

Designing Virtual Environments for Breath-Awareness & Eliciting Positive Affective States

SFU SIMON FRASER UNIVERSITY
ENGAGING THE WORLD



Alexandra Kitson
akitson@sfu.ca



Mirjana Prpa
mprpa@sfu.ca



Bernhard E. Riecke
ber1@sfu.ca

School of Interactive Arts & Technology, Simon Fraser University, Surrey, BC, Canada



Sonic Cradle^[1,2]

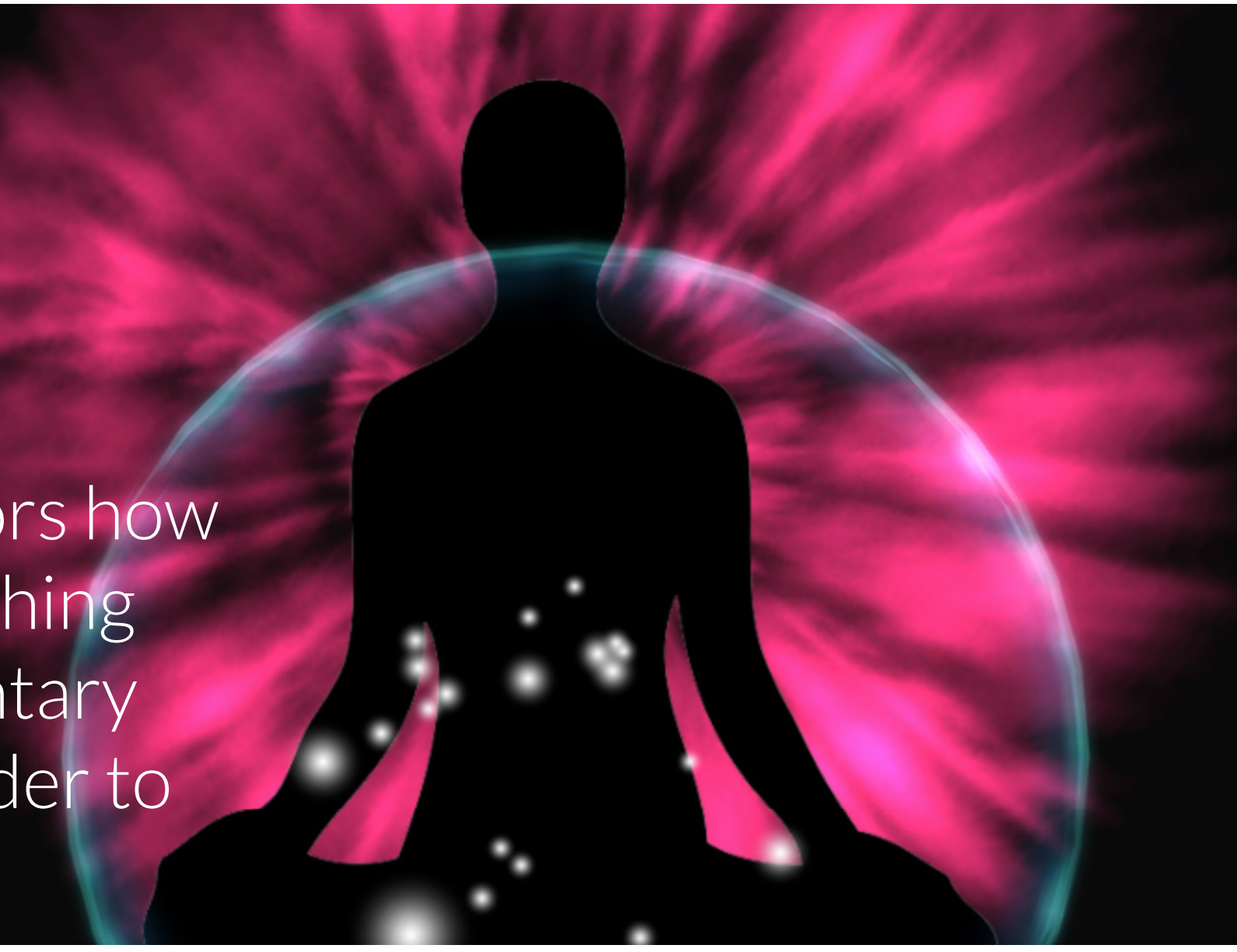
Freeform exploration of breathing patterns.

An immersive soundscape that supports mindfulness-like awareness for novice meditators in a playful way by controlling sounds using their breath.

