

Worried Sick

Activity 1: Grades 5-8

Temperature and Stress

In the *Scientific American Frontiers* segment, "[Just Relax](#)," you observed the remarkable ability of some Tibetan monks to control their body temperature. Using relaxation and mental techniques, the monks are able to significantly elevate their skins temperature. Although the complete mechanics are unknown, scientists believe that relaxation releases chemicals that increase blood flow to the skin's surface. This increased circulation causes body temperature to rise. The increase is significant enough to steam dry sheets that are placed onto the monks' exposed shoulders and back.



This activity page will offer:

- Insight into the physiological effects of stress
- Construction of an electronic temperature measuring device
- Investigation into the effect of emotion on body temperature
- Investigation into the effect of relaxation on body temperature

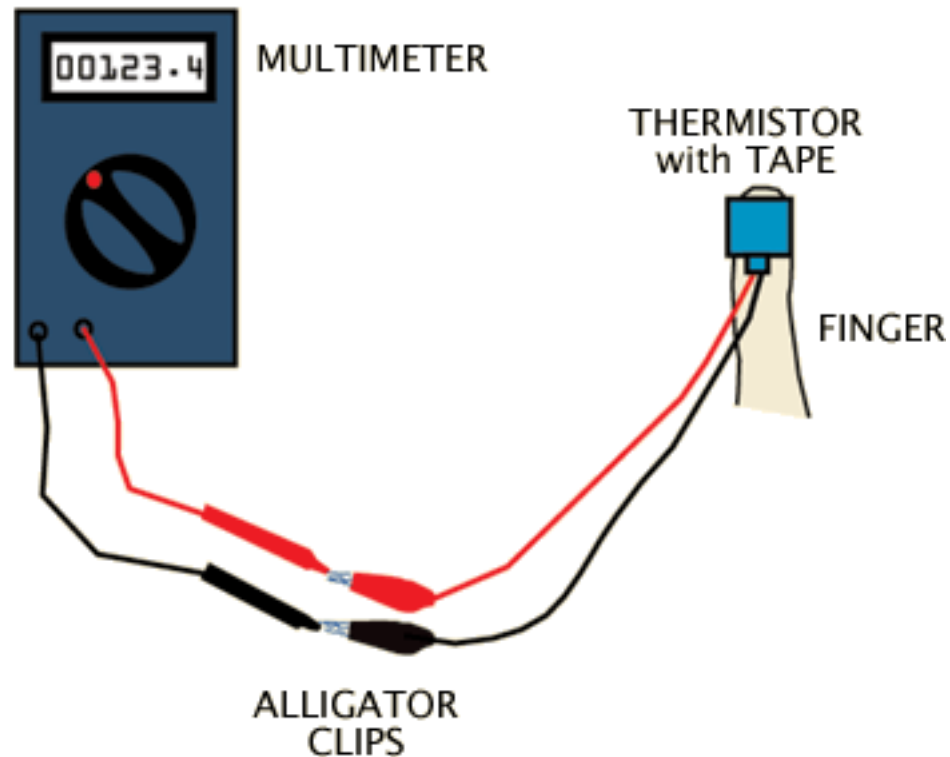
Temperature Control

A thermistor is an electronic device whose resistance varies with temperature. When connected to a multimeter that is set to measure resistance, the thermistor can be used to indicate relative temperatures. In this activity, you'll attach a thermistor to your fingertip and uncover a baseline temperature. Then, you'll observe how acting out various emotional states affects this baseline. Finally, you'll investigate if relaxation techniques can produce changes in the detected temperature.

Materials

- Thermistor (available through electronics stores such as Radio Shack)
- Connecting wires with alligator clips
- Tape
- Multimeter (also referred to as a voltmeter, these are basic electronic boxes that can measure voltage, current, and resistance (hence the

"multi" in their name.) These are also available at an electronics store.



