

The Magic of the Mind

Objective:

The students will be able to describe the cognitive process of lateral inhibition and recognize it in commonplace situations in their everyday lives.

lateral inhibition: the capacity of an active neuron to suppress the activation of a neighboring neuron.

Materials Needed:

1. Youtube clips:
 - a) <https://www.youtube.com/watch?v=Jy0T-55dru4&t=38s> (magic trick)
 - b) <https://www.youtube.com/watch?v=aWTIEoNyVfE> (Mach bands)
2. Copies of Live Science article about lateral inhibition:
 - a) <https://www.livescience.com/9065-neuroscientists-reveal-magicianssecrets.html>
3. Black, red, yellow, and green dry erase markers.

Activation:

1. Show the students the following magic trick on Youtube and elicit feedback:
<https://www.youtube.com/watch?v=Jy0T-55dru4&t=38s>
 - a) Students should not be able to describe how the magician is performing the trick, but the video will likely elicit interest and excitement in trying to figure it out.
 - b) Hopefully the students will be familiar with the phrase “sleight of hand.” If not, introduce the phrase and lead the discussion toward them trying to figure out what is happening in the brain when someone is performing sleight of hand.

2. Have the students write down notes of their ideas before proceeding to the demonstration.

Demonstration:

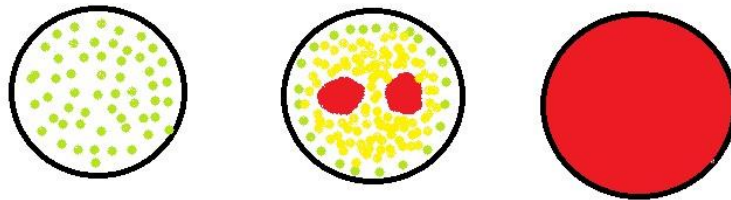
1. Prior to passing out copies of the article, write the following definitions on the board:

neuron: a specialized cell transmitting nerve impulses; a nerve cell.

stimulus: a thing or event that evokes a specific functional reaction in an organ or tissue.

2. Give examples explaining how neurons control everything in the body and how stimuli cause them to activate.
 - a) Example: Toss a marker to an unexpected student. Explain that the student's sight of the marker caused a neuron in their visual system to activate, and that neuron, in turn, sent a signal to their arm to try to catch it.
3. Read "Neuroscientists Reveal Magicians Secrets" and discuss its contents.
4. Illustrate how quickly neurons can activate.
 - a) Go to the light switch in the classroom and turn it off.
 - b) After a few seconds, slowly turn it on and explain how the light is representative of a neuron.
 - c) Then rapidly flip the light switch on and off to illustrate the speed of neurons firing.
5. Make drawings on the white board to illustrate lateral inhibition.
 - a) Draw three large circles with the black marker on the white board and write "no stimuli," "moderate stimuli," and "intense stimuli" above them.

- b) In the “no stimuli” circle, insert green dots that are even and spaced out.
- c) In the “moderate stimuli” circle, insert green dots toward the edge of the circle. Next, insert two densely packed groups of red dots, with slightly less densely packed yellow dots surrounding the red ones.
- d) In the “intense stimuli” circle, fill the whole circle in with red.



- e) Explain to the students that the more intense stimuli are in a particular area of the brain, the more it will inhibit neighboring neurons to activate.

6. Show the students the YouTube video of “Mach bands.”

- a) Explain to the students that as the bands get closer to each other, the reason they are eventually unable to perceive the differences in the bands is a result of the stimuli in certain groups of neurons in the optical nerve getting more excited, causing neighboring neurons to remain inactive.

7. Replay the video of the magician, but this time reduce the playback speed to 0.25 in Youtube’s settings. This should allow the students to see exactly how the magician is performing the trick because the decrease in speed causes a decrease in lateral inhibition, which allows the viewer to direct their attention to other parts of their field of vision.

Application:

1. Have students work in groups to come up with as many examples as they can of lateral inhibition in the world (sports, movies, art, etc.).
 - a) Make sure to have students try to expand the concept of lateral inhibition to senses other than vision (auditory, tactile, etc.)
3. Have each group share their findings with the class.

Integration:

1. Assign this essay prompt to integrate how the concept of lateral inhibition can have major real-life consequences:
 - a) “How does lateral inhibition explain the unreliability of eye-witness testimonies?”