Study shows one brain's electrical pulses can influence those of another

By Los Angeles Times, adapted by Newsela staff
05.02.17

Thanks to scientists who have gone outside the laboratory, we have learned that interacting with others changes us. For instance, research shows that good friendships are connected to good health. Women who spend a lot of time together can start to experience synchronized menstrual periods, and couples who stay together long enough can even begin to look alike.

In the wilds of a New York City biology classroom, a new study has captured another group phenomenon known to exist in labs but never before in humans' natural habitat: group brain synchrony. Group brain synchrony is when people's brains work in very similar ways at the same time.

Neurons, the cells in our brains, process and transmit information through electrical and chemical signals. The human brain has about 100 billion neurons, and everything we think, feel and do is a result of communication between them. When a mass of neurons communicate with each other, synchronized electrical pulses are produced. These are called brain waves, and scientists measure them to learn more about how our brains work.

"Theta" Waves And "Beta" Waves

Waves are measured in frequency, which is the number of pulses in a certain amount of time. Scientists generally use the unit hertz (Hz), which is equal to one pulse per second. Different brain-wave patterns have different names based on their frequency. "Theta" waves, for example, are 4-7 Hz, or pulses per second. This pattern is associated with daydreaming or feeling sleepy, while the "Beta" wave pattern, with a range of 12-30 Hz, is the most common frequency when we're awake.

Scientists can measure brain-wave patterns using a machine called an electroencephalograph or EEG. In group brain synchrony, the brain-wave patterns inside two or more brains, as seen on EEG readings, will look very similar.

Psychology researchers at New York University gave 12 high school seniors a portable EEG machine to gather the students' brain-wave readings. They observed the students' brain-wave patterns over an entire semester's worth of biology classes. The researchers reported that when students were most engaged with each other and deeply involved in group learning, the readings on their EEGs tended to show very similar brain-wave patterns.

Strong Connections

The group brain synchrony was most pronounced when students liked their teacher. Individual students who reported feeling connected to their classmates, as well as those who showed high levels of empathy, were most likely to fall into synchrony with classmates during group learning.

The new research suggests that neural synchrony may also reflect something more than just shared attention. According to neuroscientist Suzanne Dikker, who worked on the study, it was evident in social dynamics among classmates as well. This is notable since the give-and-take of group learning might have made for a less uniform experience, Dikker said.

“Brain-to-brain synchrony is a possible neural marker for dynamic social interactions, likely driven by shared attention mechanisms,” the team of researchers wrote.

Using what we know about brain waves, we can actually change how our brains work. Through a process called brain-wave "entrainment," audio or visual stimulation can train our brains to follow a certain wave pattern. For instance, brainwaves of 2Hz usually happen when we’re sleeping. If someone is having trouble sleeping, special audio recordings of the 2Hz frequency can nudge the brain to follow along.

Brain Waves In Sync

When two or more people are engaged socially with one another, that, too, appears to involve something resembling "entrainment." It seems that when everyone in a room is paying attention to the same thing, their brain waves will start to be in sync. The similar type of brain activity shows up on EEGs as neural synchrony. In other words, the electrical pulses in one brain can influence those of another.

Dikker noted that the project itself was explicitly designed as an effort to gather data in a natural setting. The researchers first gave the students a crash course in neuroscience. After enlisting their support in designing the experiment, the researchers helped the students craft a few of their own.

“They loved it — at least they said they did,” Dikker said. Except during lack of student attention around college-application time and the appearance of “senioritis” toward the end of the semester, “they really owned the project,” she said.

Researchers Design Larger Projects

The idea that neural entrainment in groups can be detected and measured with portable EEGs — and then analyzed to perceive patterns — opens new avenues for research, Dikker added.

The researchers are now designing larger projects in which they’ll be able to record brain data from up to 45 people at once.

Among the questions they hope to answer: What are the optimal conditions for an audience to experience a performance or movie? Is there an ideal group size? Does having some joint interaction right before a performance improve the experience? How does the audience affect the performer, and vice versa?

Directions for Response:

This week you need to write a <u>response of TWO paragraphs</u>. This should be done on a separate sheet of paper and follow this format:

1) **1st Paragraph**: Write a summary of the article. Make sure you:
    - **a)** Use your own words
    - **b)** Choose only the most important details
    - **c)** Pay attention to the order of the details you include
2) *****HELLO HELLO PAY ATTENTION: Your 2nd Paragraph Will Be DIFFERENT This Week!*****
    - a) Answer the following questions in your 2nd paragraph:
        - i) When can brain-to-brain synchrony be a good thing?
        - ii) When can it be a bad thing?
        - iii) What’s one way we could tap into the benefits of brain-to-brain synchrony?