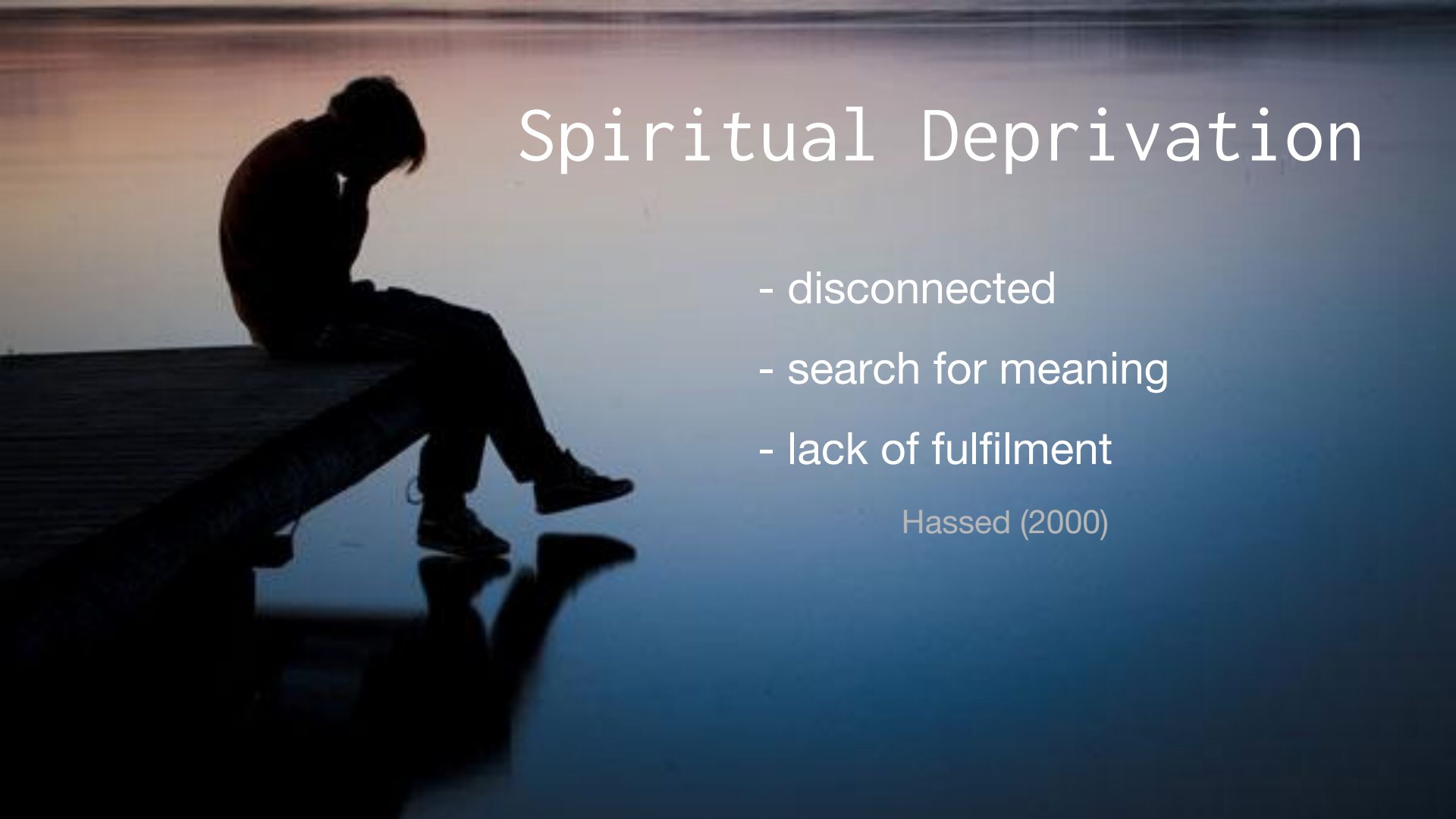
Going Beyond:

Lucid Dreaming as a Lens into Transformative Experience Design for Virtual Reality

CYPSY23 2018 // KITSON & RIECKE // SIMON FRASER UNIVERSITY



Spiritual Deprivation

- disconnected
- search for meaning
- lack of fulfilment

Hassed (2000)

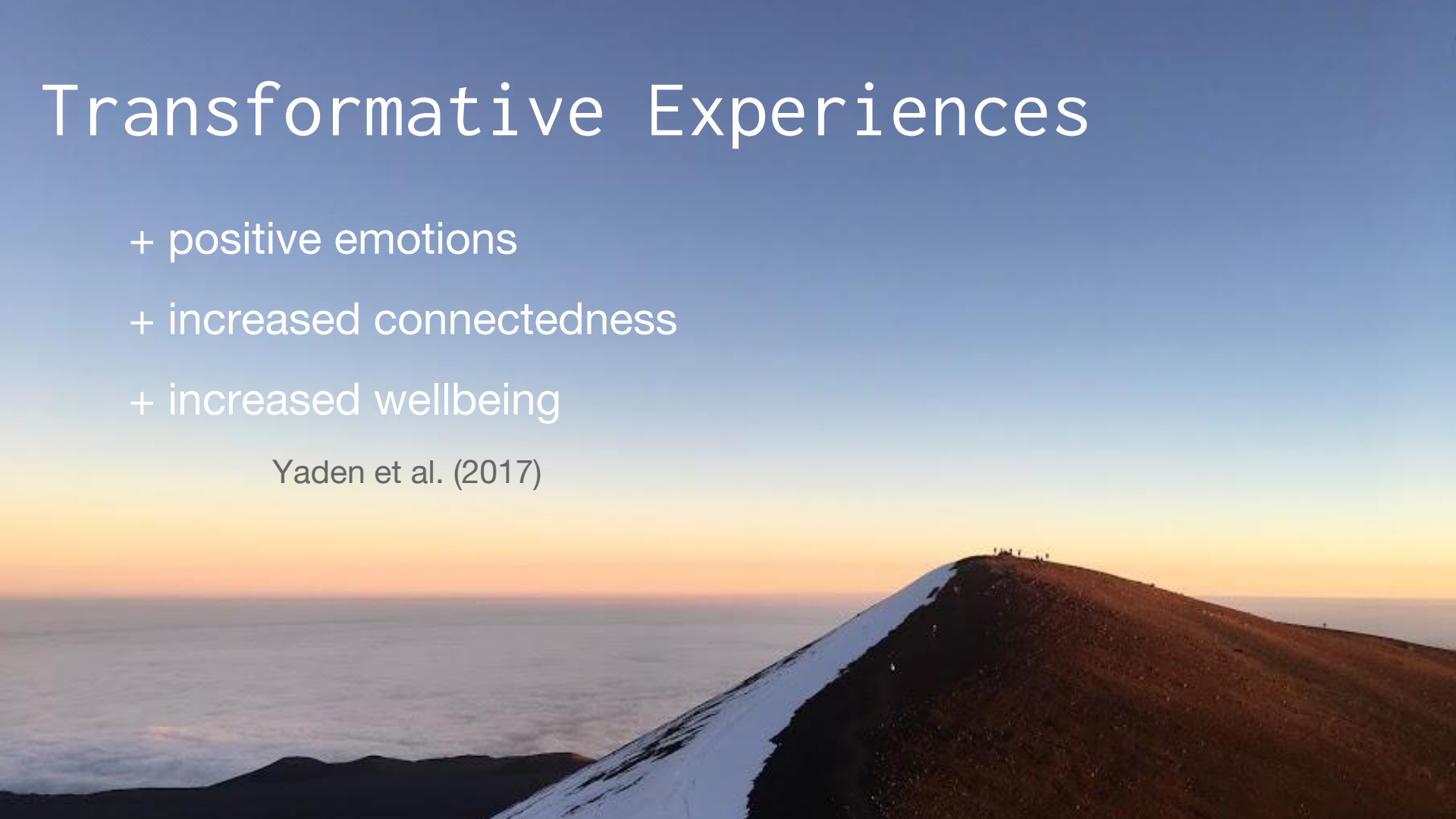
Transformative Experiences

+ positive emotions

+ increased connectedness

+ increased wellbeing

Yaden et al. (2017)



