ScienceCube

Bioelectricity

Measure and compare the current flowing through the body based on hand dryness, voltage strength, and gender using a battery

Fundamental Concept

Current and the Human Body

The intensity of the shock experienced by the human body is determined more by the strength of the current and the path it takes than by the voltage. Therefore, the effect varies depending on the dryness of the skin and the intensity of contact with the power source. For men, a current of about 1 mA can be felt, while women, with softer skin, can feel a current at around 0.7 mA. The electrical resistance of the human body when dry is about 500,000 Ω, but this decreases to about 1,000 Ω when the body is sweaty. With moisture, resistance drops to 1/500, causing the current flowing through the body to increase by 500 times according to Ohm's Law (V=IR). When the body is sweaty, using a 1.5V battery can result in a maximum current of 1.5 mA. However, the current from the battery is not harmful, so you can safely conduct the experiment.

< Human Body Response to Different Current Levels>

Magnitude of current passing through	1mA	5mA	10mA	15mA	50~100mA
Sensation	Slightly felt	Causes convulsions	Feels unpleasant	Causes strong convulsions	Death
					

Measure and explain the current flowing through the body from a battery and compare the results based on gender through experimentation..

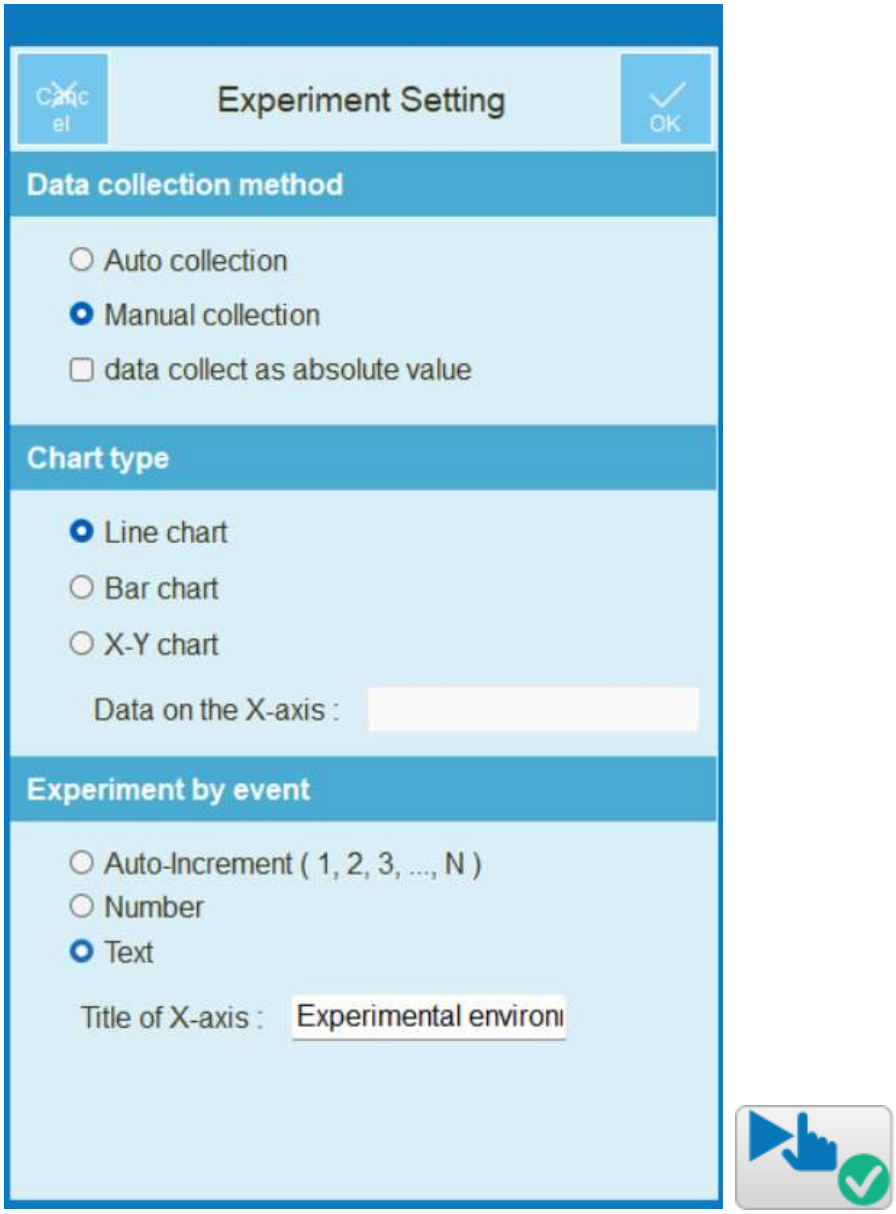
Experiment

Materials Needed

Interface, Science# program (smart device), Ammeter sensor, Two 1.5V batteries, Battery holders, Alligator clip wires, Small amount of water, Test subjects (1 female, 1 male)

Interface Setup

1.  Run the Science# program.
2. Connect the ammeter sensor to the interface.
3. Press  to calibrate the ammeter sensor to 0.0V..
4. Press  to set up the experimental environment as shown below or press  for automatic setup.



Data Collection

1. Press  to set the chart to a bar graph..
2. Press  to start data collection.

[Current Strength Based on Hand Dryness]

3. Insert a 1.5V battery into the battery holder and use the ammeter sensor and alligator clips to create a series circuit.

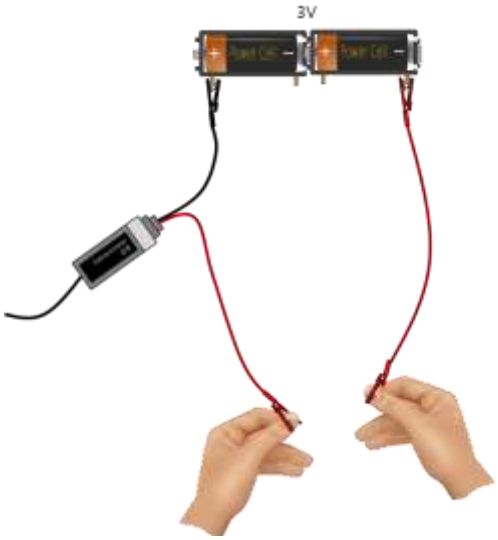