Steps

1. Work with a partner. One of you will read measurements while the other will have the thermistor attached to his/her finger. Wrap the thermistor in a piece of tape so that hard and/or sharp edges are covered.
2. Use alligator clip connectors to attach each lead from your thermistor to one of the probes of your multimeter.
3. Set the multimeter to detect and measure resistance. Set aside for several moments until the readout becomes stable. Record this value as room temperature resistance. Gently blow on the thermistor. How does your hot breath affect the displayed resistance?
4. Position the wrapped thermistor against the inside of the tip of the index finger. Use another piece of tape to secure the wrapped thermistor to the skin. CAUTION: Do not tightly bind the tape since this would interfere with blood circulation. Wait until the display becomes stable. Record this value as baseline resistance.
5. For several moments, have the subject act out the emotion of anger. Observe and record any changes in the detected resistance.
6. Then, have the subject act out the emotional states of sadness, fright, happiness, and content. Each time, record any observed changes in the resistance.
7. Once again, obtain a baseline measurement for temperature.
8. Then, have the subject enter a less-stressed state. Encourage them to relax their muscles and meditate on calming thoughts. Suggest deep

breathing and concentrate on the word "calm." Maintain this state for several minutes. Note and record any changes in temperature.

9. Exchange roles and repeat steps 3 through 7.

Questions

1. How does heat affect the thermistor?
2. Did mood role playing affect the resistance?
3. How did relaxation affect the multimeter display?

Heated Extension

In this activity you examined temperature changes in fingertips. Yet, the monks appeared to increase the temperature of their shoulders and back. How would you adapt this classroom activity to more accurately test the monks' ability to significantly alter body temperature?

Film Fakery

Was the clip that showed monks steam-drying wet towels faked? How do you know? What proof (if any) do you have that validates this video footage? Should we believe someone just because they are a scientist? Consider lunar landings. Some people say that the footage showing astronauts on the moon is faked. How do we know that these images are real and not a product of some Hollywood special effects team? How might increasing ability of digital fakery affect our future trust in the media?

Biofeedback on the Airwaves

Write a 5-minute infomercial in which you try to convince your listener audience to pursue biofeedback therapies. Make sure to address their apprehension and inertia in moving to a new healing strategy. Cite the appropriate resources. You might even "stage" an interview with a fictitious researcher, physician or satisfied patient. With your instructor's approval, perform a staged reading of your work or videotape it for class showing at a later date.

More FX

In this activity, you observed the effects of mood role-playing and relaxation technique on the ability to regulate body temperature. Consider additional parameters such as breathing rate, relative percent of exhaled carbon dioxide, pulse rate, and blood pressure. Expand your experimental design to include any of the additional parameters. Share your design with your instructor and with his or her permission perform the activity.

GSR

The acronym GSR stands for galvanic skin response. GSR is a measurement of the skin's electrical conductivity. When you perspire, the skin's ability to conduct electrical current increases. By measuring this change in conductivity, scientists can gauge emotional response. Use Internet and print resources to uncover how the GSR is used as a measurement in lie-detecting devices.

Web Connection

BIOFEEDBACK: Review, History and Application

<http://members.cts.com/crash/d/deohair/psychoph.html>

A history of biofeedback and its use and acceptance as a therapeutic tool

Biofeedback and Hypertension

<http://www.nau.edu/~eaw/future.htm>

An example of how biofeedback may be used in the treatment of hypertension

Mind, Body, Medicine

http://www.emory.edu/ACAD_EXCHANGE/2002/

[febmar/raisonqa.html](http://www.emory.edu/ACAD_EXCHANGE/2002/febmar/raisonqa.html)

A scientist's speculation and inquiry perspective on temperature regulation by monks

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ANSWERS

Questions

1. What do the two numbers represent in blood pressure readings?
(The first number called the systolic pressure identifies the pressure associated with the contraction of the heart. The second number known as the diastolic pressure identifies the "resting" pressure in the vessel during a time when the heart is not contracting.)
2. Do any of the mood role-playing events affect blood pressure and pulse rates? If so, explain.
(Accept all reasonable responses)
3. Was there a significant (and repeatable) change in blood pressure and/or pulse rate following the relaxation and stressful periods? If so, explain.
(Accept all reasonable responses)

CURRICULUM LINKS

Life Science:

Effect of stress on human body

Effect of emotion on body temperature

Effect of relaxation on body temperature

Effect of emotion on Galvanic skin response

Technology and Design:

Design and build a thermistor to collect data on relative changes in temperature

NATIONAL SCIENCE STANDARDS (Grades 5-8)

Science as Inquiry- Content Standard A

Students will design and conduct a scientific investigation.

Students will use technological tools and develop techniques to collect data.

Students will explore cause and effect relationships by analyzing data.

Physical Science - Content Standard B

Students will investigate the transfer of electrical energy.

Students will observe the predictable movement of heat energy.

Life Science - Content Standard C

Students will learn about interactions between the nervous and circulatory systems.

Students will discuss an organisms behavioral response to internal stimuli.