

**BIODOT SKIN THERMOMETERS,
BIOFEEDBACK, AND STRESS**

TEACHER'S GUIDE

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I

- Objectives:
1. Acquaint students with the phenomenon of Biofeedback.
 2. To provide a simple, but important, lesson or review about how the various parts of the body function separately and yet interconnect and work harmoniously as a whole.
 3. To show, through the use of the Biodot® skin thermometer and the accompanying text, that Biofeedback can alter certain biological functions, specifically those that cause stress.
 4. Help students to learn how to deal with stress.

It can be used in any class (biology, health, family living, physical education, music, etc.) in which a discussion of stress would be relevant.

Teaching Time: The time required for teaching this specific unit is between 35 and 40 minutes, depending on student participation.

Suggested Ages: This particular unit, if used correctly, could be useful for almost any age group, as students from the first grade on up to the adult levels find the Biodot® skin thermometer fascinating. However, it is particularly recommended for the upper elementary grades through junior high school.

Related Activities:

1. Have the students wear Biodot® skin thermometers for one week and record the colors of the dots at times of varying degrees of stress (e.g., taking a test, conversing with family, getting ready for sleep).
2. As a class, have the students concentrate on a stressful situation for a short period of time and note any change of color of the Biodot® skin thermometer.
3. Present a unit on the circulatory system of the body.
4. Solicit individual reports on some of the other forms of introspective body control, e.g. Yoga, Zen, meditation.

II

Stress is a major problem in America today. It is a subject that abounds in current literature, in newspapers and magazines, especially on the subjects of work, marriage and school. Our intent is to make students more aware of the causes and effects of stress. More and more stress-producing pressures are placed on our young people. This is evidenced by the fact that suicide is the leading cause of teenage death. Therefore, it is vital that young people learn how to control their levels of stress and to remain calm in the face of problems and pressures. Students, even at early ages, can be taught to establish habits that will last a lifetime, so that when they become adults, they will be able to continue to cope with the problems of life in a reasonable and healthy manner.

There are many highly effective methods of dealing with stress. Some of them are quite old; some are new. The one we will be discussing is a complex and highly conceptual phenomenon known as "BIOFEEDBACK".

The purpose of this text is to provide teachers with a basic, but easy to understand, explanation of how this phenomenon works. It also will describe a simple, but effective, means of using Biofeedback to deal with stress. It should be clearly understood by both teachers and students that this is meant to be an introductory glance at a new area for study not an in-depth exploration of the subject. Many books have been, and are being written on the subject, but they are aimed mainly at an adult audience.

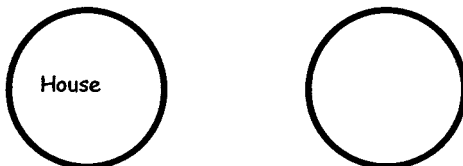
It should be noted that the Biodot[®] skin thermometers that accompany this text are, in reality, miniature thermometers: they will give an accurate measurement of skin temperature. The Biodot[®] skin thermometers themselves will not "do" anything other than change color in response to the temperature of the skin. As will be shown in more detail later. The students will need to understand that the variance of temperature in various parts of the body is caused by the distribution of blood in the body. Too much blood in a certain area will cause pressure in that area. Too much pressure will cause pain. For example, a tension headache is caused physiologically by too much blood in the head. This text will show how one can "think" blood out of the head and into the hands, thereby reducing the pressure and, subsequently, the headache.

For ease of understanding, a house has been used as an analogy to the human body. With some variation allowed for levels of sophistication, this text could be used with students of almost any age level. However, it is recommended for students in the upper elementary grades through junior high school.

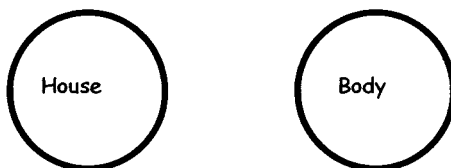
III

Teacher's Text for Biofeedback Unit

- STEP 1. Draw two large circles on the blackboard.
Label the circle on the left "House".



- STEP 2. Now describe the circle on the right as the student's "personal house". Let the students try to envision their bodies as being their personal houses.
Label the circle on the right "Body".

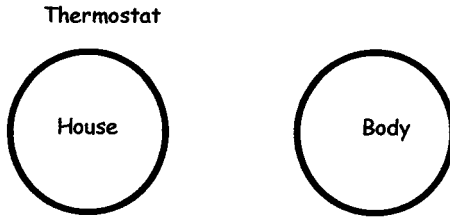


Explain that these circles enclose related areas of function. Anything that happens in a house generally affects all the other people in the house. Likewise, anything that happens to the body affects the entire body. Just as the song says, "the neck bone is connected to the head bone", and so on.

