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Scientists Are Now Tapping Our Brain Waves

The human body is controlled by the most amazing biological computer found in our natural world. One can argue that ours is not the largest brain found in nature, but it is the only one that can turn conscious thoughts into complex technologies.

Recognizing the power of our brains is nothing new but trying to tap into our thoughts to create cyborg human enhancements is no longer science fiction.

One of Elon Musk's newest technology initiatives is the creation of a company named Neuralink.

The goal he set for its scientists and engineers is the development of hardware that can allow the human brain to automatically interface its thoughts with artificial intelligence programs on the person's computer or smartphone. Neuralink is now hiring; if you feel you have what

Elon Musk is looking for, you should complete the application process at www.neuralink.com

Musk's Neuralink initiative appears to be looking to create their symbiotic bio-hacking cyborg connection using devices implanted inside peoples' brains. I am sure Musk will have no problem getting volunteers for their implants when

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Neuralink's technology is ready and approved for human testing.

At CES 2019 I found BrainCo. Founded in 2015, it has already made



Photo 1 (above)—
The Focus1 BMI captures brain-waves from its contact points on a person's skull



Photo 2—The BrainCo BMI uses electroencephalogram (EEG) technology, but with much fewer contact points on a person's skull than a medical EEG.

major strides in tapping human brain waves without the need for brain surgery. The BrainCo technology was developed by scientists, engineers, and PhD students from Harvard University. The Focus1 headband that they created (Photo 1), is an electroencephalogram (EEG) interface that detects the electrical activity of a person's brain through contact with several points on a person's skull. The significant difference between the BrainCo brain-machine interface (BMI) and a medical EEG is the number of contact points that are detecting a person's brainwaves. You can see in Photo 2 that the BrainCo BMI only makes contact with a limited number of points on a person's skull.

At the Harvard University Center

for Brain Science the researchers and PhD students developed and tested the headband brain wave detection system. They also developed and tested the algorithms that would allow this technology to eventually become useful products after BrainCo became an independent company from Harvard.

To interpret the brainwaves that their headband interface picks up, the scientists developed algorithms that convert the brain's electrical signals into digital code that their computer programs can use to measure a wearer's concentration and focus. Their algorithms allow the researchers to measure concentration. Their system includes programs and games that are designed to help a wearer improve the attributes that the researchers or educators are going to measure.

The neurofeedback that a wearer receives, as they complete tasks in the different computer programs, are designed to help them improve their attention and focus during different types of learning activities. Photo 3 shows me wearing the BrainCO BMI at CES 2019 and working with their software. My goal was to relax my body and mind and focus my

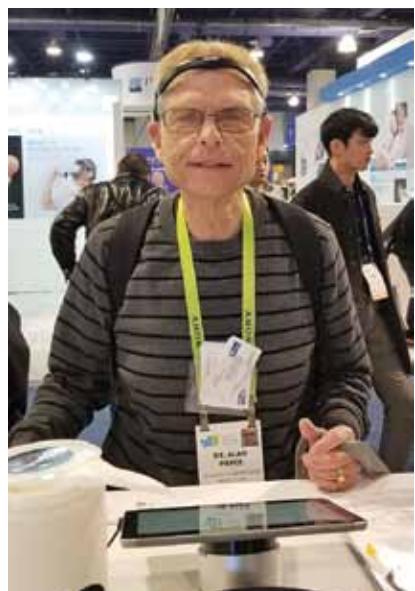


Photo 3—My testing of their BMI headband and software at CES made it clear to me that their 5,000 student study results could become an education game changer.

Photo 4—The BrainCo brainwave research study can selectively look at individual students. Its researchers and school administrators can, on the fly, measure their attention to what is going on in the classroom.



BrainCo

thoughts to control, only with my mind, a car on the computer screen. They have now developed proprietary algorithms and neurofeedback programs and products for education (FocusEDU), fitness (FocusFIT) and wellness (FocusNOW).

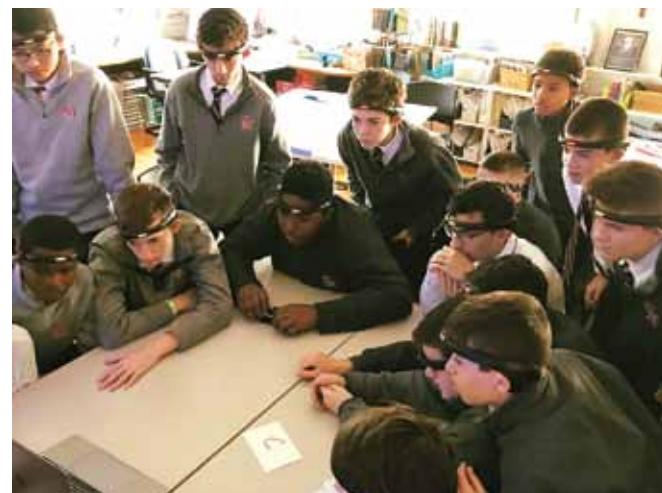
FocusEDU started out as a joint project between PhD students from the Harvard Center for Brain Science and the Harvard Graduate School of Education. Together they created the FocusEDU program. BrainCo has signed up 5,000 students in what they indicate is the “world’s largest student brainwave study.”

Through the use of the headband brain interface and the proprietary software, FocusEDU is studying the effectiveness of the headband’s ability to measure and increase student attention and focus during different types of learning activities. Figure 1 shows how the brain study research-

ers and educators can view individual students and measure their attention levels on the fly during classroom activities when the Focus1 hardware is being used (Photos 4 and 5).

The training programs include

**Photo 5—
Students
don’t have to
be sitting at
a computer
for their
brainwaves
to be
measured and
documented.**



BrainCo

games, exercises, and activities that are designed to help students relax and improve their attention and focus. When the 5,000-student brainwave study is completed the researchers will have documentation that hopefully proves that their technology can, at a statistically significant level, improve a person’s ability to concentrate and focus on different learning tasks. A successful research outcome will show that their system can determine and measure each student’s learning style, and at the same time improve the overall performance of all the students in the classroom.

The goal of FocusFIT is to use the BMI neurofeedback, algorithms, and appropriate computer games and activities to help athletes reach their



Fig. 1—The algorithms chart the variability of student concentration and can provide insight into the individual learning styles of each student.

best performance and fastest recovery times. The wellness program FocusNOW has its own algorithms and software designed to help adults and seniors reduce stress and improve their focus and concentration.

Taking It a Step Further

1. If, in the near future, an implant or BMI headband could give you a cyborg link with your smartphone, how do you feel this would change our education system?

2. As a class assignment, compete to see which group can identify:

- The number of animals that have larger brains than us.

• The number of animals besides us that use tools. Describe how these tools are used or made. ☺