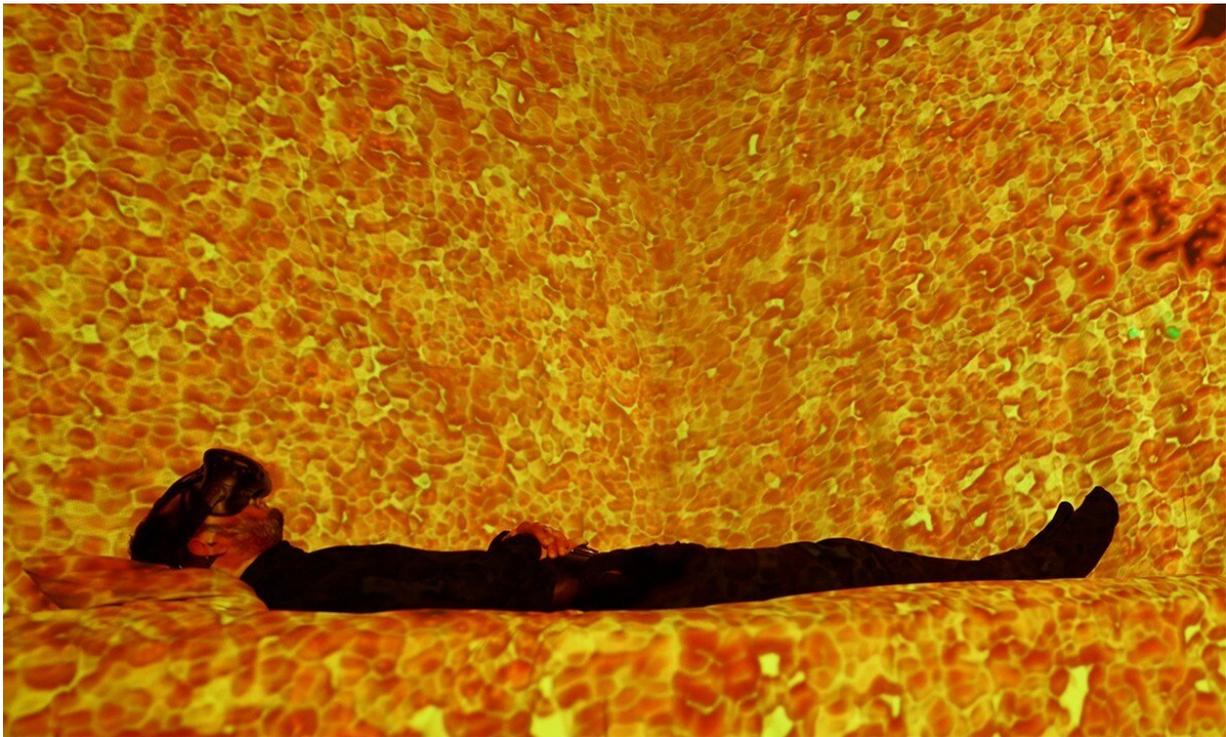


VR lullaby machine shown to induce tranquil pre-sleep states

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Inter-Dream involves an interactive bed and ambient music controlled by the artists, and kaleidoscopic visuals controlled by the user with their own brainwaves, via EEG. Credit: RMIT

Designed by PluginHUMAN art duo, Dr. Betty Sargeant and Justin Dwyer, the system involves an interactive bed and ambient music controlled by the artists, and kaleidoscopic visuals controlled by the user

with their own brainwaves, via EEG.

With each brain frequency assigned a different colour and brainwave intensity tied to movement, each person's brain activity generates unique imagery.

Ph.D. researcher with RMIT University's Exertion Games Lab, Natanan Semertzidis, has now assessed the system for inducing pre-[sleep](#) states and general mental wellbeing.

"Technology and sleep are always talked about as incompatible," Semertzidis says. "Our findings flip that notion upside down and show how technology can also aid rest and relaxation."

Analysis of physiological and psychological data along with user interviews were recently presented at the premier international conference of Human-Computer Interaction, CHI 2019.

"Results demonstrated statistically significant decreases in pre-sleep cognitive arousal and negative emotion," Semertzidis says.

"EEG readings were also indicative of restorative restfulness and a clear mind, while interview responses described experiences of mindfulness."

Participants reported a 21 per cent drop in general negative emotion and a 55 per cent drop in feelings of fear after using Inter-Dream. Meanwhile, general positive emotions increased by 8 per cent and feelings of serenity by 13 per cent.

Good sleep is acknowledged to be preceded by a characteristic set of specific cognitive and mood states, as well as physiological changes, says Semertzidis.

"Good sleepers are generally more relaxed and positive, while bad sleepers are more likely to focus on unpleasant and intrusive worries and stressors because of involuntary mental rehearsal of the past day's events," he says.

"It makes sense that influencing these cognitive mood states can help us better ease into rest."

Semertzidis says people not only passively relaxed into the experience but creatively interacted with it too.

"Some of them reported really going on a journey by manipulating the system with their minds," he says.

"This is no trivial notion in the context of inducing positive pre-sleep states, as it has been well documented that creative expression is strongly associated with positive effects on emotion and affect."

Another prevalent theme from the 12 user interviews was cognitive states consistent with those of mindfulness.

"This was often voiced as a redirection of thought away from life stressors and toward the present experience as a result of the system's neurofeedback reactivity," he says.

Semertzidis' supervisor and co-author on the paper, Associate Professor Fabio Zambetta, said while the system itself was not the answer to healthy sleep—clinical interventions would require larger samples and control groups, and technology would need to be explored that was less invasive during sleep—it presented a fascinating case study.

"Our findings are really significant in pointing a possible way forward using [neurofeedback](#) technology to facilitate restfulness and sleep onset,"

Zambetta said.

Semertzidis' co-supervisor Professor Florian 'Floyd' Mueller, who heads RMIT University's Exertion Games Lab, said the project demonstrated how art and science can complement each other in novel approaches to address old problems.

"The work really puts the human body centre stage, allowing us to see the human body not just as a mere input controller, but rather allowing people to experience their bodies as play," Mueller said.

"For me, this is a beginning to facilitate a more playful future, in particular, one where we can even experience rest and ultimately sleep as a form of (digital) [play](#): it would be fascinating to explore what such a future could look like and we are always looking for Ph.D. candidates who want to explore this."

Provided by RMIT University

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