MedicalXpress

Overnight experiment creates social brain lab, yields new insights about 'speed of learning' changes in the brain

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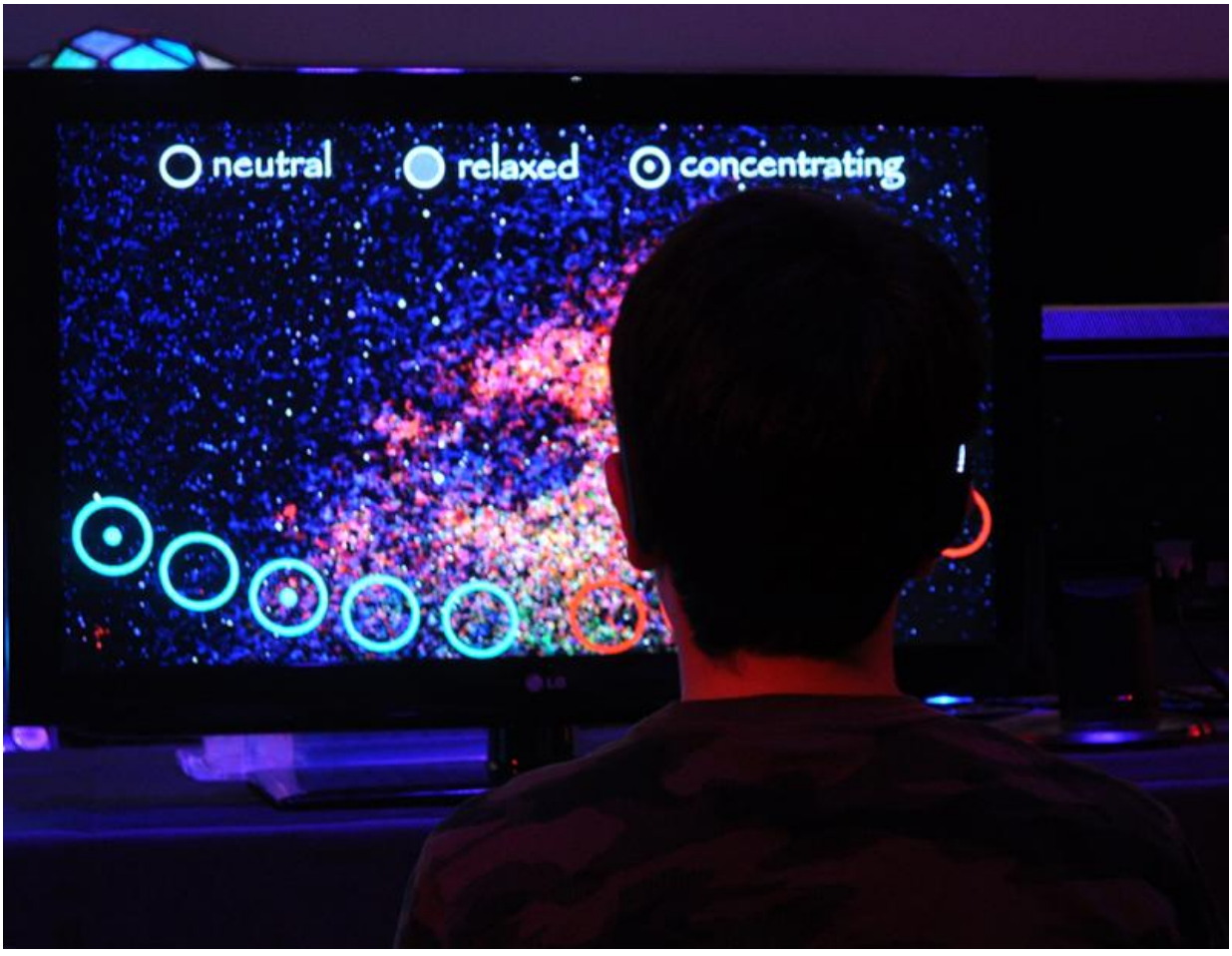

A study participant manipulates his mental states of relaxation and concentration as part of a collective neurofeedback experiment conducted with 523 adults at the 2013 Scotiabank Nuit Blanche arts festival in Toronto. Credit: Kelly Connelly / Baycrest Health Sciences

Neuroscientists in Toronto have shown that crowdsourcing brain data with hundreds of adults in a short period of time could be a new frontier in neuroscience and lead to new insights about the brain.