SOLAR^[3]

Guided experience --> freeform exploration of mindful breathing.

A VE that teaches novice meditators how to meditate by utilizing their breathing and EEG data through complementary visual and auditory feedback in order to reduce stress.



Introduction Computer-supported mindfulness can use breath awareness as a feedback mechanism that the user can attend to for meditation, leading to overall decreased negative affect, e.g., stress, and increased well-being. What exactly is the relationship between breath and audio/visual mappings in virtual environments, and those interaction paradigms that contribute to eliciting positive affective states? We offer design principles derived from having created two virtual experiences for breath-awareness and eliciting positive affective states: Sonic Cradle and SOLAR.

Derived Design Principles

Sonic Cradle

- 1. Exploration:** let the user play and discover.
- 2. Minimal stimuli:** reduce outside noise or influences to create a safe space for the user to engage in the experience, allowing them to focus on breathing.
- 3. Comfort:** wearables should be seamlessly integrated into the system so that the user can focus on the experience of breathing rather than on the technology itself.
- 4. Personalized sound:** some sounds can be triggering and have the reverse effect of relaxation, so designers should carefully consider which sounds are selected.

SOLAR

- 1. Thought distancing:** a state of awareness in which internal mental events are not judged, analyzed or responded to.
- 2. Abstract Visual Elements:** concrete images, e.g., flower, sun, and beach, are more likely to trigger memories, judgments, etc.
- 3. Rewarding System:** the user's anticipation of an enjoyable soundscape and visuals that accompany a proper meditation session will provide motivational feedback, signaling to the user they are meditating properly, and will reinforce thought distancing techniques for longer periods of time.
- 4. Immersive and Attention Restorative Environments (ARE):** immersive environments can positively impact user's attention; the environments with stimuli that modestly capture attention are preferred.

Lessons Learned: Stimulus

Sonic Cradle

Sounds are closely tied to memory and may trigger intense thoughts or feelings in some users; we recommend a personalized soundscape for each user.

SOLAR

Too complex environments are distracting; introduce stimuli one at the time.

Introducing the stimuli in the guided session helped novice meditators to approach practice without judgment about their performance in moment-to-moment evaluation.

Some of the participants expressed that a black and white environment would be more suitable for this kind of practice in order to minimize distractions.

The Sonic Cradle really helped, a lot actually. It's a really dynamic, free-floating experience. Your mind is engaged without having to think. So, it's keeping you distracted but not... maybe you don't think critically. You're not distracted by other things, and you're able to just relax. -Sonic Cradle

I didn't know why I was nervous about meditating but I was. I was kind of daunted by the no time limit because I haven't meditated for so long time and it was really great! The visuals made me more aware of my breathing and controlled it. -SOLAR

Lessons Learned: Mapping

Sonic Cradle

Hold the breath to add sound; breathe quickly to subtract sound did not work as an intuitive mapping because the goal of meditation is more to be without sound when focusing on slow, steady breathing; instead we recommend quick breathing, like agni-prasana in kundalini yoga, to bring in sounds and holding the breath to subtract sounds, like pausing your breath after a long inhale/exhale.

SOLAR

Two scenes
Scene 1: intro to meditation where the mapping is explained;
Scene 2: breathing is mapped to a circle that expands while the user is breathing in, and contracts as the user is breathing out.
User's EEG data is mapped to the colour of a sun-shaped element behind the silhouette as a subtle reminder of a current state.

Lessons Learned: Space

Sonic Cradle

Sonic Cradle is in a completely dark room without distractions, but theoretically this could be used in any space that is comfortable for the user, somewhere non-judgemental and safe so that users can be free to play and explore the system.

SOLAR

If possible, the system should be placed in a quiet room without external distractions; lab settings and busy spaces can be distracting and uncomfortable.

References

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- [2] Vidyarthi, J., Riecke, B. E., & Gromala, D. (2012). Sonic Cradle: Designing for an Immersive Experience of Meditation by Connecting Respiration to Music. In Proceedings of the Designing Interactive Systems Conference (pp. 408–417). New York, NY, USA: ACM.
- [3] Prpa, M., Cochrane, K., & Riecke, B. E. (2015). Hacking Alternatives in 21st Century: Designing a Bio-Responsive Virtual Environment for Stress Reduction. In S. Serino, A. Matic, D. Giakoumis, G. Lopez, & P. Cipresso (Eds.), Pervasive Computing Paradigms for Mental Health (pp. 34–39). Springer International Publishing.

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