

Can Lucid Dreaming Research Guide Self-Transcendent Experience Design in Virtual Reality?

Alexandra Kitson*
Simon Fraser University
Surrey, BC, Canada

Bernhard E. Riecke**
Simon Fraser University
Surrey, BC, Canada

ABSTRACT

As virtual reality designers, we aim to create technological experiences to better human connection and well-being in hopes of helping humankind and society in a positive way. It is therefore important to ground the frameworks we use in genuine human experience rather than mindlessly apply models that do not account for highly personal and profound experiences. One type of experience that could help create positive connection and decrease self-saliency is self-transcendence. However, currently there does not exist a concrete model for designing self-transcendent experiences for virtual reality. Lucid dreaming, being conscious one is dreaming while in the dream, has the potential to induce self-transcendence; it is essentially the ultimate virtual reality. If lucid dreaming and virtual reality are so similar, then can we research self-transcendent experiences in lucid dreaming and apply that knowledge to virtual reality? In this paper we argue that lucid dreaming could indeed act as a guide for designing transcendent experiences in virtual reality.

Keywords: Somaesthetics, user-centered design, technowellness, positive technology, positive computing, techno-spiritual design, lucid dreaming, virtual reality.

Index Terms: *Human-centered computing~HCI theory, concepts and models*

1 INTRODUCTION

Technology is becoming increasingly prevalent in our everyday lives, making connecting with others easier and accessing information almost instantaneous. Yet, despite all these benefits that come with an increased presence of technology we still see its darker side: social networks are mainly shallow interactions, and many people are mindlessly consuming and sharing content. Consequently, decreased connectedness and increased self-saliency have ensued, which can lead to depression, anxiety, and decreased self-worth [1]. That said, there exist movements in different fields to design and use technology to support positive human functioning and well-being, e.g., Positive Computing and Positive Technology, which we will later elaborate on. One sub-field is Transcendence Technology, which aims “to design technology that facilitates three aspects of transcendence: moving beyond the self, connecting with others, and sharing pro-social goals and ideas” [2]. Therefore, we might be able to apply the design principles from these fields in order to create technologies that connect people in ways that are meaningful and authentic. However, the nature of transcendent experiences is highly

personal and introspective in nature, and often cannot be described by the confines of language alone [3]. One existing technology that fits well with the experience of transcendence is virtual reality (VR) because of three unique kinds of transformative potentials: manipulating bodily self-consciousness, embodying another person's subjective experience, and altering laws of logic and nature [4]. Yet, there are currently no existing principles to guide the design of transcendent experiences in virtual reality. The authors believe the philosophy of user-centered design in this case should be upheld – designers should optimize a product around how users can, want, or need to use the product rather than forcing users to change their behaviour to accommodate the product that is not optimized for them [5]. Thus, we posit that improving our understanding of real human experiences of self-transcendence might help us to design better virtual reality experiences that aim to provide a similar experience of transcendence. And, we have a particular transcendent experience in mind to guide the design of transcendent experiences in virtual reality: lucid dreaming – knowing one is dreaming while in a dream [6]. Lucid dreaming may be a good candidate for several reasons, including its parallelism to virtual reality experiences and ability to induce self-transcendent experiences. We will elaborate on these points in the discussion.

2 BACKGROUND

In the field of human-computer interaction (HCI), Norman and Draper [5] first put forth the philosophy of user-centered design in an effort to put the needs of people at the center of product design rather than having technologists and designers force users to change their behaviours to match their products. From user-centered design came many fields that attempted to integrate this philosophy: somaesthetics, technowellness, techno-spiritual design, positive technology, positive computing, and transcendence technology. In the following sections, we will provide a brief background on these fields before jointly discussing their contribution in the discussion section.

2.1 Positive Psychology, Technology, and Computing

Positive Psychology was developed by Seligman and Csikszentmihalyi [7] in order to create balance, in opposition of the predominantly disease and treatment focused fields of psychotherapy and psychiatry, toward a model of human flourishing. From the idea of Positive Psychology came the fields of Positive Technology [8] and Computing [9], [10]. Positive Technology was created from a psychology and social science perspective, focused on improving personal experience. Positive Computing, on the other hand, was created from a computer science perspective, focused on universal well-being design. Though each offer a different perspective on designing for positive technological experience, both Positive Technology and Computing attempt to integrate scientific principles of well-being into the design of interactive systems [11].

