Investigating the Efficacy of Virtual Experiences on Stress Reduction

(Technical Paper)

Investigating the Future Negative Consequences of Virtual Reality

(STS Paper)

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On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

Introduction

Virtual reality (VR) is a technology that elicits strong reactions from professionals and laypeople alike. VR represents a certain logical end to which the modern digital world is leading us. As technology advances the level of immersion or presence that one derives from smartphones, laptops, and wearable technologies is ever increasing and serves to create a parallel concrete and virtual worlds. The verisimilitude achievable with virtual reality provides both opportunities and pitfalls. Research has shown that the sense of presence and emotional engagement when gaming in VR is higher than that of conventional video games (Pallavicini, Pepe, & Minissi, 2019). This heightened emotional response can be helpful when treating patients for anxiety (Carl et al., 2019) or helping soldiers to cope with post traumatic stress disorder by reliving traumatic events (Deng et al., 2019). Like other activities that provides for escapism and intense emotional reactions such as drug use, there exists a potential for anti-social and addictive behaviors. In order for society to be fully informed of the benefits and risks of VR, research must happen on both the ideal and non-ideal scenarios of VR adoption.

The proposed technical project is aimed at studying the beneficial effects of virtual reality by seeing if the cognitive benefits of being in nature can be simulated by virtual reality, an example of benefits from VR in the treatment of issues of stress or anxiety. The investigation will collect data from participants who will experience natural environments in a controlled VR setting. The proposed STS research will focus on the potential pitfalls caused by high availability and overuse of VR and the question of VR replacing our current reality. The paper will have a particular focus on using existing examples of technology use such as video games and smartphones causing addiction and other anti-social behaviors. These two projects complement

each other very well, as one focuses on the cognitive benefits due to the ability to achieve verisimilitude with the physical world and the other focuses on the negative aspects that VR could have on a societal scale and how to deal with this disruption.

Technical Topic

The technical project is a combination of the convenience, realism, and immersion of virtual reality with the theoretical foundations described by attention restoration theory to alleviate stress and fatigue in the workplace. The investigation will focus on the efficacy of 15 minute “micro vacations” on stress and productivity in the workplace.

Attention Restoration Theory

Attention Restoration Theory (ART) posits that spending time in natural environments helps to stimulate concentration and replenish a level of cognitive performance. The theory states that “soft fascinations” in nature serve to focus effortless attention, a subconscious process, that will allow the user to replenish their voluntary attention, attention which requires cognitive effort (Williams et al., 2018). Previous research shows that a few minutes in nature, or even just the sight of a natural environment, reduces stress and increase self-discipline (Taylor, Kuo, & Sullivan, 2002). The theory views effortful kinds of attention, associated with high level tasks and constant exertion, to be a limited resource, the reserves of which will be consumed over time all while the quality of the attention degrades. ART states that nature can achieve effortless attention due to the presence of soft stimuli such as tree leaves blowing in the wind or clouds moving in the sky (Basu, Duvall, & Kaplan, 2019).

Questions remain as to whether the restorative benefits of the natural environment extend to the world of VR. However, studies show that virtual reality achieves some of the effects without the person actually having to visit nature (Snell, McLean, McAsey, Zhang, & Maggs, 2019). Simulation of natural environments via VR could be a great benefit as modern workers tend to spend much of their time inside in artificial settings; both workers and their employers find it very difficult to enjoy the benefits of nature while attending to their current job duties.

Virtual Reality Basics

Virtual reality refers to a simulated experience that is capable of imitating, to some extent, the physical world by stimulating a variety of senses, the word virtual refers to something that does not physically exist, but is made to appear so using software. While the concept of virtual reality has existed for much of the 20th century, only recently have technological advances, such as low persistence displays, made VR attractive and accessible for consumers. In recent years the therapeutic benefits of VR have been the subject of much research and excitement. These benefits arise from the ability of VR to simulate lifelike events in a controlled manner where the subject feels safe and secure; examples include VR therapy for PTSD or video game addiction (Park et al., 2016). As is the case in the technical project, most virtual reality in the present day makes use of specialized headsets.

Project Overview and Significance

The participants of the study will undergo certain tasks to determine memory capacity and productivity, comparing these measures before and after a micro vacation in virtual reality. During this time, biometric data such as heart rate and galvanic skin response will be collected to determine stress levels. The aim of this experiment is two-fold: to determine if the cognitive

benefits of attention restoration therapy is replicated, or at least approximated, using virtual reality, and to quantify the benefits in terms of stress reduction or productivity gain in a workplace setting. High stress is associated with reduced wellbeing and higher healthcare costs, a major concern for companies and a cost that has come under increased scrutiny recently (McEwen, 2008). Interventions such as these prove to be a cost-effective way of reducing workplace stress and increasing productivity which is important not only to employers, but also to society at large.