Virtual Reality

+ emotional affordances
+ epistemic affordances
+ impossible worlds and selves
+ controlled, safe space

Gaggioli et al. (2016)

Tech4Good Movements

User Centered Design
Norman & Draper (1986)

Hedonomics
Helander (2002)
Hancock et al. (2005)

Anthropology-Based Computing
Brown (2013)

Computer-Mediated Self-Transcendence
Gaggioli et al. (2016)

Calm Technology
Weiser & Brown (1996)

Affective Computing
Picard (2000)

Positive Technology
Riva et al. (2012)
Gaggioloi et al. (2017)

Technowellness
Kennedy (2014)

Ergonomics
Jastrzebowski (1857)
Edholm & Morrell (1973)

Positive Computing
Sander (2011)
Calvo & Peters (2014)

Positive Design
Desmet & Pohlmeyer (2013)

Transcendence Technology
Mossbridge (2016)

Persuasive Technology
Fogg (1999)

Somaesthetics
Shusterman (2012)
Schiphorst (2009)
Lee et al. (2014)
Höök et al. (2015)

Techno-Spiritual Design
Buie (2016)

Lucid Dreaming

the dreamer is aware

that they are dreaming

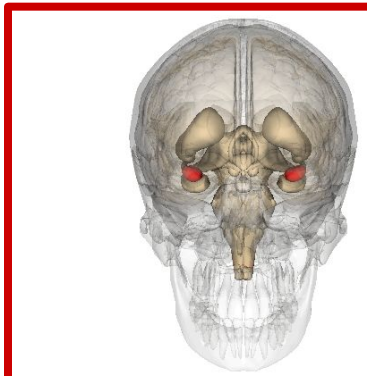
LaBerge et al. (1986)

Lucid Dreaming

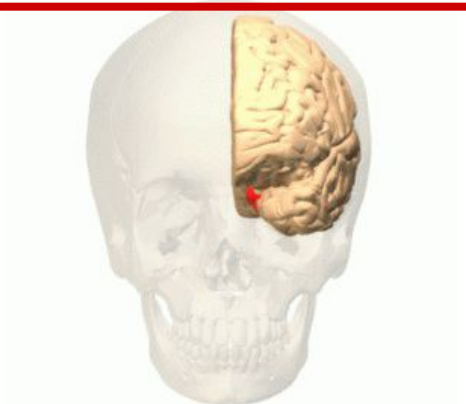
+ experience anything
+ spiritual practice
+ ultimate VR

