

MUSCLE STRENGTH

Grip strength, also known as hand strength, is a measure of muscular strength of one's forearm muscles. A strong grip is important for a range of sports, like climbing and wrestling, and everyday activities, such as opening a jar, turning a door knob, and writing. Grip strength is used as an indicator of body strength and overall health. In this investigation, you will figure out how muscles work by testing your grip strength as you squeeze a syringe.

Objectives

- Compare muscle performance between the right and left hand.
- Examine the effect of fatigue on muscle strength.

Materials and Equipment

- Data collection system
- Wireless Pressure Sensor

Procedure

Part 1 –Comparing Grip Strength Between your Left and Right Hand

*Force is pressure by area, $F=P*A$. In this experiment, because area is kept constant one can use only pressure to compare the different forces. Work in pairs.*

1. Select **Sensor Data** in SPARKvue.
2. Connect the Pressure sensor to your device.
3. Make sure the Pressure measurement is checked and choose the Graph template.
4. Connect the tubing to the pressure sensor (do not connect the syringe yet).
5. Push the plunger on the syringe down to 30mL, then connect it to the other end of the tubing as shown in the picture.
6. Using your right hand, grip the syringe between your index and middle fingers with your thumb on the plunger as shown in the picture.
7. Your partner will begin recording data by selecting **Start** (making sure that the pressure sensor is set to zero on the left lower bar.)
8. Looking away from the SPARKvue screen, or with your eyes closed, compress the syringe as much as possible for about 10 seconds.
9. Repeat with your left hand.
10. Repeat steps 7-8 for a total of three times alternating between your right and left hand. Let your arms rest at least for one minute between trials.
11. Using the SPARKvue graphic tools, record your maximum pressure reached in Table 1. Consider only the part of the curve that is stable.

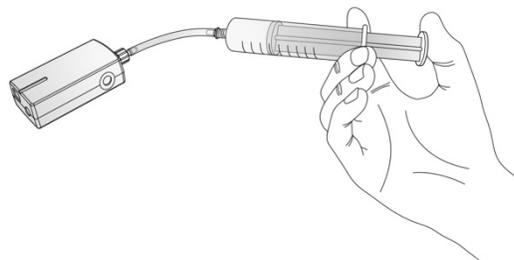


Figure 1. Grip strength setup.

12. Make sure to zero the sensor before each trial.
13. Switch places with your partner.
14. Calculate your average maximum pressured reached for each hand.

Part 2 –Muscle Fatigue

In this part you will investigate how your grip strength compares after sustaining exercise for longer periods of time. Use your strongest hand from Part 1.

15. Follow steps 1-7 from Part 1.
16. Looking away from the SPARKvue screen, or with your eyes closed, compress the syringe with your dominant hand as much as possible. Sustain the compression for 60 seconds.
17. Repeat the compression for a total of five times, resting for 10-15 seconds between each trial.
18. Using SPARKvue graphing tools calculate the minimum, maximum, and average pressure for each trial. Select only the area of the curve where pressure is sustained. Record the values in Table 2.

Data Collection

Part 1 –Comparing Grip Strength Between your Left and Right Hand

1. Enter your data from Step 11.

Table 1: Maximum pressure reached for the right and left pinch-grip.

Trial	1	2	3	Mean
Right hand pressure (kPa)				
Left hand pressure (kPa)				

Part 2 –Muscle Fatigue

2. Enter your data from Step 18.

Table 2: Maximum and minimum pressure sustained for one minute.

Trial	1	2	3	4	5
Minimum					
Maximum					
Mean					

