

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

Weekly Reading HW

HW Wk \_\_\_\_\_

*Directions: Read and annotate the passage below. Then answer the questions.*

### Shivering as a Form of Exercise

This winter's frigid temperatures could be having one desirable side effect – they may be revving up your metabolism. Shivering alters fat cells and boosts metabolism, much as formal exercise does. The findings intimate that exercise and shivering are related in ways not previously suspected.

For the new study, N.I.H. researchers drew blood and obtained small samples of muscle and fat cells from 10 healthy men and women. During one lab visit, the volunteers completed a short but intense session of stationary bicycling, riding as hard as they could until they were exhausted. Then, on another day, they rode the bike at a gentle, easily sustained pace for an hour. On their final visit, the researchers had each volunteer lie in bed for 30 minutes as the temperature dropped from about 75 to a chilly 53 degrees. By the end of the session, the volunteers were noticeably shivering. After each session, the scientists analyzed changes in the volunteers' white and brown fat.

Until a few years ago, it was widely believed that adult humans do not have brown fat, which unlike white fat, burns calories and generates heat. Infants carry plenty of brown fat, which helps to keep them warm, since they are not good at shivering. But scientists had thought that after childhood, humans lost their brown fat and substituted shivering to stay warm. Newer studies, however, have found varying amounts of brown fat in humans of all ages. Scientists were unclear why as a species, we continue to shiver if we have brown fat.

In a recent study, scientists learned that animals that produced more of the hormone, irisin, had more brown fat than other animals. Muscle contractions from exercise increased irisin levels, which caused white fat to turn into brown fat. Many scientists were puzzled by these findings because exercise creates heat as working muscle cells generate energy. So why would the body produce a hormone during exercise that would increase body heat even more?

The N.I.H. researchers, however, had a different interpretation. The volunteers' levels of irisin were just as high after shivering in the cold room than after exercising. The researchers reasoned that irisin originally was created by the muscular contractions occurring during shivering. Exercise increases irisin production because it is basically an exaggerated form of shivering. The new study suggests that if you can't get to the gym, at least consider lingering outside at the bus stop and shivering.

1. (RST.9-10.2) The main idea of the passage is that:
  - a. Shivering is a good replacement for exercise and is necessary to stay healthy.
  - b. Shivering, like exercise, can increase brown fat, which burns calories and generates heat.
  - c. Shivering is something that is learned, which is why babies cannot do it.
  - d. Brown fat is healthier, so people should be trying to increase their brown fat levels.
  
2. (RST.9-10.4) As it is used in the passage, the word *intimate* means:
  - a. Private
  - b. Personal
  - c. Detailed
  - d. Imply

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Period: \_\_\_\_\_

3. (RST.9-10.1) Which of the following is NOT one of the parts of the experiment by N.I.H. researchers?
- a. One hour of easily sustained exercise
  - b. Short period of intense exercise
  - c. Lying in a room that gets colder
  - d. Lying in a room that gets warmer
4. (RST.9-10.1) Why was it widely believed that adult humans do not have brown fat?
- a. Adult humans exercise more than babies, which remove most of the fat in their bodies.
  - b. Adult humans have the ability to shiver so they do not need brown fat to stay warm.
  - c. Adult humans have slower metabolisms so their brown fat turns to white fat.
  - d. Brown fat is more difficult to see on a scan than white fat.

5. (RST.9-10.2) What was the purpose of the study conducted by the N.I.H. researchers?

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6. (RST.9-10.1) Based on the results of the second study, what happens when a person exercises?

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*Adapted from the article, "Shivering as a Form of Exercise" by Gretchen Reynolds for The New York Times, on February 5, 2014.*