* akitson@sfu.ca

** ber1@sfu.ca

2.2 Somaesthetics

Somaesthetics is the notion that all of our experiences and interactions in the world happen through our bodies, and that by becoming more aware of our bodily interactions we can also become more perceptive of the world we live in [12]. The HCI literature has begun to incorporate this idea into design practice and technological creation [13]–[17].

2.3 Technowellness and Techno-Spiritual Design

TechnoWellness is defined as “a mode of interacting with technology that maximizes its potential to enhance health and wellbeing and contribute to an optimal life” [18]. TechnoWellness shares similar goals to Positive Technology, but Kennedy argues Positive Technology fails to incorporate some components of the counselling well-being models. TechnoWellness, then, incorporates the Indivisible Self (IS-WeI) model [19] that includes five second-order factors: Creative Self, Coping Self, Social Self, Essential Self, and Physical Self. Techno-spiritual design bridges the domains of spiritual experience and user experience (UX) by studying the artefacts in spiritual experiences [20]. Techno-spiritual design uses a research through design approach combined with gaming to capture and create ineffable experiences such as transcendent experiences; the idea behind this being that people can express ineffable experiences through creativity. Unlike the previous domains of well-being and technology, techno-spiritual design does not refer to or build off of other theories.

2.4 Virtual Reality

Virtual Reality (VR) is an immersive space in which a user can interact with the environment. The first head-mounted display, called the Telesphere Mask, was invented in the 1960s by Heilig [21] and then further developed into Headsight by Comeau & Bryan [22]. Since then, we have witnessed more and more applications, but only now are designers and technologists looking at using VR beyond entertainment and training tools and into the realm for self-actualizing experiences [23]. For example, there have been several VR experiences that aim to better mental health and well-being through meditative practices and biofeedback [24]–[39].

2.5 Lucid Dreaming

Lucid dreaming is defined as the experience of knowing one is dreaming while one is dreaming [6]. It has been described throughout human history, and was scientifically validated by LaBerge relatively recently through an experiment involving asking proficient lucid dreamers to move their eyes in a specific way when they were lucid while dreaming [40]. The practice of lucid dreaming is related to Dream Yoga, a Buddhist practice of exploring one’s consciousness during sleep [41]. However, lucid dreaming is not associated with religious practice. Instead, lucid dreamers can choose to interact or change their environment as they see fit, which may include interacting with or exploring their own consciousness [42].

3 DISCUSSION

There have been several fields advancing virtual reality applications relating to positive mental health and well-being, such as technowellness, techno-spiritual design, positive technology, and positive computing. Yet, the actual VR experiences created are primarily focused on stress reduction and modulating high valence emotional states, i.e., the hedonic level of positive human functioning, and less on self-transcendence, i.e., the eudaimonic and social level of positive human

functioning. Currently, we do not have a clear model for designing self-transcendent experiences in VR. However, the advancement of somaesthetics, human-centered design, and transcendence technology point towards using genuine, real human experiences to help guide human-computer interaction. In the following sections, we will provide evidence for the claim that researching lucid dream experiences and practices might provide us with guidelines for designing better transcendent experiences in virtual reality, as well as address any counter-claims.

3.1 Lucid Dreaming as a Virtual World

Lucid dreaming has many parallels to virtual reality, which can make it a suitable subject to study for designing similar VR experiences. For example, lucid dreamers feel present in the dream world and can interact with the objects in it [43], which is similar to how users interact in a virtual environment. Lucid dreamers can also see fantastical worlds and experience things they would not otherwise be able to do in the real world, such as flying or conversing with a unicorn [44]; this is much like virtual reality in that the virtual world is only limited to the designer’s imagination and available hardware. Lucid dreaming is also much like VR because what is experienced in the lucid dream has real world effects both on a person’s psychological and behavioural level [45]. For example, one can change the outcome of a nightmare or practice a sport while lucid dreaming, and have that confidence carry over into waking life [46]. VR may have the same potential in modifying our behaviours and perceptions by allowing its users to feel as if the virtual world is really happening to them.

3.2 Transcendence in Lucid Dreams

Lucid dreams might be a platform in which to help induce transcendent experiences. Lucid dreams are created and informed by our own consciousness, which may give us a different perspective on our own internal states and thoughts [45]. This altered perspective could give the right conditions that make transcendent experiences possible. There have been many reports from lucid dreamers that they use lucid dreaming as a way to introspect [44] and some researchers have argued that lucid dreaming presents a unique opportunity to study aspects of consciousness and introspection [47]. Therefore, we can research lucid dreaming and we might use it as a lens into the unseen world of transcendent experiences.

