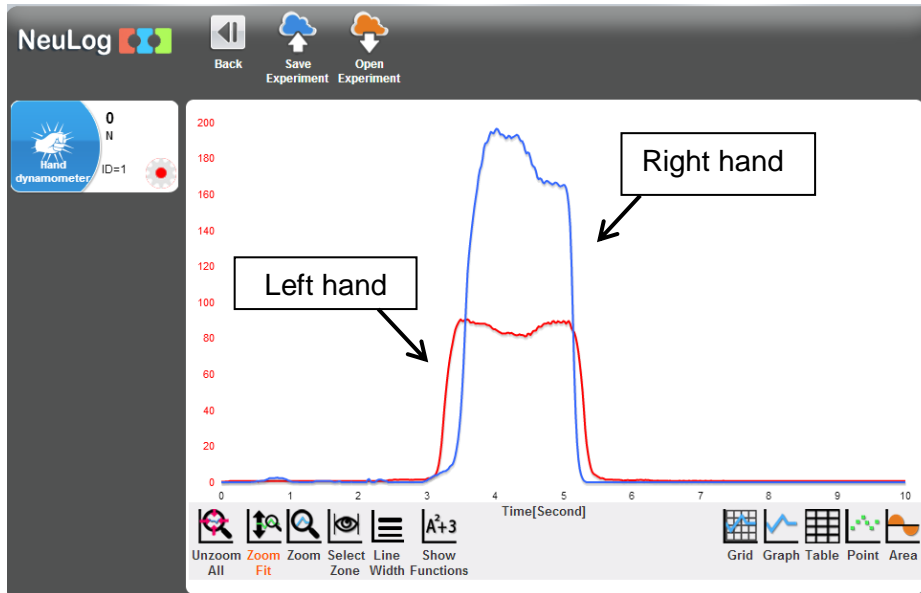
8. Click on the **Experiment Setup** icon  and set the:
 Experiment duration to 10 seconds
 Sampling rate to 50 per second


Testing and measurements




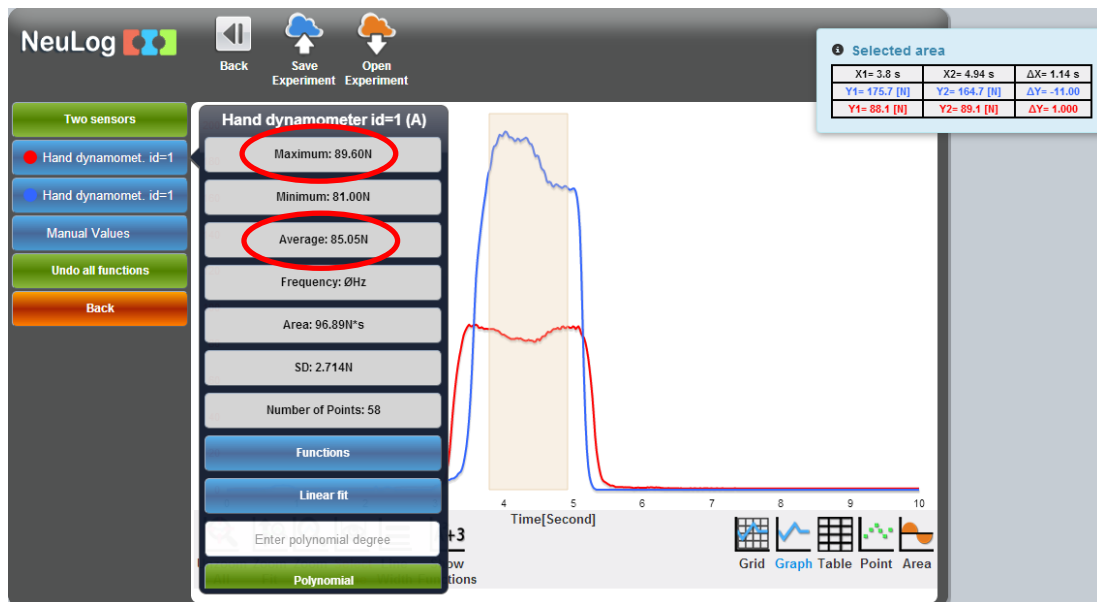
9. Hold the hand dynamometer handle with your right hand without applying any force on it.
10. Click on the **Reset** button to offset the sensor to zero (as shown in the figure on the previous page).
11. Click on the **Run Experiment** icon  to start the measurement.
12. Do not look at the screen during the experiment, it might affect the results.
13. After around three seconds, grip the hand dynamometer handle as hard as you can for around 3 seconds.
14. After the first measurement ends, repeat these steps for the left hand (without deleting the right hand graph).

15. At the end of the measurement, click on the **Zoom fit** icon .
16. Your graph should be similar to the following:



17. Save your graph.
18. Click on the **Show Functions** icon .

19. Click on the **Select zone** icon  and choose an area of the graph that includes the maximum force.
20. Click on the **Hand dynamometer** button on the left of the screen (choose the one that fits the first measurement).
21. Look at the **maximum** and **average** values.



22. Fill your results in the following table.
23. In the grey box write another characteristic that will be used for comparison between the members of your group or class. This characteristic will be chosen by your teacher or decided together by the group or class.

Student's name:	Male/ Female	Dominant hand (right/left)		Right/left hand measurement	Average force [N]	Max. force [N]
				Right hand		
				Left hand		

24. Click on the second **Hand dynamometer** button on the left of the screen (choose the one that fits the second measurement) and fill the results in the table above.

Female students' names	Dominant hand average force [N]	Dominant hand maximum force [N]
Average of each parameter		

Male students' names	Dominant hand average force [N]	Dominant hand maximum force [N]
Average of each parameter		

Summary questions

1. What is the correlation between a student's dominant hand and the strength of each hand? Explain.
2. What is the correlation between a student's gender and the grip strength? Explain.
3. What characteristic did you choose? Did you find a correlation between it and the grip strength of the students? Explain.