- not accessible
- time consuming

NEUROSCIENCE OF LUCID DREAMS

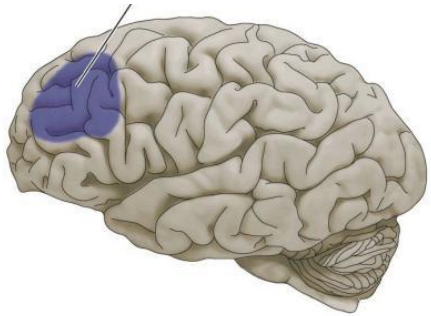


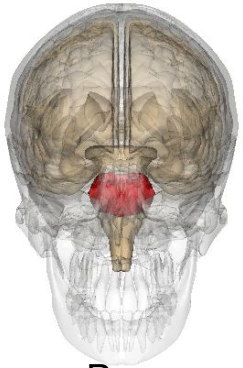
Amygdala



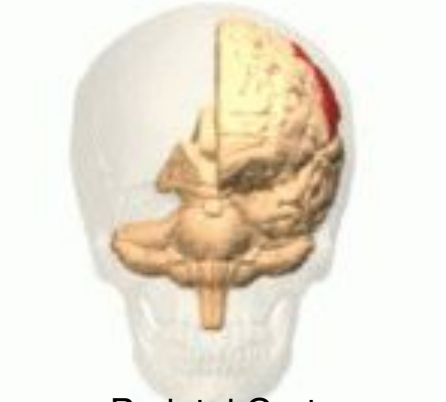
Parahippocampal Cortex

Dorsolateral Prefrontal Cortex





Pons



Parietal Cortex

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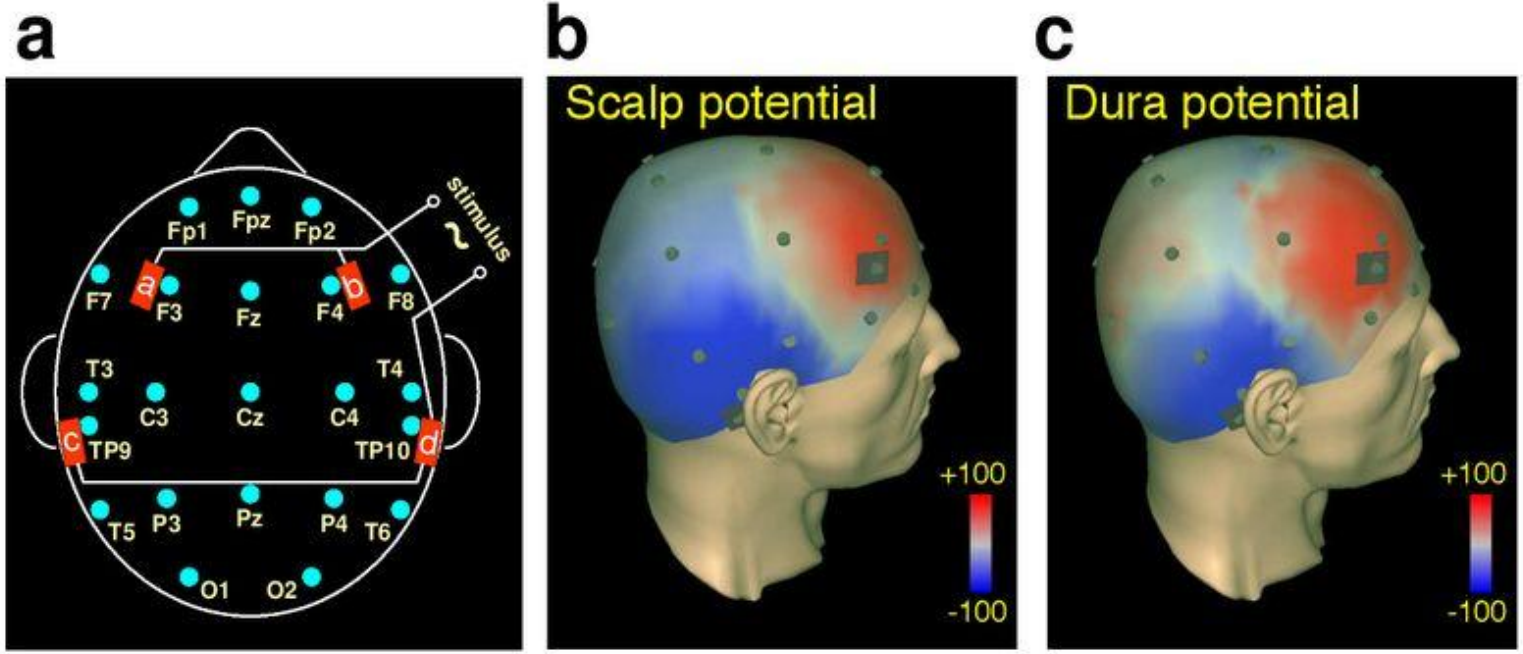
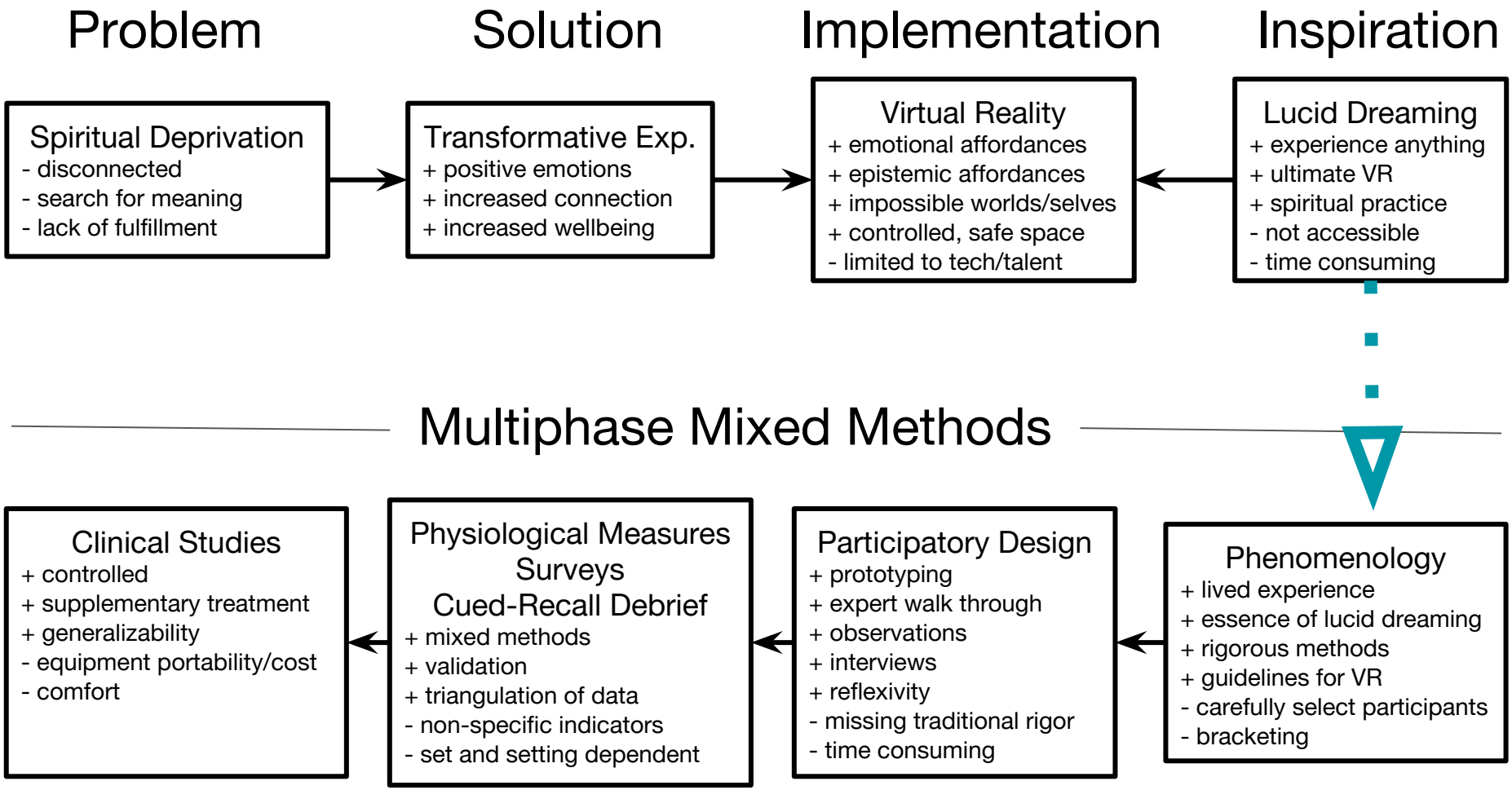


Voss, U., Holzmann, R., Tuin, I., & Hobson, J. A. (2009). Lucid dreaming: a state of consciousness with features of both waking and non-lucid dreaming.Sleep, 32(9), 1191-1200.

Voss, U., Holzmann, R., Hobson, A., Paulus, W., Koppehele-Gossel, J., Klimke, A., & Nitsche, M. A. (2014). Induction of self awareness in dreams through frontal low current stimulation of gamma activity. Nature neuroscience, 17(6), 810-812.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Solution
Implementation
Inspiration
Spiritual Deprivation
- disconnected
- search for meaning
- lack of fulfillment
Transformative Exp.
+ positive emotions
+ increased connection
+ increased wellbeing
Virtual Reality
+ emotional affordances
+ epistemic affordances
+ impossible worlds/selves
+ controlled, safe space
- limited to tech/talent
Lucid Dreaming
+ experience anything
+ ultimate VR
+ spiritual practice
- not accessible
- time consuming
Multiphase Mixed Methods
Clinical Studies
+ controlled
+ supplementary treatment
+ generalizability
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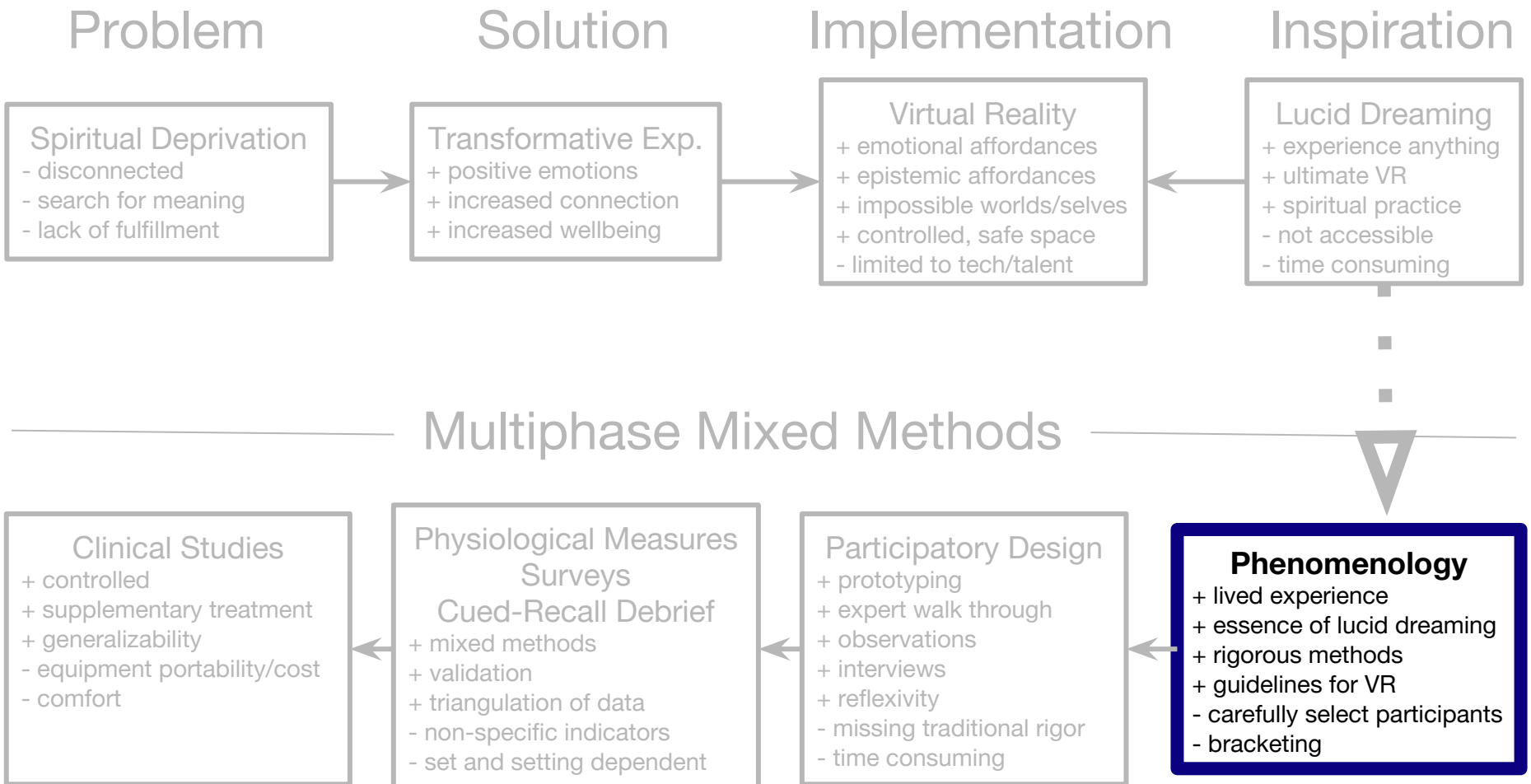
- comfort
Physiological Measures
Surveys
Cued-Recall Debrief
+ mixed methods
+ validation
+ triangulation of data
- non-specific indicators
- set and setting dependent
Participatory Design
+ prototyping
+ expert walk through
+ observations
+ interviews
+ reflexivity
- missing traditional rigor
- time consuming
Phenomenology
+ lived experience
+ essence of lucid dreaming
+ rigorous methods
+ guidelines for VR
- carefully select participants
- bracketing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QUAL : PHENOMENOLOGY

