

Daniel Dang

Tom Sokolowski

ENC 2135

14 February 2022

How will current and advancing virtual reality technology affect individuals in society?

Introduction

College is an incredible milestone in one's life to get to and succeed in, especially as by this point, you must pick out a major to focus on. There are a variety of majors to choose from, especially at Florida State University, ranging from commercial music to cyber criminology, to retail entrepreneurship, and even to Asian studies with an emphasis on business. Computer science is also an option in college that many choose, due to its versatility and functionality all over the world. One such creation that arose thanks to computer science is virtual reality. Virtual reality is an ever-evolving technology in the computer science world, where there are many unknowns of this modern creation in relation to society. Many of those that own a virtual reality headset use it as a source of entertainment, but most individuals do not know the implications of using such technology. This research project will focus on how current and advancing virtual reality technology will affect individuals in society, by homing in on the implications that virtual reality has on individuals' privacy, physiology, psychology, and finances. These topics will be investigated through the use of case studies, articles, and journals to answer the research question.

Physiological

While investigating the effects of virtual reality on individuals, I came across an article titled "Don't make me sick: investigating the incidence of cybersickness in commercial virtual

reality headsets”, by Caglar Yildirim, who is an Assistant Professor with a Ph.D. in Human Computer Interaction. This article revealed and investigated a new keyword to me that defined the main physiological effect of virtual reality headsets: cybersickness. Although the concept of cybersickness “is not a new issue; it is in fact coeval with the invention of VR technology” (Yildirim 232), specifically modern virtual reality headsets known as the “Oculus Rift CV1 and HTC Vive” (Yildirim 233). This article goes over two different experiments to compare and contrast the two virtual reality headsets and a regular “1920×1280 pixel” resolution desktop monitor, using a test to measure cybersickness called the “Simulator Sickness Questionnaire” (Yildirim 233). This test, abbreviated as SSQ, “includes sixteen symptoms of cybersickness, rated on a 4-point scale”, and categorizes symptoms into “nausea (N), oculomotor (O) and disorientation (D)”. In experiment 1, subjects were given a first-person shooter video game to play which was made for desktop and virtual reality. The results indicated that the average SSQ score of those that used the desktop, Oculus, and Vive, was around 20, 60, and 80 out of 100 respectively (Yildirim 234). Then, experiment 2 replicated the first experiment but with a racing game instead, where the results ended with an SSQ score of 10, 80, and 60 respectively (Yildirim 236). These two experiments would indicate that virtual reality can induce three to four times as negative physiological effects than a desktop screen, making it an apparent harm to individuals even in the modern world. While virtual reality can be seen to affect people’s physiological harmfully right now, I believe that it is still possible to reduce such effects in future inventions, as computer scientists will keep it in mind while making them.

Then, I found an article written by a former Tech Editorial intern on Business Insider, Kaylee Fagan, titled “Here's what happens to your body when you've been in virtual reality for too long” that goes over the general physiological effects of virtual reality, providing video and

photo examples. The first effect that was discussed was the loss of spatial awareness, where over 30 minutes of use would make individuals unaware of their physical surroundings (Fagan). Next was dizziness and disorientation, where those “prone to motion sickness or vertigo” would experience more disorientation due to how some virtual experiences are made (Fagan). Seizures were the following issue, as some experiences may have rapid changing lights that induce seizures. These seizures can happen in “about 1 in 4000” people that have had no record of a seizure or epilepsy when “they are watching TV, playing video games or experiencing virtual reality”, depending on the hours played in a session (Fagan). Afterward is nausea, where cybersickness is discussed. It is apparent that an individual can’t just get used to cybersickness through use over time, as “VR-induced nausea actually gets worse over time” (Fagan). The last point that Fagan makes in the article is eye soreness, and trouble focusing. It is expressed in the article that short-term eye strain is a regular thing with virtual reality, but it is also pointed out by a few experts that in the long run, it can affect one’s ability “to focus interchangeably between close and far objects” (Fagan). From the article, virtual reality can be attributed to a variety of physiological negatives to individuals, which is not what should be expected from modern technology. Fundamentally, with the many accidents and harm that virtual reality is or is potentially causing, I believe that more safety measures need to be taken in future virtual reality technology for it to be considered for use by society.

Psychological

After the physiological effects of virtual reality on individuals come the psychological influences. An article written by four people, three of which who have Ph.D.’s, three Registered Nurses, two Associate Professors, and one with a Master of Science in nursing, titled “Effects of virtual reality on pain, fear and anxiety during blood draw in children aged 5–12 years old: A