Dr. Natasha Kovacevic of Baycrest Health Sciences' Rotman Research Institute is the lead author of a scientific paper on the crowdsourcing experiment - "My Virtual Dream: Collective Neurofeedback in an Immersive Art Environment" - published online today in the journal *PLOS ONE*.

More than 500 adults aged 18 and older participated in the experiment at the 2013 Scotiabank Nuit Blanche arts event in Toronto. Baycrest, in partnership with the University of Toronto and industry partners, created a large-scale art-science installation called My Virtual Dream. Festival-goers were invited to wear a Muse wireless electroencephalography (EEG) headband and participate in a brief collective neurofeedback experience in groups of 20 inside a 60-foot geodesic dome. The group's collective EEG signals triggered a specific catalogue of artistic imagery displayed on the dome's 360-degree interior, along with spontaneous musical interpretation by live musicians on stage.

The installation was one of the most popular at Nuit Blanche, with an average lineup wait time of two hours.

Studying brains in a social and multi-sensory environment is closer to real life and may help scientists to approach questions of complex real-life social cognition that otherwise are not accessible in traditional labs that study one person's cognitive functions at a time.

"In traditional lab settings, the environment is so controlled that you can lose some of the fine points of real-time brain activity that occur in a

social life setting," said Dr. Kovacevic, creative producer of My Virtual Dream and program manager of the Centre for Integrative Brain Dynamics at Baycrest's Rotman Research Institute.

"What we've done is taken the lab to the public. We collaborated with multi-media artists, made this experiment incredibly engaging, attracted highly motivated subjects which is not easy to do in the traditional lab setting, and collected useful scientific data from their experience."

Results from the experiment not only demonstrated the scientific viability of collective neurofeedback as a potential new avenue of neuroscience research that takes into account individuality, complexity and sociability of the human mind, but yielded new evidence that neurofeedback learning can have an effect on the brain almost immediately.

Neurofeedback learning supports mindful awareness and joins a growing market for wearable biofeedback devices. The device used in this study, Muse, is a clinical-grade EEG brain computer interface (BCI) headband that helps individuals to be more aware of their brain states (relaxed versus focused versus distracted) and learn self-regulation of brain function to fit their personal goals.

A total of 523 adults (209 males, 314 females), ranging in age from 18 to 89, with an average age of 31, contributed their EEG brain data for the study. Each session involved 20 participants being seated in a semicircle in front of a stage and divided into four groups ("pods") of five. They played a collective neurofeedback computer game where they were required to manipulate their mental states of relaxation and concentration. The neurofeedback training lasted 6.5 minutes, which is much shorter than typical neurofeedback training experiments.

The massive amount of EEG data collected in one night yielded an

interesting and statistically relevant finding - that subtle brain activity changes were taking place within approximately one minute of the neurofeedback learning exercise - unprecedented speed of learning changes that have not been demonstrated before.

"These results really open up a whole new domain of neuroscience study that actively engages the public to advance our understanding of the brain," said Dr. Randy McIntosh, director of the Rotman Research Institute and vice-president of Research at Baycrest. He is a senior author on the paper.

The idea for the Nuit Blanche art -science experiment was inspired by Baycrest's ongoing international project to build the world's first functional, virtual brain - a research and diagnostic tool that could one day revolutionize brain healthcare.

Baycrest cognitive neuroscientists collaborated with artists and gaming and wearable technology industry partners for over a year to create the My Virtual Dream installation. Partners included the University of Toronto, Scotiabank Nuit Blanche, Muse and Uken Games.

Plans are underway to travel My Virtual Dream to other cities around the world.

Provided by Baycrest Centre for Geriatric Care