What are transformative experiences like in lucid dreaming?

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QUAL: PHENOMENOLOGY

Semi-structured Interviews

Active and proficient lucid dreamers [1]
M = 20 years & one lucid dream per week

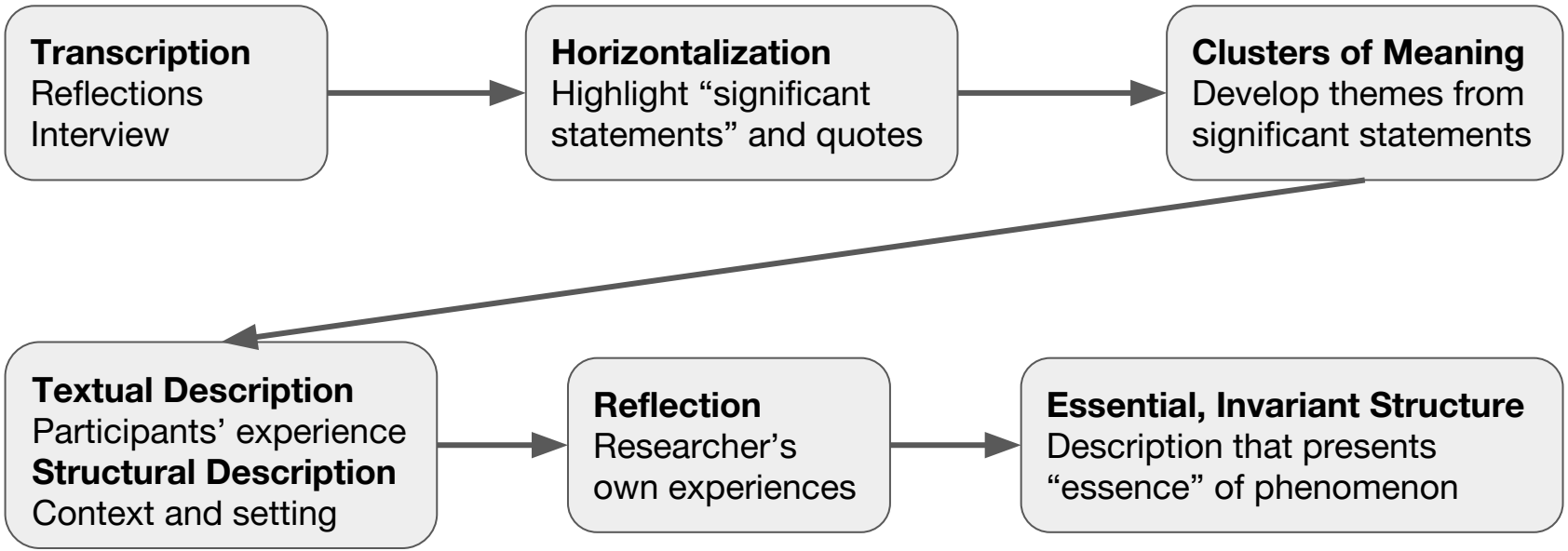
Nine in-depth individual interviews
6F, 3M; Ages 19-57

Broad, open ended questions [2]
25-60 min. interview; audio recorded

1 LaBerge, S. (2014). Lucid dreaming: Paradoxes of dreaming consciousness. 45-173.
2 Bevan, M. T. (2014). A method of phenomenological interviewing. *Qualitative health research*, *24*(1), 136-144.