3.3 Limitations of Lucid Dreaming Research

Lucid dreams may have many similarities to virtual reality and have the potential to induce transcendent experiences that we might then apply to VR transcendent experience design. However, there are several considerations and limitations we need to address. First, there is currently no empirically method to validate lucid dreaming experiences; we cannot look into the minds of lucid dreamers and see what they are seeing while dreaming. There is some research using EEG and fMRI to study sleep and dreams [48]. However, brain activity is quite different than subjective experience and even more different than capturing a self-transcendent experience. Therefore, any guidelines we might draw from lucid dreaming experiences of transcendence will be a second-hand account and may be flawed or biased. Yet, there do exist methods that can place the participant in the experience as it happened to provide a realistic and accurate account, such as micro-phenomenology [49] and cued-recall debrief [50].

A second limitation for using lucid dreaming to provide insight into VR transcendence design is that current technology does not exist to capture the highly personal nature of lucid dreams. Hence, lucid dreaming cannot be fully realized as a VR experience.

However, the authors believe that technology will only get better at simulating these kinds of experiences reported in lucid dreams, e.g., flying, and that brain-computer interfaces will eventually be able to provide biofeedback to a VR environment based on the user's neurological states. Moreover, lucid dreaming could show the path towards what "natural" and intuitive interaction design looks like in VR. Even if currently we cannot totally simulate lucid dreaming experiences, we can still attempt to provide the space that allows people the opportunity to have a transcendent experience. After all, one cannot make a person have a transcendent experience – we can only design the right tools and environment in which a person might engage in one.

4 CONCLUSION

Spiritual experiences like lucid dreaming can provide us with rich data on how to better design for self-transcendent experiences in virtual reality because of their strong parallels to each other and potential for self-transcendent experiences. Lucid dreaming offers designers a unique perspective to both see how the ultimate VR might look at its full potential and inspire a product that is grounded in genuine human experience. With support from the fields of somaesthetics, technowellness, techno-spiritual design, positive technology, and positive computing, we might be able to design a virtual reality in which people could have self-transcendent experiences. Ultimately, these self-transcendent experiences in VR could have positive effects on people by increasing their sense of connection and decreasing self-saliency.

