Literature Review on Awe Response

Zenan Shang (SHNZEN001)
Computer Science
University of Cape Town
City State Country

TITLE

The Use of Immersive Virtual Reality Environments for Awe-Based Interventions

ABSTRACT

This literature review examines the empirical evidence on the relationship between virtual reality and awe. Awe is an emotion characterized by a mix of fear, wonder and reverence in front of something vast and powerful (Shiota, 2007). This review provides a comprehensive overview on the underlying mechanism of awe, including its characteristics and the human psychology behind it. The review identifies potential opportunities and challenges researchers may face when eliciting awe emotions through virtual environment. Such challenges may include technical issues, ethical consideration and out limitation of understanding of both awe and virtual reality. Overall, this literature review will highlight the potential opportunities between virtual reality and awe, providing an in-depth knowledge for future research and development in this exciting and rapidly evolving area.

KEYWORDS

Virtual Reality, Awe, Emotion,

INTRODUCTION

The popularity of virtual reality (VR) technology has grown rapidly, presenting medical specialists with distinct opportunities and tools to treat patients. VR enables users to fully immerse themselves in a realistic digital environment created by a computer, providing a sense of presence and engagement that is challenging and can be expensive to achieve through other means. One possible application of VR is to evoke awe in patients during treatment. Awe is an emotion characterized by a sense of strong amazement or wonder towards something vast or powerful. In this regard, VR has the potential to generate breathtaking scenery and visuals.

Awe is an emotion that has received limited research attention despite its significant transformative potential. Interest in studying awe and its underlying impact has increased in recent years. Studies have shown that the sensation of awe has many benefits, including enhancing well-being, improving social connection, promoting better health, and increasing pro-social behavior (Shiota, 2007). VR technology is a relatively new innovation that emerged in the early 1990s. One of the earliest VR tests involved treating patients with mental disorders, specifically fear of flying (Rothbaum, Hodges, Watson, Kessler, Opdyke, 1996). The experiment conducted by a group of researchers was found to be more effective in treating fear of flying than the standard exposure therapy and a waiting list control. Therefore, VRE has been deemed effective in treating patients with fear of flying.

Numerous studies have examined the potential of VR technology to evoke emotional responses in users. The purpose of this literature review is to provide a comprehensive overview of this research and to identify potential opportunities and challenges associated with using VR technology to elicit awe in users. Additionally, we will explore the psychosocial mechanisms underlying the experience of awe and how they may be leveraged in a VR environment. Finally, we will discuss potential challenges associated with generating awe emotions through VR technology, including technical issues, ethical considerations, and limitations of our understanding of both the emotion of awe and its combination with virtual reality.

Overall, this literature review seeks to provide a comprehensive overview of the state of the art in VR technology and awe-inspiring experiences, highlighting potential avenues for future research and development in this exciting and rapidly evolving field.

DEFINITION AND CHARACTERISTICS OF AWE

Awe is a complex emotion that have been describes as a mix of fear, wonder and reverence in front of something vast and powerful (Shiota, 2007). For example, imaging you are in a musical concert, you are sitting amidst of silent crowd listening to the roaring sound of the horns, with each bass drum thumped like a heartbeat. The lead singer's voice was raw and soulful, stirring up memories and feelings long forgotten. The feeling you have as an audience would be awe.

In their review of the theoretical literature on awe (Keltner & Haidt, 2003), it is proposed that stimuli capable of eliciting awe possess two distinct characteristics: perceptual vastness and the need for accommodation. In this context, "vastness" refers to any stimulus that challenges one's typical frame of reference in some dimension, whether it be time, physical space, numbers, sound, or complexity in detail. Drawing upon our previous example of a musical concert, we can discern a sense of vastness in the juxtaposition of the low, rumbling tones of the bass and the soaring melodies of the violin, the sheer number of instruments being played within the confines of a packed venue, and the profound silence of the captivated audience. The sheer multitude of details requires a vast amount of observed brain process to fully comprehend the scene.

Keltner and Haidt's definition of awe also posits four hypotheses concerning the elicitors of awe and the impact of awe on self-awareness (Keltner & Haidt, 2003). Firstly, awe is expected to be induced by information-rich stimuli rather than positive events, though empirical evidence supporting this assertion has yet to be presented. Secondly, generating awe experiences ought to be stimulus-focused and self-diminishment, emphasizing the magnificence that exists beyond the self. Lastly, individuals who experience awe on a more frequent basis are anticipated to exhibit more significant average emotional changes.

Awe can promote a shift in attention from the self to the world, and a dissolution of the boundaries between self and other (Piff,2015). Awe can help individuals to experience a sense of interconnectedness with the surrounding environment. This experience can lead to a sense of purpose and meaning in life, and a greater appreciation of the value of others.