QUAL: PHENOMENOLOGY

Data Analysis



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DESIGN IMPLICATIONS

VR Transformative Experiences

DESIGN IMPLICATIONS

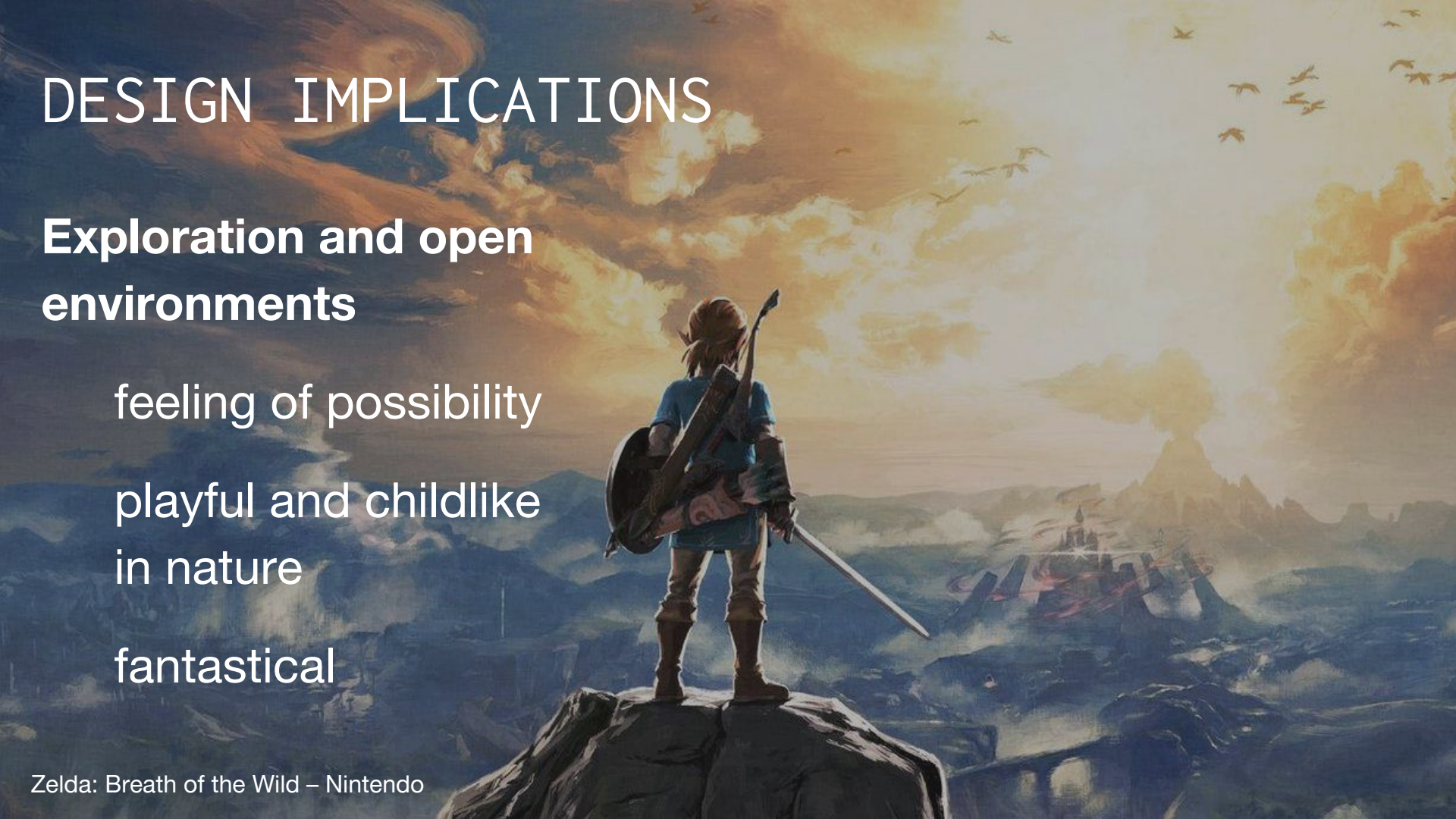
Vivid visuals & other senses add to the experience

absence or inaccuracies do not detract from “realness”

DESIGN IMPLICATIONS

Exploration and open environments

- feeling of possibility
- playful and childlike in nature
- fantastical



Zelda: Breath of the Wild – Nintendo

DESIGN IMPLICATIONS

Give users a sense of

- control
- empowerment
- confidence

DESIGN IMPLICATIONS

Space for personal meaning and interpretation

- abstract worlds
- nature-like environments
- embodied experiences

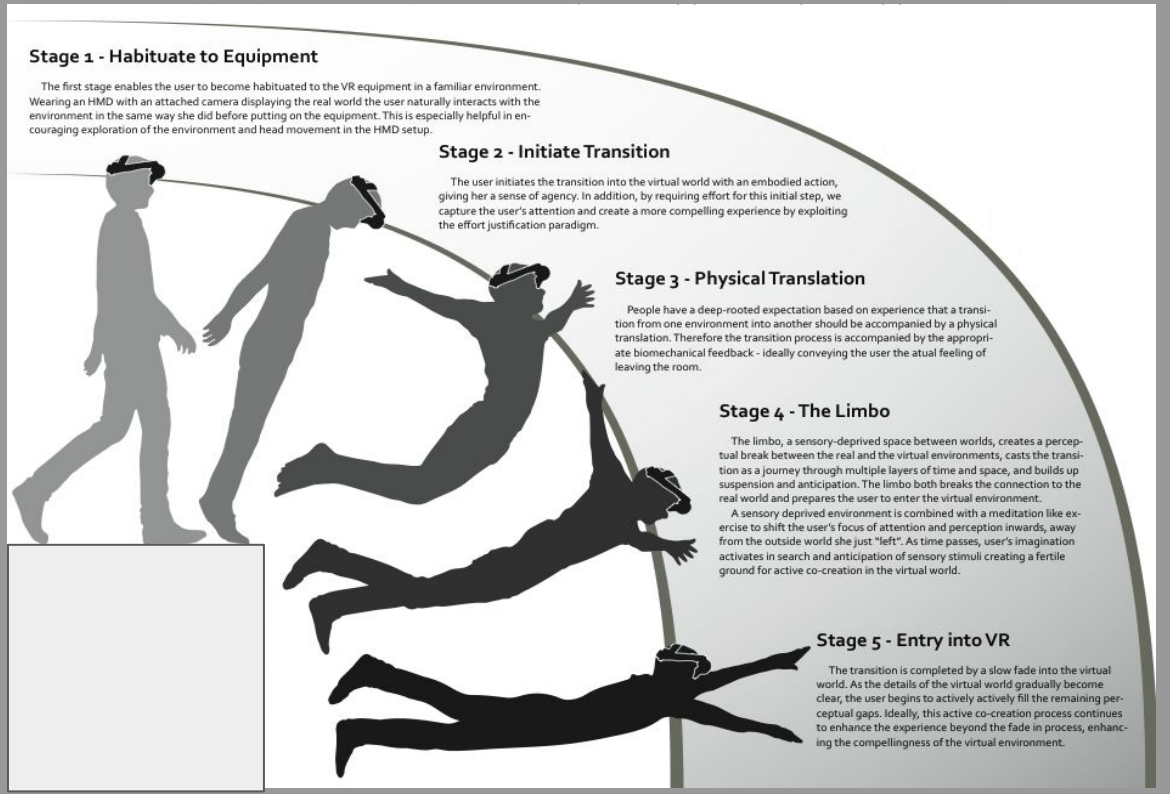
Prpa et al. (2017)