STS Report

Background

Personal technology use has accelerated rapidly over the last two decades. Today, most people own smartphones and laptops, and many use wearable technologies, such as a smartwatch or fitness tracker. Pew Research estimates that 68% of US adults own a smartphone, within the 18 to 36 age group that figure rises to 86% ("U.S. Technology Device Ownership 2015," 2015). Our behavior and interactions have been shaped by the novel and widespread use of personal technology. Prevalence has added convenience and efficiency in many aspects of life, but the combination of pleasure and proximity leads to misuse. Though frequently dismissed as insignificant, pathological use of technology is a growing area of research and concern. Internet gaming disorder, a subset of the larger category of Internet disorders, was added to the Diagnostic Standard Manual in 2013 (American Psychiatric Association, 2013) and several other categorizations of disorders are recognized with varying degrees of formality. Video game addiction is a well recorded phenomenon that impacts academic and social performance in college aged males (Schmitt & Livingston, 2015). The transition to more intense VR games with

a higher degree of immersion could exacerbate already existing tendencies towards pathological technology usage.

Virtual Reality generally creates a greater sense of presence and elicits a greater emotional response than conventional methods of digital content consumption (Pallavicini et al., 2019). These reasons are exactly why VR has come to be a successful clinical intervention in many cases, but it also provides the opportunity to engage in stimulating activities that result in addictive or anti-social behavior. There are current examples of people being so immersed in online gaming that they have died after marathon gaming sessions ("Man in China dies after three-day Internet session," 2007; Spencer, 2007). Another consideration is if, beyond the conventional understanding of addiction, users of VR come to simply prefer the world of virtual reality to the physical world. For example, in Korea a child being abandoned by its parents in favor of raising a virtual child ended in the death of the couple's daughter ("Jail for couple whose baby died while they raised online child—CNN.com," n.d.). How will VR shape the future of our interpersonal relationships? Will people find the company of a virtual partner powered by artificial intelligence to be a better companion than a real person? Research shows that first person VR pornography increases arousal in all aspects compared to traditional pornography (Elsey, van Andel, Kater, Reints, & Spiering, 2019). There are a multitude of questions that should be considered to achieve a healthy and productive relationship with VR technology.

STS Frameworks

Since the improvement of technology requires new notions of how to implement it into society, it immediately ignites some reactionary views which might predominate if a better view

of the technology is not thoughtfully considered beforehand. These frameworks are important as an interpretive aid that will help current technologists and policy makers to be able to anticipate the future path that such technologies could take and the roles which those technologies play in society.

Technological determinism is one of the more naïve and less popular frameworks; it states that technology exerts an inexorable influence over society that is all but irresistible. While viewed by some as overly reductionist and outdated, and there are good reasons for such skepticism, there is some benefit from using this framework. The framework calls for consideration of even the most subtle ways in which technology can influence the lives of average people and how even slight forces exerted on the fabric of society can have long term consequences. A determinist view of VR would find society becoming irreparably changed by the technology without much recourse for those who wish to resist VR.

Technological momentum is a more nuanced synthesis between the social construction of technology, the theory that society determines the impact of technology completely, and technological determinism. The framework posits a time dependent relationship between social forces and technology. Generally, when a technology is first introduced it can relatively easily be changed by social forces due to its novelty and lack of integration into society (Hughes, 1969). When that technology progresses becomes an integral part of the daily life of many and becomes in and of itself an institution it begins to exert influence over the course of society. VR could be shaped so that the negative effects could be minimized before it grows to become a large institution that exerts a high degree of influence over society.

Research Question

How can current use of technology inform potential users of VR as to the potential negative impact of widespread adoption of virtual reality technology on society at large?

Methods

The negative impacts of VR have not been considered extensively in an academic setting. The first method will be document analysis since much background information about things such as pathological technological usage and VR emotive response intensity will be based on journal articles and scientific papers. High quality research provide vital links between current behavior with regards to technology usage and any extrapolation I wish to make about the future place of VR in society and negative consequences.

The second is case studies of previous technology that has caused shifts in society, such as the introduction of the personal computer and the cell phone. These technologies will provide examples of disruptive events that created a shift towards more personal technological usage. The focus will be on how VR is similar to these technologies and how in some ways it represents a more extreme form of what already exists.

Conclusion

Our Capstone project will produce a technical report for our client with regards to the efficacy of their VR product. The report will focus not only on the usefulness of this one specific product but on the viability of extending attention restoration therapy to the area of virtual reality. The idea of virtual natural environments eliciting the same cognitive benefits as the real world is in the very beginning of theoretical support and research. The STS research portion will

be a synthesis of current knowledge and opinion on the subject of usage of VR and will give a speculation of its future role based on case studies of current technology usage.

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