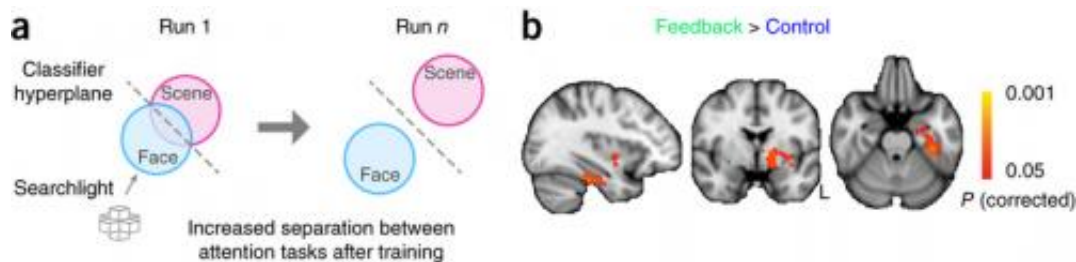


# Researchers use closed-loop feedback from the brain to improve attention abilities

February 10 2015, by Bob Yirka



Searchlight analyses. Credit: *Nature Neuroscience* (2015) doi:10.1038/nn.3940

(Medical Xpress)—A team of researchers at Princeton University has found a way to improve the attention span of volunteers in a study. In their paper published in the journal *Nature Neuroscience*, the team describes how they used fMRI machines to provide feedback to volunteers having their attention abilities tested and the impact it had on them.

As the researchers note, the importance of paying attention at important times has become more important in our modern society—lapses can lead to car accidents or looking silly in a business meeting. They, like many others, wanted to know if a way could be found to cause people to be better at paying attention. To find out they enlisted the assistance of several volunteers who agreed to lay down inside of an fMRI machine while they played what amounted to a simple [video game](#).

The idea was relatively straight forward, ask the volunteers to look at images of landscapes with people's faces superimposed over them and to press a button when the face shown was female (which was most of the time) and then to press a button depending on whether the landscape scene was inside or outside. Very easy and very boring, which was the point, they wanted the volunteers to zone out. As the volunteers did as they were asked, their brains were scanned by the fMRI with the images sent to a computer running pattern recognition software that was able to detect if they were looking at a male or female face or an indoor or outdoor scene, which meant it could tell when the person was spacing out.

The next part involved training the mind—when the software detected mind wandering, it automatically made very subtle changes to what the volunteers were seeing, making the background landscape grow dimmer for example, to highlight the face on top of it. By doing so, the researchers were able to cause an improvement in focus (as compared to a control group which did not get any brain feedback adjustments to their screen) by the [volunteers](#) as evidenced by the scores they received while playing their video game. That showed, the researchers claimed, that they were able to exercise the brain in a way that caused an improved ability to pay [attention](#).

The findings by the team may or may not relate to real world situations, but the team is confident that they have found that providing feedback from a person's own brain can help improve concentration abilities.

**More information:** Closed-loop training of attention with real-time brain imaging, *Nature Neuroscience* (2015) [DOI: 10.1038/nn.3940](https://doi.org/10.1038/nn.3940)

## Abstract

Lapses of attention can have negative consequences, including accidents and lost productivity. Here we used closed-loop neurofeedback to

improve sustained attention abilities and reduce the frequency of lapses. During a sustained attention task, the focus of attention was monitored in real time with multivariate pattern analysis of whole-brain neuroimaging data. When indicators of an attentional lapse were detected in the brain, we gave human participants feedback by making the task more difficult. Behavioral performance improved after one training session, relative to control participants who received feedback from other participants' brains. This improvement was largest when feedback carried information from a frontoparietal attention network. A neural consequence of training was that the basal ganglia and ventral temporal cortex came to represent attentional states more distinctively. These findings suggest that attentional failures do not reflect an upper limit on cognitive potential and that attention can be trained with appropriate feedback about neural signals.

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