DESIGN IMPLICATIONS

Seamless transitions

safe space

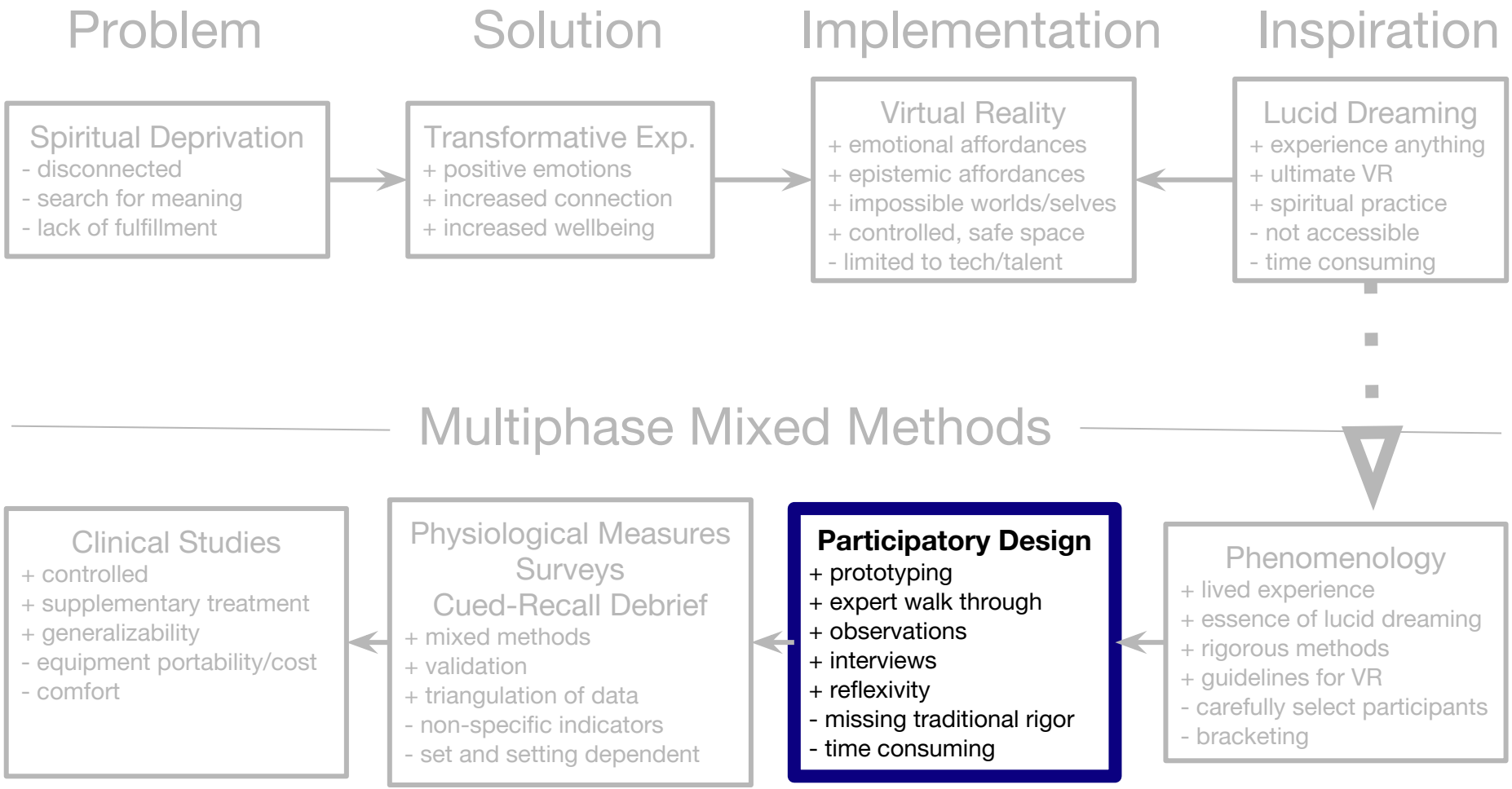
intention



Sproll et al. (2013)

Ceremony

Where Thoughts Go – Lucas Rizzotto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QUAL: PARTICIPATORY DESIGN[1]

Exploration

+ examining artifacts (technology)
+ interviews
+ walkthroughs

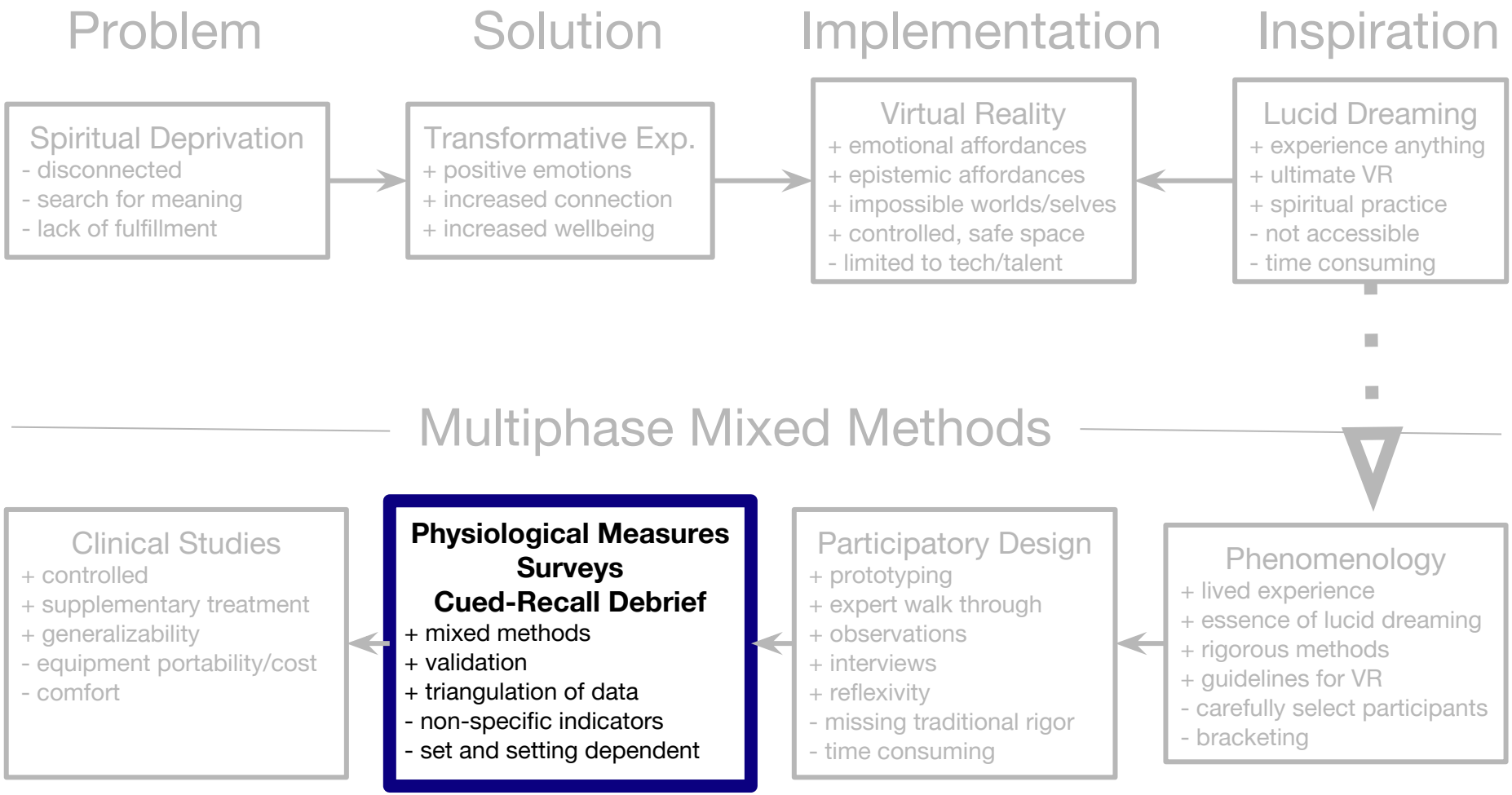
Prototyping

+ cooperative prototyping
+ talk-aloud feedback
+ interviews

Discovery

+ workshop
+ storyboarding

1 Spinuzzi, C. (2005). The Methodology of Participatory Design. Technical Communication, 52(2), 163–174.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MIXED METHODS: QUAN(qual)

Survey[1]

