

## Essential Question: How can my lifestyle affect the quality of my life?

### Activity 1 – How can Teen Sleep, affect Memory & Learning?



**Purpose:** I can explain how lifestyle choices & our environment affect parts of the human body.

**Background:** The general public has just discovered that the patterns young teens were showing -- an inability to go to sleep at night, followed by profound drowsiness on waking -- are so universal that what parents were seeing at home had already been shown in tests in the Stanford and Brown university sleep labs. Also, that there are common sense ways to overcome these problems.

**Instructions:** Please read the **Teen Sleep, Learning Memory** article, then answer these questions in complete sentences reflecting the questions using **FRED**.

1. Summarize the sleep-wake cycle theory AND tell two exceptions to this theory.

2. Compare the difference between the biological clock of younger children and that for pre teens.

3. Tell how much sleep a teen should have compared to a preteen AND tell how much more sleep is needed for teens to be alert.

4. Give two facts sleep researchers use to base their concerns about teen sleep debt and AND tell what researchers are doing to try to do to solve this concern?

AND

Newborns sleep a total of 14 to 17 hours a day on an irregular schedule with periods of one to three hours spent awake.

**Student Review:** 1-Below Standard, 2-Approaching Standard, 3-Standard, 4-Above Standard  
Use the scale to evaluate completeness & correctness of the job. Put score, Initial & date in boxes.

Score

Initial/Date

5. Tell the results students showed on test trials with normal sleep afterwards and with less than six hours of sleep.

6. Explain why it is hard for teenagers to develop good sleep habits.

7. Tell two things that you can do differently to keep your internal clock working the best for your studies AND how you will try to do each.

And

8. Explain why “sleeping in” to catch up on sleep actually works against good performance AND tell what you can do instead to catch up.

**Challenge / EC:** Read the fact sheet at this link, then tell three important facts about Circadian Rhythms that are not discussed in the Sleep article: [https://www.nigms.nih.gov/Education/Pages/Factsheet\\_CircadianRhythms.aspx](https://www.nigms.nih.gov/Education/Pages/Factsheet_CircadianRhythms.aspx)

- 1.
  
- 2.
  
- 3.
  
- 4.

**Student Review:** 1-Below Standard, 2-Approaching Standard, 3-Standard, 4-Above Standard  
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## MASTER

Reference Sara Spinks Adolescents and Sleep

A summary of what researchers know about teenagers' need for sleep and why sleep affects memory and learning

**Background:** Researchers always believed that sleep was ruled by a guideline that went something like: "The longer one is awake, the greater the pressure is for sleep to occur." This hypothesis, called the **sleep-wake cycle**, was thought to account for an increased need to sleep after staying awake all night." [1] But this rule did not account for a number of patterns observed in real life. For example: Jet travelers wake up at 2 a.m. despite being exhausted after flying from Boston to London, teenagers having trouble falling asleep even though they seem to be very tired, and older people waking up very early in the morning.

**The Biological Clock:** What researchers discovered is that the body has an internal biological clock. This clock sometimes acts against the sleep-wake cycle by keeping us alert when we should be feeling tired. Sleep researchers [Mary Carskadon](#) and Bill Dement saw this biological clock in action when they tested a group of 10-12 year olds at Stanford. Dement, a pioneer in sleep research, wrote: "After centuries of assuming the longer we are awake, the sleepier we will become and the more we will tend to fall asleep, we were confronted by a surprising result... After 12 hours of being awake, subjects were *less* sleepy than earlier in the day, and after more than 14 hours... the study subjects were even less sleepy." [2]

The researchers found that the brain has a "biological clock" (or circadian rhythm) that works against the sleep-wake cycle at certain points of the day and at certain ages. This clock keeps people awake when they were very tired. Also, just before puberty, the internal clock helped teens stay alert at night when they should have been falling asleep. The researchers called this a "phase-delay."

The studies also show that the biological clock of younger children does not have the same delay. Nothing opposes their need to sleep in the evening. Up to the age of 10, many children wake up fresh and energetic to start the day. In contrast, the biological clock of pre-teens often shifts forward, creating a "forbidden" zone for sleep around 9 or 10 p.m. It props teens up just as they should be feeling sleepy. In middle age, the clock appears to shift back, making it hard for parents to stay awake just when their teens are most alert.

Mary Carskadon discovered other important patterns in teen sleep. By studying alertness, she found teens, far from needing less sleep, actually needed as much or more sleep than they had gotten as children -- nine and a quarter hours. Also, most teenagers were getting an hour and a half less sleep than they needed to be alert. The teens experienced drowsiness in the early morning and in the mid-afternoon before perking up at night, even if they had not had a nap.

**Sleep Debt:** A great concern of sleep researchers is that teens and adults are so sleep-deprived and carry around a huge sleep debt every day. In fact, sleep researchers worry teenagers carry a sleep debt that is mostly hidden. This is important as U.S. high schools start around 7:20 a.m. but most teens now go to bed between 11 and 12 p.m. partly due to their biological clock. So there are millions of teens who feel drowsy, get poor marks and are too tired to join high-school teams because they are getting too little sleep. Since students are often driving to school, sporting events, and home late at night, this sleep debt holds huge risks. As a result, sleep researchers are

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pushing for later school start times and are trying to introduce sleep issues into the high school curriculum.

**Sleep, Learning, and Memory** - The other important area of sleep research is the effect of sleep on learning and memory. In experiments done at Harvard Medical School and Trent University in Canada, students go through a series of tests and then sleep various lengths of time to determine how sleep affects learning. The tests show that a student's brain puts together and practices what was learned earlier while sleeping. Parents always thought that sleep helps learning, but few knew that learning continues to take place while a person is asleep. This research shows sleep *after* a lesson is learned is just as important as getting a good night's rest before a test or exam.

This type of sleep research is done by giving students a series of tests. For example: In some tests students are trained to do a skill and then repeat the skill until each is able to do the skill faster and more accurately. Other tests copy what a student might learn in physics or math, or in certain sports. However, each test presents students with something new to be learned or to form a picture of the task in their minds. The final test trial results have shown that the students who got a good night's sleep improved. Also, students who got less than six hours sleep either did not improve or actually fell behind.

Thus learning a new task, whether it is sports or music, will be greatly helped by getting a good night's sleep. Also, a student's ability to remember things, be it a lesson on geometry or the causes of the Second World War, is aided by sleep. Whatever the task, it appears that adequate sleep is vital for optimal performance in learning.

**Learning Good Sleep Habits** Developing good sleep habits can be very hard for teenagers. That is because many teens do not have control over the time they need to wake up and their own biological clock is fighting against going to sleep early. However, teens can do things to try to bring their internal body clock forward.

- Dimming the lights at night and getting lots of daylight in the morning can help.
- Having a routine bedtime of 10 p.m.,
- Sleeping in a cool environment,
- Turning off music, the Internet, and televisions help to reset the body clock.
- Finally lots of sports helps and is better when done earlier in the day rather than later.

Also trying to get up after only an extra hour or two of sleep is a lot better than "binge-sleeping" on the weekends. A student used to getting up at 6:30 a.m. should not sleep until noon on the weekend. This simply confuses their bodies.

Sleep research explodes some of the myths around sleep: principally the idea that people need less and less sleep as they grow up. Sleep is one area where the lessons are clear and the benefits of following these lessons are quickly apparent.