REFERENCES

- [1] K. L. Williams and R. V. Galliher, "Predicting Depression and Self-Esteem from Social Connectedness, Support, and Competence," *J. Soc. Clin. Psychol.*, vol. 25, no. 8, pp. 855–874, Oct. 2006.
- [2] J. Mossbridge, "Designing Transcendence Technology," in *Psychology's New Design Science and the Reflective Practitioner*, 2016, pp. 1–27.
- [3] M. Rankin, *An Introduction to Religious and Spiritual Experience*. Bloomsbury Publishing, 2008.
- [4] A. Gaggioli, *Transformative Experience Design*. De Gruyter, 2016.
- [5] D. A. Norman and S. W. Draper, *User Centered System Design; New Perspectives on Human-Computer Interaction*. Hillsdale, NJ, USA: L. Erlbaum Associates Inc., 1986.
- [6] S. LaBerge, *Lucid Dreaming: A Concise Guide to Awakening in Your Dreams and in Your Life*. ReadHowYouWant.com, 2009.
- [7] M. E. P. Seligman and M. Csikszentmihalyi, "Positive Psychology: An Introduction," in *Flow and the Foundations of Positive Psychology*, Springer, Dordrecht, 2014, pp. 279–298.
- [8] G. Riva, R. M. Baños, C. Botella, B. K. Wiederhold, and A. Gaggioli, "Positive Technology: Using Interactive Technologies to Promote Positive Functioning," *Cyberpsychology Behav. Soc. Netw.*, vol. 15, no. 2, pp. 69–77, Feb. 2012.
- [9] T. Sander, "Positive Computing," in *Positive Psychology as Social Change*, Springer, Dordrecht, 2011, pp. 309–326.
- [10] R. A. Calvo and D. Peters, *Positive Computing: Technology for Wellbeing and Human Potential*. MIT Press, 2014.
- [11] A. Gaggioli, G. Riva, D. Peters, and R. A. Calvo, "Positive Technology, Computing, and Design: Shaping a Future in Which Technology Promotes Psychological Well-Being," in *Emotions and Affect in Human Factors and Human-Computer Interaction*, Elsevier, 2017, pp. 477–502.
- [12] R. Shusterman, *Thinking through the body: essays in somaesthetics*. Cambridge, UK; New York: Cambridge University Press, 2012.
- [13] K. Höök, A. Ståhl, M. Jonsson, J. Mercurio, A. Karlsson, and E.-C. B. Johnson, "Cover story somaesthetic design," *interactions*, vol. 22, no. 4, pp. 26–33, 2015.
- [14] S. Fdili Alaoui, T. Schiphorst, S. Cuykendall, K. Carlson, K. Studd, and K. Bradley, "Strategies for Embodied Design: The Value and Challenges of Observing Movement," in *Proceedings of the 2015 ACM SIGCHI Conference on Creativity and Cognition*, New York, NY, USA, 2015, pp. 121–130.
- [15] I. Aslan, H. Burkhardt, J. Kraus, and E. André, "Hold My Heart and Breathe with Me: Tangible Somaesthetic Designs," in *Proceedings of the 9th Nordic Conference on Human-Computer Interaction*, New York, NY, USA, 2016, p. 92:1–92:6.
- [16] W. Lee, Y. Lim, and R. Shusterman, "Practicing somaesthetics: exploring its impact on interactive product design ideation," 2014, pp. 1055–1064.
- [17] T. Schiphorst, "Soft(N): Toward a Somaesthetics of Touch," in *CHI '09 Extended Abstracts on Human Factors in Computing Systems*, New York, NY, USA, 2009, pp. 2427–2438.
- [18] S. D. Kennedy, "TechnoWellness: A New Wellness Construct in the 21st Century," *J. Couns. Leadersh. Advocacy*, vol. 1, no. 2, pp. 113–127, Jul. 2014.
- [19] J. E. Myers and T. J. Sweeney, "The Indivisible Self: An Evidence-Based Model of Wellness (reprint)," *J. Individ. Psychol.*, vol. 61, no. 3, pp. 269–279, Fall 2005.
- [20] E. Buie, "Transcendhance: A Game to Facilitate Techno-Spiritual Design," in *Proceedings of the 2016 CHI Conference Extended Abstracts on Human Factors in Computing Systems*, New York, NY, USA, 2016, pp. 1367–1374.
- [21] "Stereoscopic-television apparatus for individual use," 24-May-1957.
- [22] C. Comeau and J. Bryan, "Headsight Television System Provides Remote Surveillance," *Electronics*, vol. 10, no. 34, pp. 86–90, 1961.
- [23] C. Botella, G. Riva, A. Gaggioli, B. K. Wiederhold, M. Alcaniz, and R. M. Baños, "The Present and Future of Positive Technologies," *Cyberpsychology Behav. Soc. Netw.*, vol. 15, no. 2, pp. 78–84, Feb. 2012.
- [24] M. Alcañiz, R. Baños, C. Botella, and B. Rey, "The EMMA project: emotions as a determinant of presence," *Psychology J.*, vol. 1, no. 2, pp. 141–150, 2003.
- [25] C. D. Shaw, D. Gromala, and A. F. Seay, "The Meditation Chamber: Enacting Autonomic Senses," in *Proceedings of ENACTIVE/07*, Grenoble, France, 2007.
- [26] L. Chittaro and N. Zangrando, "The Persuasive Power of Virtual Reality: Effects of Simulated Human Distress on Attitudes towards Fire Safety," in *Persuasive Technology, Proceedings*, vol. 6137, T. Ploug, P. Hasle, and H. Oinas-Kukkonen, Eds. Berlin: Springer-Verlag Berlin, 2010, pp. 58–69.
- [27] H. Bal, "Responsive Aesthetics for Yogic Meditation: An Innovative Design Theory for Holistic Health that supports Autonomy and Effective Training," M.Des., Ontario College of Art & Design (Canada), Canada, 2013.
- [28] R. M. Baños *et al.*, "A positive psychological intervention using virtual reality for patients with advanced cancer in a