The concepts of Biofeedback, stress control, Transcendental Meditation, Yoga, or body control by introspection or by any other method are all based on the one simple premise that the body is an entity, a whole, with each and every part interconnected and working together. All this is within the confines of the body—for our illustration, the circle.

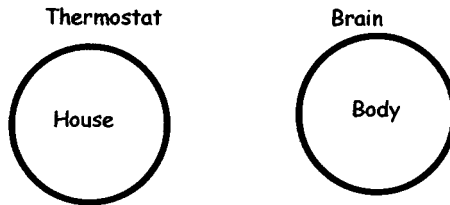
- STEP 3. Explain that a house, just like a body, needs certain controls to make it work. Try to draw out from the students some of the controls that are found in every home (for instance: light switches, faucets, etc.) and then lead them to identify controls that function on their own, such as a thermostat. Make sure that all the students understand the term "thermostat".

Label the "House" circle with the word "Thermostat" at top.



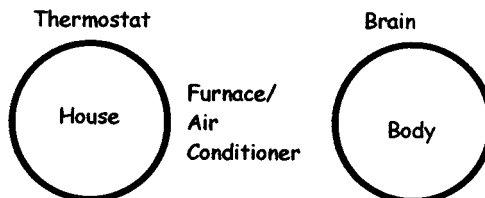
Ask the students what in the body is like the thermostat in the house. Liken the thermostat in the house to the brain in the body. When this point is firmly established:

Label the "Body" circle with the word "Brain" at the top.



STEP 4. Ask the students what the thermostat controls. The answer is, of course, the furnace and/or the air conditioner.

Label the "House" circle with "Furnace/Air Conditioner" on the side.

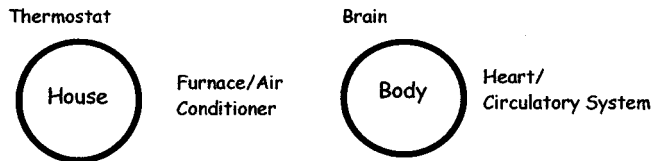


STEP 5. Now give an explanation of how the heart and circulatory system act as the body's furnace and air conditioner. Explain how blood is pumped and carried to all parts of the body to keep it warm and how the process of perspiring cools the body. Point out how important it is that the body maintains a constant environment for the delicate organs. Also note that although the internal temperature tries to remain at 98.6°F, the external, or skin, temperature always is somewhat cooler. The skin temperature also reflects its surroundings; it is cooler in winter and warmer in summer.

Explain that when there is an infection in the body, the blood is pumped at a greater rate, thus causing fever in the entire body. Point out that it is possible however, for various parts of the body to gain in temperature without the presence of fever. When this happens, the blood's temperature is not actually being raised; the rise in local temperature is due to a greater quantity of blood being needed in and sent to that local area. And because the amount of blood in the body is constant, when one area of the body receives more blood and becomes warmer, all the other areas of the body become cooler. An example of this is when you eat a large meal: more blood is pumped to the stomach to aid in digestion, and the stomach becomes warmer. Or if you hit your finger with a hammer, the finger immediately becomes warmer, and the rest of your body may experience a sudden chill (a slight case of shock). When you have a headache, your head becomes warmer.

Again, point out to the students that the heart and circulatory system are the body's furnace/air conditioner.

Label the "Body" circle with "Heart/Circulatory System" on the side.



STEP 6. Now suggest to the students that it is sometimes beneficial to check the efficiency of the thermostat. One might do this by installing a thermometer in a room far away from the thermostat. Explain that a thermometer, in itself, does nothing more than give information. This information (the temperature reading) is affected (or altered) by any outside action that causes a change in temperature. If the thermostat were poorly situated (for example, right in front of an outside door), the entire system would suffer because the thermostat would trigger the heating or cooling process each time the door was opened. In another example, if the thermostat were in the kitchen, when someone was cooking, the kitchen would be warmer than the rest of the house and the thermostat would not sense that the rest of the house was cooler. Point out that the best way to decide on the proper location for the thermostat would be to install thermometers in all the rooms of the house until the optimum location for the thermostat—the room with the most average temperature of the house—was found.

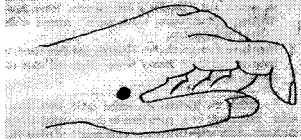
Biofeedback has come to mean not only the sending and receiving of bodily information, but also the use of it to actually alter biological functions within the body.

In animals, this process is instinctual, but in humans it requires concentration and thought.

Now that the students have been introduced to the concept of biofeedback, you can proceed to prove to them that it really can work. Distribute the Biodot[®] skin thermometers at this point. NOTE: if you pass the Biodot[®] skin thermometers out before this, the students' attention to the previous discussion will be diminished.