VIRTUAL REALITY AND EMOTIONS

Virtual reality is an increasingly popular technology that can provide users with immersive experiences that closely simulate the real world. Studies have shown that the use of virtual reality can elicit emotional responses in users based on the environment presented through the VR headset (Slater, 2009). As a result, there is growing interest in investigating the relationship between VR and emotions. Research has demonstrated that virtual reality can induce a range of emotions, including fear. For example, Freeman in 2019 conducted a study in which participants with persecutory delusions, who believe that others intend to harm them, were placed in a virtual reality environment resembling a shopping mall with virtual customers walking around. The participants in the study experienced strong emotional responses, including fear.

Numerous studies have revealed that the level of immersion experienced by users of virtual reality technology can significantly impact their emotional response. Immersion is the extent to which the user feels like they are a part of the virtual environment (Bessa, 2017), and its level can be enhanced through the use of advanced technologies such as haptic feedback and full-body motion capture (Lombard & Ditton, 1997). According to a study, participants who experienced high levels of immersion in a virtual environment reported more intense emotional responses than those who experienced lower levels of immersion (Jennett, Cox, Cairns, Dhoparee, Epps, Tijs, Walton, 2008). However, external factors such as the quality of the display and the headset devices can also impact immersion levels (Witmer & Singer, 1998). Ultimately, the degree of immersion experienced in virtual reality is largely dependent on the user and their level of involvement with the technology.

The relationship between emotions and virtual reality is multifaceted. While virtual reality has been shown to elicit negative emotions such as fear and anxiety, it also has the potential to evoke positive emotions like awe and wonder. Chirico's study highlights how virtual reality can generate diverse and expansive stimuli that can elicit positive responses in users. However, it is important to note that the emotional response to VR can be heightened using realistic graphics, sound, and haptic feedback (Witmer & Singer, 1998).

PREVIOUS RESEARCH ON AWE INDUCTION

Research on awe induction has increased in recent years, and numerous studies have investigated the effect of awe on various aspects in human behavior and psychology. Studies have shown that awe can be elicited by a variety of stimuli including natural landscape, art, music, and spiritual experience (Keltner & Haidt, 2003).

One noticeable study conducted by Chirico that focuses on designing awe in virtual reality (Chirico, 2018). The experiment uses VR technology that combines multi-sensory stimuli to generate perception of being "present" within a computer-generated environment. The experiment will include 3 vast awe-inducing virtual environments being the forest, high snow mountains, earth view from space. And a neutral environment including green grass, flowers, and trees. The result of this experiment suggests that Only positive affect dimensions, sense of perceived vastness, sense of physical presence, perceived engagement in each condition were normally distributed. However, the experiment shows that the awe inducing virtual environment induces higher level of awe compared to the neutral stimuli.

Past research has indicated that computer-generated virtual environments elicit a stronger reaction than 2D photos (Chirico et al., 2017), while other studies have manipulated awe by exposing participants to awe-inspiring natural scenes (Piff et al., 2015; Ballew & Omoto, 2018). However, all these studies have one critical limitation: they do not consider the user's familiarity with virtual reality technology.

A 2023 article studies used virtual reality images to experimentally manipulate familiarity and measure the effect it had on participants' experience of awe (Ochadleus, 2023). The article turned out to suggest that users with higher familiarity with VR technology does have a diminishing effect on the intensity of awe experience compared to users with less familiarity.

Overall, the existing research suggests that inducing virtual reality is a better way of inducing awe than 2D photos. However, to induce a higher level of awe, vastness is an important factor. Familiarity to virtual environment will be an undeniable factor that can alter a user's reaction to the virtual environment, which in return will have a diminishing effect of the awe induction.

ETHICAL CONSIDERATION

Incorporating ethical considerations is crucial when using VR projects to evoke awe in users. One of the primary concerns for such projects is the potential manipulation of users' emotions and perceptions (Beauchamp & Childress, 2012:102). VR environments can be tailored to elicit specific emotions like awe, which raises the risk of exploiting such emotions for personal or commercial gain (Beauchamp & Childress, 2012:107). As a result, obtaining informed consent from the client is now a standard requirement in most medical and research codes. (Beauchamp & Childress, 2012:121)

Another ethical concern is the potential harm and discomfort that VR experiments can cause for vulnerable users. For instance, a VR program designed to simulate a suspension bridge could be harmful to users with a fear of heights or other mental health issues. Thus, it is essential to design VR experiences with the user's safety and well-being in mind and appropriately label and market them (American Psychological Association, n.d.).

Lastly, there is a concern about the ownership of personal data collected through experimental research. With expanding technology, more personal data such as heart rate, blood pressure, brain activity, and more is being collected. Therefore, obtaining informed consent from the client is necessary to proceed with using the data (Beauchamp & Childress, 2012:121).

