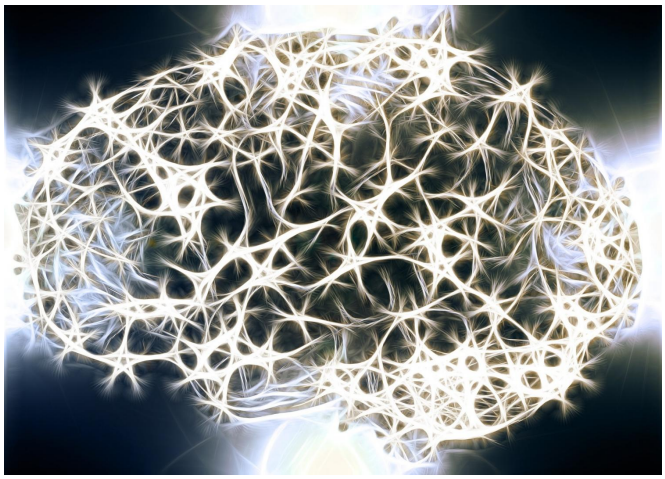
Training changes the way the brain pays attention

27 June 2017



Behavioral training changes the way attention facilitates information processing in the human brain. Credit: Geralt, Pixabay

Behavioral training changes the way attention facilitates information processing in the human brain, a study publishing on June 27 in the open access journal *PLOS Biology* led by Sirawaj Itthipuripat, at University of California San Diego, has found.

After moving to a new city, driving to work on the second or third day may feel very different than it felt on the first day. Over time, drivers will feel more at ease on the road, not only because they can better remember which road signs to attend to or where to turn, but also because they will have an actual experience of doing so. This type of cognitive phenomenon applies not only for everyday-life activities like driving, but also for career-related skills that require training and expertise such as reading x-rays and excelling in sporting activities.

The scientists monitored behavioral performance and brain activity using electroencephalography (EEG) for over 1 month in human participants performing a computer task that required them to direct their attention to a visual stimulus.

They discovered that early in the task, attention enhanced the magnitude of sensory-evoked responses in the visual cortex. Using computational modeling, they also found that this attentional gain predicted the benefit of training observed in behavioral performance. Surprisingly, after extended training, this attentional gain disappeared, even though behavioral performance was still improved compared to before training. Their modelling experiments indicated that after extended training noise-reduction in brain activity predicted the benefit of training in behavioral performance.

Interestingly, these findings also help reconcile contradictory results observed across studies conducted in different species. Specifically, in monkeys, previous research has demonstrated that changes in neural noise play a more dominant role than attentional gain in supporting attention-related benefits in behavioral performance. The current findings in humans suggest that this particular result from monkey studies could be due to non-human primates being highly-trained.

According to Itthipuripat, "Most primate studies have to train subjects over many months to perform behavioral tasks that humans can conceptualize and perform well within 2-3 minutes. So, it is not surprising that many times, results obtained from humans and monkeys diverge from one another. Here we had to train human participants across many days to observe converging results across the two species. Our research, which demonstrates that attentional mechanisms could change with training, teaches us that we can't fully understand how attention operates at the neural level without understanding how attentional mechanisms may change through a course of training. Thus, our research has important implications for understanding attentional mechanisms, as well as

for generalizing results from studies using different species that often require substantially different amounts of training."

More information: Itthipuripat S, Cha K, Byers A, Serences JT (2017) Two different mechanisms support selective attention at different phases of training. *PLoS Biol* 15(6): e2001724. doi.org/10.1371/journal.pbio.2001724

Provided by Public Library of Science