Explain that in a laboratory of hospital surroundings, very sophisticated, electronic machines are used not only to measure temperature, but also blood flow rates, brain waves, and other indicators of body functions, but that even the simplest of thermometers can prove and illustrate the working of Biofeedback.

A convenient place to put the Biodot[®] skin thermometer is between the base of the thumb and the forefinger. This placement is suggested because the Biodot[®] skin thermometer then is highly visible, yet is not likely to be knocked off or bothered by the bending of the fingers.



Explain that a Biodot[®] skin thermometer indicates changes in temperature by changing color. The temperature range of these dots is from 89.6°F to 94.6°F. Any temperature above or below that range will turn the dots black. Within this pre-stated range, brown (amber) is the coolest visible reading, and a deep violet is the warmest visible reading.

The students should be reminded again that external body temperatures always are cooler than internal body temperatures. Also, external heat or cold can affect the readings. Even with these limitations, however, the Biodot[®] skin thermometers can be used as general indicators.

STEP 9. The color sequence and temperatures should be written on the blackboard next to the two circles:

AMBER.....	89.6° F Tense
YELLOW.....	90.6° F Unsettled
GREEN.....	91.6° F Involved (normal)
TURQUOISE.....	92.6° F Relaxed
BLUE.....	93.6° F Calm
VIOLET.....	94.6° F Very Relaxed

Tell the students one way that Biofeedback is being used is to help people get rid of headaches. For example, if a person has a headache that is caused by stress and tension, there is too much blood flow to the head. Consequently, the person's hands would be cooler than the person's head. Using Biofeedback, the person would think, "Hands warm, hands warm" until the brain heard the message. The brain would then direct blood to flow to the person's hands to warm them up, thus reducing the blood pressure in the head. As some of the extra blood flowed out of that area the headache would then be reduced. The point of the Biofeedback then is not actually to warm the hands, but to regulate the blood flow throughout the body, just as the thermostat in a house attempts to keep the entire house at an even temperature.

Tell the students that the Biodot[®] skin thermometer can be used to tell them if their hands are too cool (suggesting uneven temperatures in the body generally caused by stress). The same way a thermometer can be used to tell if there are uneven temperatures in the various rooms of a house.

- STEP 10. Two exercises that are interesting as well as demonstrative can be done at this point.
1. Have the students check the color of their Biodot[®] skin thermometer and then close their eyes, sit quietly and relax for a few minutes. Have them try to concentrate on thinking, "Hands warm, hands warm". After a while, have them check the color of their Biodot[®] skin thermometer.
 2. Now have them check their Biodot[®] skin thermometer, and then stand, remaining by their seats, jump up and down twenty times. Then tell them to check the color of the Biodot[®] skin thermometer again.

When the students are seated again, have them discuss the changes in color. This might be a good time to discuss what is happening to the blood and the heart—both when they were being quiet and when they were exercising.

- STEP 11. Reinforce the fact that when people are in a stress-producing situation of any kind, whether taking a test, auditioning for a play, or trying out for the basketball team, they can think themselves cool by "thinking their hands warm". They will be reducing the effects of the stress within their own bodies.
- Two good ways to remember this are:*
1. "When you become angry, think 'hands warm' before acting,"
 2. "Keep your cool!"

IV Suggested Work Sheet

1. The thermostat in a house is like the brain in the body.
2. The heart and circulatory system act as the body's furnace.
3. The circulatory system carries blood to all parts of the body.
4. When infection is in the body, blood is pumped at a greater rate to fight the infection. This causes a fever in the body.
5. When one area of the body becomes warmer (such as the stomach), it is because more blood is being pumped there. The rest of the body becomes cool.
6. In a house, a thermometer can be used to test the accuracy of a thermostat.
7. In a body, a hand thermometer can be used to test the accuracy of the body's thermostat.
8. "Bio" comes from the word biology, which means the science of living things.
9. Biofeedback means the continual monitoring and sending of information back to the brain.
10. Thermometers that indicate varying temperature of the hands are called Biodot® skin thermometers.
11. If a person's hands are cold, it could be an indication that there is too much blood in the brain. This could cause pressure in the brain from the extra blood, which might cause the person to have a headache.
12. By concentrating, a person could "think" his or her hands to be warm. This would tell the brain to take blood from the brain and send it to the hands.
13. If a Biodot® skin thermometer is brown or amber, it means that the hands are cool.
14. If a Biodot® skin thermometer is Blue or violet, it means that the hands are warm.
15. A simple way of explaining Biofeedback would be "to learn to keep your cool."