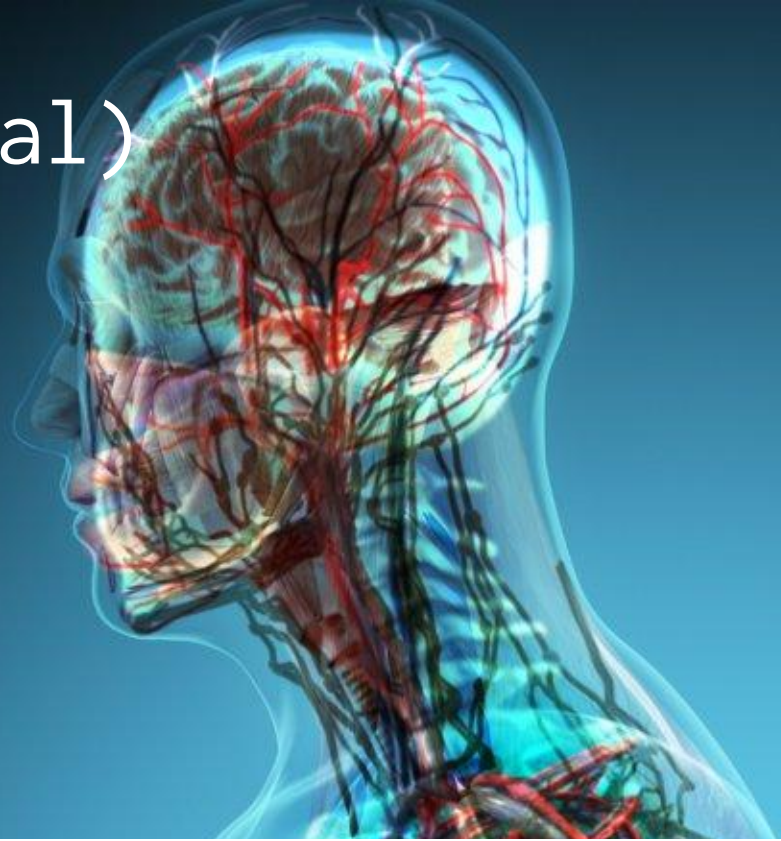
Adult Self-Transcendence Inventory (ASTI)

Physiological[2,3]

EEG, EDA, ECG, EMG, Resp, Goosecam

Cued-Recall Debrief[4]

Expert Evaluation & Naive Participants

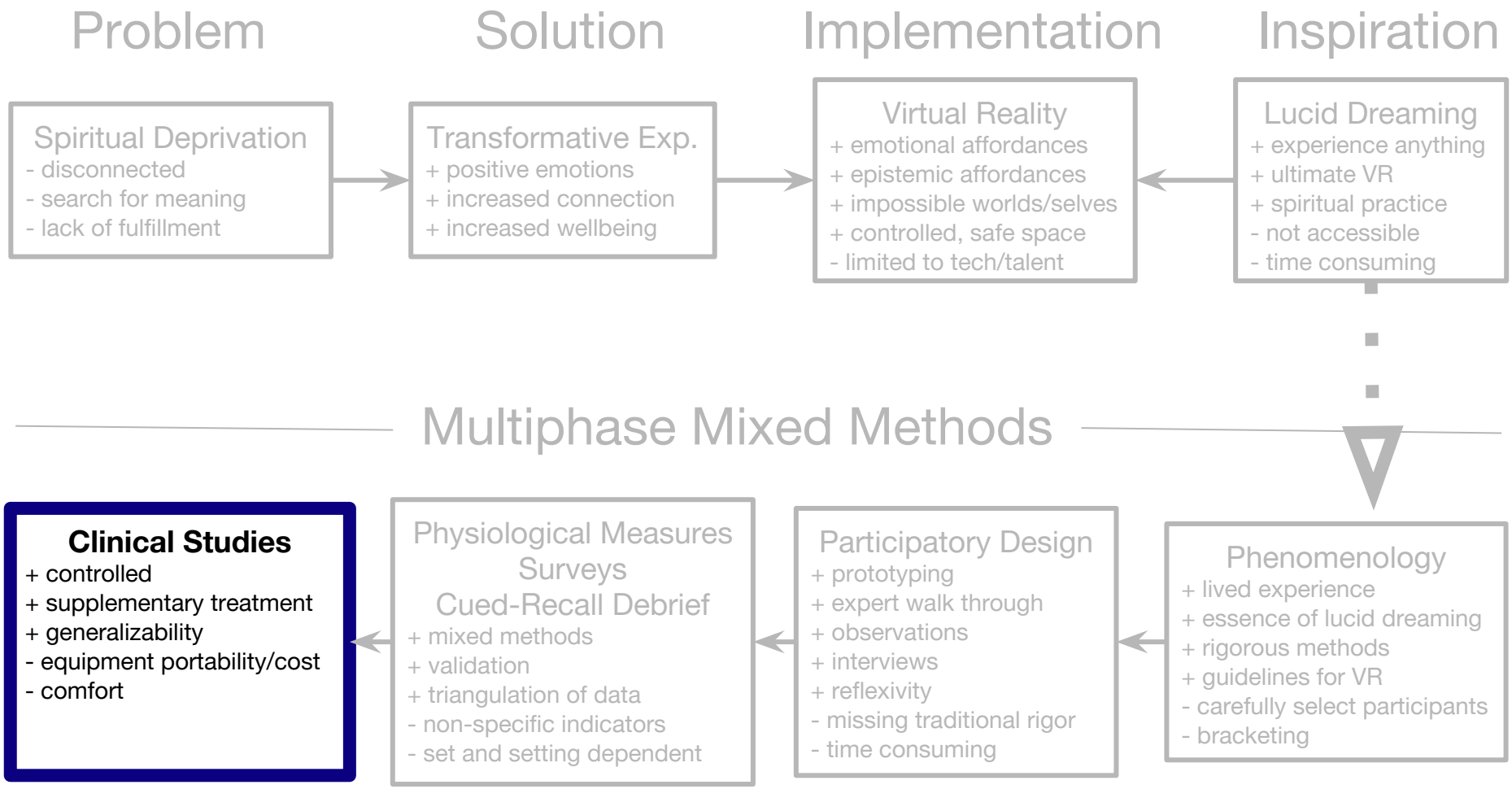


1 Levenson, M. R., Jennings, P. A., Aldwin, C. M., & Shiraishi, R. W. (2005). Self-Transcendence: Conceptualization and Measurement. The International Journal of Aging and Human Development, 60(2), 127–143.

2 Potter, R. F., & Bolls, P. D. (2012). Psychophysiological measurement and meaning: cognitive and emotional processing of media. New York: Routledge.

3 Benedek, M., Wilfling, B., Lukas-Wolfbauer, R., Katzur, B. H., & Kaernbach, C. (2010). Objective and continuous measurement of piloerection. Psychophysiology, 47(5), 989–993.

4 Bentley, T., Johnston, L., & von Baggo, K. (2005). Evaluation using cued-recall debrief to elicit information about a user's affective experiences. In Proceedings of the 17th Australia conference on CHI: Citizens Online: Considerations for Today and the Future, 1-10.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Potential Applications to Health Care

Stress reduction [1]

Transcendent experiences [2]

Connecting to self and others [3]

Supporting personal growth [4]

Exploring consciousness [5]

1 K. Ćosić, S. Popović, D. Kukolja, M. Horvat, and B. Dropuljić, (2010) “Physiology-Driven Adaptive Virtual Reality Stimulation for Prevention and Treatment of Stress Related Disorders,” Cyberpsychology, Behavior, and Social Networking, vol. 13, no. 1, pp. 73–78.

2 Chirico, A., Ferrise, F., Cordella, L., & Gaggioli, A. (2018). Designing Awe in Virtual Reality: An Experimental Study. Frontiers in Psychology, 8.
Quesnel, D., & Riecke, B. E. (2017). Awestruck: Natural interaction with virtual reality on eliciting awe (pp. 205–206). IEEE.

3 Tarr, B., Slater, M., & Cohen, E. (2018). Synchrony and social connection in immersive Virtual Reality. Scientific Reports, 8(1), 3693.

4 Riva, G., Baños, R. M., Botella, C., Mantovani, F., & Gaggioli, A. (2016). Transforming Experience: The Potential of Augmented Reality and Virtual Reality for Enhancing Personal and Clinical Change. Frontiers in Psychiatry, 7, 164.