Overall, it is crucial to prioritize the privacy and consent of users when conducting any research to ensure their safety and the ethicalness of the experiment.

CONCLUSION

Virtual reality technology has the potential to elicit awe-inspiring experience in user, which can lead to numerous benefits such as better health, enhance well-being and improve social connection. Awe is a complex emotion that have been describes as a mix of fear, wonder and reverence in front of something vast and powerful (Shiota, 2007). VR environments can also foster a sense of interconnectedness with the

world, leading to more realistic emotional reaction from the user. However, there are several challenges associated with using virtual reality technology to elicit awe such as technical issues, ethical consideration, and limitation in understanding the combination between awe and virtual reality. Future research should address these problems and seek better opportunities to use virtual reality technology in generating awe-inspiring experience, leading to a more innovative understanding in human psychology and technology.

References

1. Shiota, M. N. et al. (2007) The nature of awe: Elicitors, appraisals, and effects on self-concept. Cognition and emotion. [Online] 21 (5), 944–963.
2. Rothbaum, B. O., Hodges, L., Watson, B. A., Kessler, G. D., & Opdyke, D. (1996). Virtual reality exposure therapy in the treatment of fear of flying: A case report. Behaviour Research and Therapy, 34, 477–481.
3. KELTNER, D. & HAIDT, J. (2003) Approaching awe, a moral, spiritual, and aesthetic emotion: The return of pleasure. Cognition and emotion. 17 (2), 297–314.
4. Piff, P. K. et al. (2015) Awe, the Small Self, and Prosocial Behavior. Journal of personality and social psychology. [Online] 108 (6), 883–899.
5. Slater, M. (2009) Place illusion and plausibility can lead to realistic behaviour in immersive virtual environments. Philosophical Transactions of the Royal Society B: Biological Sciences. [Online] 364 (1535), 3549–3557.
6. Freeman, D. et al. (2019) Automated psychological therapy using virtual reality (VR) for patients with persecutory delusions: study protocol for a single-blind parallel-group randomised controlled trial (THRIVE). Trials. [Online] 20 (1), 87–87.
7. Bessa, M. et al. (2017) 'Impact of different display devices and types of virtual environments on emotions and feeling of presence', in 2017 24o Encontro Português de Computação Gráfica e Interação (EPCGI). [Online]. 2017 IEEE. pp. 1–7.
8. Lombard, M. & Ditton, T. (1997) At the Heart of It All: The Concept of Presence. Journal of computer-mediated communication. [Online] 3 (2), 0–0.
9. Jennett, A. L. Cox, P. Cairns, S. Dhoparee, A. Epps, T. Tijs, and A. Walton, "Measuring and defining the experience of immersion in games," Int. J. Hum. Comput. Stud., vol. 66, no. 9, pp. 641–661, 2008.
10. Witmer, B. G. & Singer, M. J. (1998) Measuring Presence in Virtual Environments: A Presence Questionnaire. Presence : teleoperators and virtual environment. [Online] 7 (3), 225–240.
11. Chirico, A. et al. (2016) The Potential of Virtual Reality for the Investigation of Awe. Frontiers in psychology. [Online] 71766–1766.
12. Chirico, A. et al. (2018) Designing Awe in Virtual Reality: An Experimental Study. Frontiers in psychology. [Online] 82351–2351.
13. Ochadleus, C. et al. (2023) It's awe-fully unfamiliar: The effect of familiarity on awe within a virtual reality setting. Frontiers in psychology. [Online] 141096283–.
14. Chirico, A., Cipresso, P., Yaden, D. B., Biassoni, F., Riva, G., and Gaggioli, A. (2017). Effectiveness of immersive videos in inducing awe: an experimental study. Sci. Rep. 7:1218. doi: 10.1038/s41598-017-01242-0
15. Piff, P. K., Dietze, P., Feinberg, M., Stancato, D. M., Riva, G., and Keltner, D. (2015). Awe, the small self, and prosocial behavior. Journal of Personality and Social Psychology 108, 883–899. doi: 10.1037/pspi0000018
16. Ballew, M. T., and Omoto, A. M. (2018). Absorption: how nature experiences promote awe and other positive emotions. Ecopsychology 10, 26–35. doi: 10.1089/eco.2017.0044
17. Ochadleus, C. et al. (2023) It's awe-fully unfamiliar: The effect of familiarity on awe within a virtual reality setting. Frontiers in psychology. [Online] 141096283–.
18. Childress, J & Beauchamp, T. 2012. Principles of Biomedical Ethics. London, United Kingdom: Oxford University Press. 101-140
19. American Psychological Association. na. Research Design and Ethics.