4. Hold the ends of the alligator clips with dry hands and measure the current flowing through..

5. Once the value stabilizes, press  and enter '1.5V Dry Hands' in the text input box..
6. Wet both hands with a small amount of water and measure the current flowing through wet hands.
7. Once the value stabilizes, press  and enter '1.5V Wet Hands' in the text input box..
8. Press to end data collection..

[Current Strength  Based on Voltage]

9. Press  and add a [New Chart].
10. To compare current strength based on voltage, first hold the alligator clips connected to a 1.5V battery with wet hands and measure the current.

11. Once the value stabilizes, press  and enter '1.5V Wet Hands' in the text input box..
12. Create a series circuit with two 1.5V batteries (3V total) and measure the current flowing through the hands.



13. Once the value stabilizes, press  and enter '3V Wet Hands' in the text input box..
14.  Press to end data collection

[Current Strength Based on Gender]

15.  Press and add a [New Chart].
16. Hold the ends of the alligator clips connected to a 3V battery circuit, and measure and compare the current flowing through the body for different genders..
17. Once the value stabilizes, press  and enter the gender of the subject (e.g., 'Female') in the text input box.
18. Press  to end data collection..

Data Analysis

Recording Data

1. Measure the current flowing through the body based on the dryness of the hands. Draw

a bar graph comparing the current values for dry hands and wet hands.

2. Measure the current flowing through the body based on the voltage strength. Draw and compare the results in a bar graph.

3. Measure and compare the current flowing through the body based on gender using a bar graph.

Data Application

1. Based on the data, explain how the current flowing through the body changes with the dryness of the hands.

2. Based on the experimental data, explain how the current flowing through the body changes with the voltage strength.

3. Based on the experimental data, explain how the current flowing through the body changes with the gender of the subject.

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Report
(For Teachers)
Report
(For Students)