5 Suzuki, K., Roseboom, W., Schwartzman, D. J., & Seth, A. K. (2017). A Deep-Dream Virtual Reality Platform for Studying Altered Perceptual Phenomenology. Scientific Reports, 7(1), 15982.

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ENGAGING THE WORLD

SCHOOL OF INTERACTIVE ARTS + TECHNOLOGY

References

Benedek, M., Wilfling, B., Lukas-Wolfbauer, R., Katzur, B. H., & Kaernbach, C. (2010). Objective and continuous measurement of piloerection. Psychophysiology, 47(5), 989–993.

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Brown, J. N. A. (2013). It's as Easy as ABC Introducing Anthropology-Based Computing. In I. Rojas, G. Joya, & J. Gabestany (Eds.), Advances in Computational Intelligence, Pt I (Vol. 7902, pp. 1–16). Berlin: Springer-Verlag Berlin.

Buie, E. (2016). Transcendhance: A Game to Facilitate Techno-Spiritual Design. In Proceedings of the 2016 CHI Conference Extended Abstracts on Human Factors in Computing Systems (pp. 1367–1374). New York, NY, USA: ACM. https://doi.org/10.1145/2851581.2892536

Calvo, R. A., & Peters, D. (2014). Positive Computing: Technology for Wellbeing and Human Potential. MIT Press.

Chirico, A., Ferrise, F., Cordella, L., & Gaggioli, A. (2018). Designing Awe in Virtual Reality: An Experimental Study. Frontiers in Psychology, 8.

Creswell, J. W. (2013). Qualitative inquiry and research design: Choosing among five approaches. Sage.

Desmet, P. M. A., & Pohlmeyer, A. E. (2013). Positive Design: An Introduction to Design for Subjective Well-Being. International Journal of Design; Taipei, 7(3), n/a.

Edholm, O. G., & Murrell, K. F. H. (1973). The Ergonomics Research Society: A History 1949-1970. An Ergonomics Society Publication.

Fogg, B. J. (1999). Persuasive technologies. Association for Computing Machinery. Communications of the ACM; New York, 42(5), 26–29.

Gaggioli, A. (2016). Transformative experience design. Human Computer Confluence. Transforming Human Experience Through Symbiotic Technologies, 96–121.

Gaggioli, A., Riva, G., Peters, D., & Calvo, R. A. (2017). 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 (pp. 477–502). Elsevier. https://doi.org/10.1016/B978-0-12-801851-4.00018-5

Giorgi, A. (1985). Phenomenology and psychological research. Duquesne.

References

Hancock, P. A., Pepe, A. A., & Murphy, L. L. (2005). Hedonomics: The Power of Positive and Pleasurable Ergonomics. Ergonomics in Design: The Quarterly of Human Factors Applications, 13(1), 8–14. https://doi.org/10.1177/106480460501300104

Hassed, C. S. (2000). Depression: dispirited or spiritually deprived? The Medical Journal of Australia, 173(10), 545–547.

Helander, M. G. (2002). Hedonomics - Affective Human Factors Design. Proceedings of the Human Factors and Ergonomics Society Annual Meeting, 46(12), 978–982. https://doi.org/10.1177/154193120204601209

Hobson, J. Allan (2001). The Dream Drugstore: Chemically Altered States of Consciousness. Cambridge, Massachusetts: MIT Press. pp. 96–98.

Höök, K., St\a ahl, A., Jonsson, M., Mercurio, J., Karlsson, A., & Johnson, E.-C. B. (2015). Cover story somaesthetic design. Interactions, 22(4), 26–33.

Jastrzębowski, W. B. (1857). An outline of ergonomics, or the science of work based upon the truths drawn from the Science of Nature (Vol. 29). Nature and Industry.

Johnson, R. B., & Onwuegbuzie, A. J. (2004). Mixed methods research: A research paradigm whose time has come. Educational researcher, 33(7), 14-26.

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Kennedy, S. D. (2014). The TechnoWellness Inventory (TWI): Development of an Instrument to Assess a New Wellness Construct (Ph.D.). North Carolina State University, United States -- North Carolina. Retrieved from https://search-proquest-com.proxy.lib.sfu.ca/docview/1642784169/abstract/E5BC11EA74C94B26PQ/1

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LaBerge, S., Levitan, L., & Dement, W. C. (1986). Lucid dreaming: Physiological correlates of consciousness during REM sleep. Journal of Mind and Behavior, 7(2–3), 251–258.

References

Lee, W., Lim, Y., & Shusterman, R. (2014). Practicing somaesthetics: exploring its impact on interactive product design ideation (pp. 1055–1064). ACM Press. https://doi.org/10.1145/2598510.2598561

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Moustakas, C. (1994). Phenomenological research methods. Sage.

Norman, D. A., & Draper, S. W. (1986). User Centered System Design; New Perspectives on Human-Computer Interaction. Hillsdale, NJ, USA: L. Erlbaum Associates Inc.

Picard, R. W. (2000). Toward computers that recognize and respond to user emotion. IBM Systems Journal; Armonk, 39(3/4), 705–719.

Prpa, M., Tatar, K., Riecke, B. E., & Pasquier, P. (2017). The Pulse Breath Water System: Exploring Breathing as an Embodied Interaction for Enhancing the Affective Potential of Virtual Reality. In Virtual, Augmented and Mixed Reality (pp. 153–172). Springer, Cham. https://doi.org/10.1007/978-3-319-57987-0_13

Potter, R. F., & Bolls, P. D. (2012). Psychophysiological measurement and meaning: cognitive and emotional processing of media. New York: Routledge.

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Riva, G., Baños, R. M., Botella, C., Wiederhold, B. K., & Gaggioli, A. (2012). Positive Technology: Using Interactive Technologies to Promote Positive Functioning. Cyberpsychology, Behavior, and Social Networking, 15(2), 69–77. https://doi.org/10.1089/cyber.2011.0139

Sander, T. (2011). Positive Computing. In Positive Psychology as Social Change (pp. 309–326). Springer, Dordrecht. Retrieved from https://link.springer.com/chapter/10.1007/978-90-481-9938-9_17

References

Schiphorst, T. (2009). soft (n): Toward a Somaesthetics of Touch. In CHI'09 Extended Abstracts on Human Factors in Computing Systems (pp. 2427–2438). ACM. Retrieved from http://dl.acm.org/citation.cfm?id=1520345

Shusterman, R. (2008). Body consciousness: a philosophy of mindfulness and somaesthetics. Cambridge; New York: Cambridge University Press.

Spinuzzi, C. (2005). The Methodology of Participatory Design. Technical Communication, 52(2), 163–174.

Sproll, D., Freiberg, J., Grechkin, T., & Riecke, B. E. (2013). Poster: Paving the way into virtual reality-a transition in five stages. In 3D User Interfaces (3DUI), 2013 IEEE Symposium on (pp. 175–176). IEEE. Retrieved from http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=6550235

Voss, U., Holzmann, R., Tuin, I., & Hobson, J. A. (2009). Lucid dreaming: a state of consciousness with features of both waking and non-lucid dreaming.Sleep, 32(9), 1191-1200.

Voss, U., Holzmann, R., Hobson, A., Paulus, W., Koppehele-Gossel, J., Klimke, A., & Nitsche, M. A. (2014). Induction of self awareness in dreams through frontal low current stimulation of gamma activity. Nature neuroscience, 17(6), 810-812.

Weiser, M., & Brown, J. S. (1996). Designing calm technology. PowerGrid Journal, 1(1), 75–85.