- hospital setting: a pilot study to assess feasibility,” *Support. Care Cancer Heidelb.*, vol. 21, no. 1, pp. 263–70, Jan. 2013.
- [29] M. Karamnejad, A. Choo, D. Gromala, C. Shaw, and J. Mamisao, “Immersive Virtual Reality and Affective Computing for Gaming, Fear and Anxiety Management,” in *ACM SIGGRAPH 2013 Posters*, New York, NY, USA, 2013, p. 74:1–74:1.
- [30] A. Choo and A. May, “Virtual Mindfulness Meditation Virtual Reality and Electroencephalography for Health Gamification,” *2014 Ieee Games Media Entertain. Gem*, 2014.
- [31] L. L. Downey, “Well-being Technologies: Meditation Using Virtual Worlds,” Ph.D., Nova Southeastern University, United States -- Florida, 2015.
- [32] M. Prpa, K. Cochrane, and B. E. Riecke, “Hacking Alternatives in 21st Century: Designing a Bio-Responsive Virtual Environment for Stress Reduction,” in *Pervasive Computing Paradigms for Mental Health*, 2015, pp. 34–39.
- [33] J. Amores, X. Benavides, and P. Maes, “PsychicVR: Increasing Mindfulness by Using Virtual Reality and Brain Computer Interfaces,” in *Proceedings of the 2016 CHI Conference Extended Abstracts on Human Factors in Computing Systems*, New York, NY, USA, 2016, pp. 2–2.
- [34] I. Kosunen, M. Salminen, S. Järvelä, A. Ruonala, N. Ravaja, and G. Jacucci, “RelaWorld: Neuroadaptive and Immersive Virtual Reality Meditation System,” 2016, pp. 208–217.
- [35] J. E. Muñoz, T. Paulino, H. Vasanth, and K. Baras, “PhysioVR: A novel mobile virtual reality framework for physiological computing,” in *2016 IEEE 18th International Conference on e-Health Networking, Applications and Services (Healthcom)*, 2016, pp. 1–6.
- [36] G. Bernal and P. Maes, “Emotional Beasts: Visually Expressing Emotions Through Avatars in VR,” in *Proceedings of the 2016 CHI Conference Extended Abstracts on Human Factors in Computing Systems*, New York, NY, USA, 2017, pp. 2395–2402.
- [37] I. Du Plessis, “Strata: A Biometric VR Experience,” in *ACM SIGGRAPH 2017 VR Village*, New York, NY, USA, 2017, p. 14:1–14:2.
- [38] M. V. Navarro-Haro *et al.*, “Meditation experts try Virtual Reality Mindfulness: A pilot study evaluation of the feasibility and acceptability of Virtual Reality to facilitate mindfulness practice in people attending a Mindfulness conference.,” *PLoS One San Franc.*, vol. 12, no. 11, p. e0187777, Nov. 2017.
- [39] R. Patibanda, F. “Floyd” Mueller, M. Leskovsek, and J. Duckworth, “Life Tree: Understanding the Design of Breathing Exercise Games,” 2017, pp. 19–31.
- [40] S. LaBerge and L. D. P. Verifield, “Lucid dreaming: Psychophysiological studies of consciousness during REM sleep,” 1990.
- [41] A. Holecek, *Dream Yoga: Illuminating Your Life Through Lucid Dreaming and the Tibetan Yogas of Sleep*. Sounds True, 2016.
- [42] T. Stumbrys and D. Erlacher, “Mindfulness and Lucid Dream Frequency Predicts the Ability to Control Lucid Dreams,” *Imagin. Cogn. Personal.*, vol. 36, no. 3, pp. 229–239, Mar. 2017.
- [43] S. LaBerge, “Lucid dreaming: Evidence and methodology,” *Behav. Brain Sci.*, vol. 23, no. 6, pp. 962–964, Dec. 2000.
- [44] S. LaBerge and H. Rheingold, *Exploring the world of lucid dreaming*. Ballantine Books New York, 1990.
- [45] U. Voss, R. Holzmann, I. Tuin, and J. A. Hobson, “Lucid dreaming: a state of consciousness with features of both waking and non-lucid dreaming,” *Sleep*, vol. 32, no. 9, pp. 1191–1200, 2009.
- [46] I. Y. Taitz, “Clinical Applications of Lucid Dreaming Therapy,” *Lucid Dreaming New Perspect. Conscious. Sleep 2 Vol. New Perspect. Conscious. Sleep*, p. 167, 2014.
- [47] U. Voss, “Lucid dreaming: Reflections on the role of introspection,” *Int. J. Dream Res.*, vol. 3, no. 1, pp. 52–53, 2010.
- [48] M. Dresler *et al.*, “Neural Correlates of Dream Lucidity Obtained from Contrasting Lucid versus Non-Lucid REM Sleep: A Combined EEG/fMRI Case Study,” *SLEEP*, Jul. 2012.
- [49] C. Petitmengin, “Describing one’s subjective experience in the second person: An interview method for the science of consciousness,” *Phenomenol. Cogn. Sci.*, vol. 5, no. 3–4, pp. 229–269, Dec. 2006.
- [50] T. Bentley, L. Johnston, and K. von Baggo, “Evaluation Using Cued-recall Debrief to Elicit Information About a User’s Affective Experiences,” in *Proceedings of the 17th Australia Conference on Computer-Human Interaction: Citizens Online: Considerations for Today and the Future*, Narrabundah, Australia, Australia, 2005, pp. 1–10.