

4. I've Got Rhythm

Sleep and Daily Rhythms

Activities Guide for Teachers



National Space Biomedical Research Institute

Houston, Texas



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CONCEPTS

- Sleeping and waking are governed by an internal clock.
- The internal “sleep” clock is influenced by external cues.
- Changes in schedules can conflict with the body’s internal clock.

OVERVIEW

Students will investigate the effects of changing their bedtimes on their sleep patterns.

SCIENCE, HEALTH & MATH SKILLS

- Predicting
- Observing
- Drawing conclusions



4. I’ve Got Rhythm

Background

As students discovered previously, most people go to sleep and wake up at about the same times each day. This sleep cycle is regulated inside the brain by a group of nerve cells that govern sleeping and waking. These cells, which act as a timer, or “biological clock,” stay atuned to the outside environment by receiving time cues. Sunlight, a strong time cue, is detected by the retina (the part of the eye that has receptors for light), which sends messages to the brain. Daily exposure to light keeps the body’s sleep cycle synchronized to conditions outside.

Abrupt changes in sleeping times, such as that due to air travel or a change in work schedule, can cause difficulty with falling asleep or staying awake, because external cues conflict with messages being sent by the body’s internal clock. The brain may be signaling *sleep*, while outside conditions may be saying *be active, it’s morning!* It can take several days to adjust to a new time zone. Other factors also can affect the sleep cycle. For example, physical exercise, medicines, meal times and stimulants, (such as caffeine in coffee, tea and soft drinks).

This activity allows students to investigate their own internal clocks. Students will try going to bed one hour earlier than usual and observe the effects that it has on their abilities to fall asleep immediately and on their waking times the next morning.

Time

30–60 minutes to conduct initial class discussion; 30–60 minutes to summarize findings on the following day

Materials

Each student will need:

- copy of “Sleep Observations” sheet

Setup and Management

Conduct discussions of the activity with the entire class. Students will carry out their own investigations at home and report back the following day.

Procedure

Day One

1. Remind students of the results of the previous activities. *Did the leaves of the bean plants move in the same way each day? How about the animals that were observed? Did their behavior show a daily pattern? Do you also do things at about the same time each day? Have students refer to the sleep journals they created. Do you think some of the things you do are controlled by an internal clock?*
2. Explain to students that they will be investigating their own biological clocks for sleeping and waking. For one night, they will change their bedtime to one hour earlier than usual, and observe what happens.
3. Mention the types of observations

A group of nerve cells that act as a biological clock was first located in the brains of house sparrows. Biological clocks now have been identified in vertebrates, such as mammals, reptiles and some amphibians—and even invertebrates, such as fruit flies, cockroaches, crickets and mollusks. “Clocks” also have been found in single-celled organisms, like mold and bacteria.

Teenagers often have a sleep cycle that is shifted so that their internally programmed sleeping time ends up beginning around midnight. This may make it difficult for them to get enough sleep if they do not regulate light exposure carefully.

that students will make. For example, they should note whether it was easy or hard to fall asleep at the earlier time and whether they woke at their usual times the next morning. Students also should notice how they felt the next day—more sleepy, less sleepy, etc.

- Distribute copies of the student sheets on which students should record their observations. Explain to students that individual results will vary from person to person. If possible, have each student enlist the help of a parent or older brother or sister to record the actual time that the student falls asleep.

Activity Sheet
Sleep Observations

You will need to ask a family member or friend to help with this experiment.
You will be going to bed one hour earlier than usual. Write your observations in the spaces below.

- What time do you go to bed?
- What time do you wake up? (Enter answer with the clock for you.)
- How did you feel when you woke that night?
- What time do you wake the next morning?
- How did you feel the next morning?
- In class, write a paragraph about your experience in the space below.

Name _____

Day Two

- Have students summarize their observations by writing a short paragraph about how they felt as they tried to go to sleep at an earlier time. Stimulate their thinking by asking questions, such as, *Was it easier or more difficult than usual to go to sleep at a new time? Did you notice noises and other people more or less? How did you feel the next morning? Did you wake at your usual time?*
- Have students share their paragraphs with the rest of the class by reading them aloud or by posting them somewhere in the classroom. Initiate a class discussion of the results. Point out that some students may have had

difficulty falling asleep early because their bodies were used to sleeping at a later time. Likewise, students may have woken at their usual times in the morning, even after receiving an extra hour of sleep, because of the programming of their internal clocks.

- You may find that some students feel better after receiving the extra sleep. Initiate a discussion of how much sleep is typically obtained by children (see page 11) and how lack of sleep can impair performance on both mental and physical tasks. For example, lack of sleep, like alcohol intoxication, can make physical reactions slower.

Extensions

- Have students continue with the earlier bedtimes for several days. *Do they eventually become used to the earlier times?*
- Invite another teacher or a parent who has traveled across several time zones (across the continental US or to Europe, for example) to talk to the class about how he or she felt physically for the first one or two days in the new location. *Was it easy to sleep? Did he or she have to make adjustments again after returning home?*
- Invite a policeman, fireman or someone else who routinely works a night shift to talk to the class about how he or she has adapted to the stresses of a nocturnal work schedule.
- Some animals are more active at night than during the day. Have students investigate examples of nocturnal animals (bats, owls, luna moths, etc.) and report back to the class. *What advantages might a nocturnal lifestyle have for different kinds of animals?*

Sleep disorders affect up to 70 million people in the US. Insomnia is a sleep disorder which causes people to have difficulty staying asleep. Apnea is a disorder in which people have difficulty breathing while asleep.

Astronauts frequently have difficulty sleeping. This may be because their internal clocks are not synchronized to the light conditions they experience. In addition, the stresses of space flight and hectic work schedules can affect the quality of astronauts' sleep. Researchers are looking for ways to address these problems in space. Their results will help many people on Earth with sleep disorders.

In many places in the US, everyone sets their clocks ahead one hour in the Spring and leaves them that way until the Fall. Switching to Daylight Savings Time can cause temporary adjustment problems for some people because their sleeping times are changed by one hour.