randomised controlled study”, investigates how virtual reality can psychologically affect children while they are having their blood drawn. This study utilized virtual reality as a means to calm children aged 5-12 years old during blood draw by measuring their “pain, fear, and anxiety” (Gerçeker et al. 1152). This was accomplished by having two different distractions on the virtual reality headset and a control, which was a “VR-Rollercoaster group, VR-Ocean Rift group... [and] no VR device used [group]”, where pain, fear, and anxiety were measured with the “Wong-Baker Faces Pain Rating Scale..., The Child Fear Scale..., [and] The Children’s Anxiety Meter” (Gerçeker et al. 1153). The results showed that both the virtual reality groups had less pain expression shown by and described by “self-, parent-, researcher-, and nurse-reported pain scores” than the control group, with “no statistical superiority to each other” (Gerçeker et al. 1155). Then for fear and anxiety, measurements were taken before and after the blood draw. Before the blood draw, “there was no statistical difference between groups”, but, after the blood draw, it was revealed that the control group had their “fear levels increased by 20%” compared to the virtual reality decreasing their fear levels by 4% and 6% for the rollercoaster and ocean rift respectively (Gerçeker et al. 1156-8). Anxiety levels on the other hand were “increased by 34.1%” in the control group and decreased by 5.4% and 12.6% for the rollercoaster and ocean rift groups respectively (Gerçeker et al. 1158). This case study reveals that virtual reality was a much better distraction method than the typical method without it as shown by how children expressed significantly less pain, fear, and anxiety during blood draw. All in all, virtual reality can be seen as an improvement to people’s psychology because it had great benefits in children, especially during a stressful time like a blood draw.

Next, I found an article that focused on the positive and negative effects of virtual reality, but I will be centering on the psychological effects in the piece by Callum Moates titled “Virtual

Planet: The Societal Impacts of VR”. The first helpful impact of virtual reality having the ability to socialize with people “through gaming or other VR avenues” without going out of their houses, especially with the current coronavirus pandemic and quarantine (Moates). This is a positive psychological effect because being able to interact and hear someone can help with “loneliness or other mental health ailments” (Moates). Furthermore, virtual reality can be used to treat mental health, especially with how expensive and the amount of time needed to find the mental health professional they need. Virtual reality helps with this by simulating an environment through “in-situ coaching”, which is where individuals experience situations that are hard for us normally or make us uncomfortable, in order to get used to it and be more confident (Moates). The ability for an individual to do in-situ coaching without anything but a virtual reality headset is great for them because it can help them overcome challenges and become better as a person when they become more confident and experience things, they would normally never be able to. Another positive effect is that it can allow for a better education, because virtual reality allows individuals to see things through the headset and also do things virtually, which may not be possible in-person or on a screen. Some examples that were brought up in the article include being able to “visit Machu Picchu, perform surgery, or carry out a science experiment” even without the money or equipment to do so (Moates). This interactive learning experience allows students to keep the information retained and also open up more activities that individuals normally would not be able to do or learn, keeping it retained psychologically. However, a psychological con to virtual reality that is pointed out in the article is how addicting it can be for people. This is because virtual reality “is so immersive and the stimulus on the brain is heightened”, increasing the chance of their psych making them addicted to virtual reality. This is a negative result because this causes individuals to become isolated,

antisocial and hurt their mental health, instead of helping with it as previously brought up. In summary, virtual reality can be seen to have many benefits to individuals psychologically because it improves mental health and allows for more sociability and better learning experiences, but the possibility of addiction forming needs to be respected and addressed by professionals and engineers.

Financial

Although influencing individuals to spend time and money is still within the realm of psychology, I would like to classify it as its own factor because it is used by businesses to get profits and is usually not a common method to be used by anyone. The article being investigated is titled, “The effects of Virtual Reality (VR) on charitable giving: The role of empathy, guilt, responsibility, and social exclusion”, written by Maria Kandaurova and Seung Lee of the School of Retail Management from Ryerson University onto a business journal, focuses on the idea that virtual reality can be used to influence people’s psychology to spend money or time volunteering outside of virtual reality. The article goes over three studies, which are supported by “the media richness theory (MRT) and the social presence theory (SPT)” (Kandaurova and Lee 571). The MRT states that “richer mediums of communication lead to a better understanding of messages and tasks of greater ambiguity”, with mediums that have a “physical presence” being the greatest mediums (Kandaurova and Lee 573), such as what virtual reality tries to emulate with its immersive experience, meaning that virtual reality should, in theory, lead to a greater understanding of the topics being discussed. The SPT asserts that the “existence of other social actors in the moment of communication is important in the choice of the communication medium” because it makes people go on their best behavior when there is “the presence of others” (Kandaurova and Lee 574), therefore virtual reality can also stimulate such ideas because

other people may be using the same application to interact with individuals, providing a sense of presence. The first case study looked into whether virtual reality could lead to “higher levels of empathy and responsibility, and whether empathy mediates the relationship between VR and responsibility” (Kandaurova and Lee 574). The results of this study indicated that participants had “higher levels of immersion” in virtual reality versus the visual media flat screen. It was found that empathy was much higher in virtual reality than visual media whereas responsibility was similar in both virtual reality and visual media (Kandaurova and Lee 574). Then, the second study looked into if virtual reality would lead “to higher intention to donate money and volunteer time for a social cause” (Kandaurova and Lee 575). For this second research study, it was found that their participants had almost double the average amount of money donated (\$38.21 versus \$15.67) when they were using virtual reality while the number of hours spent volunteering was on average, 50% greater with virtual reality (12.96 hours versus 8.41 hours) (Kandaurova and Lee 575). Then, the third study examined “socially excluded individuals” to see if virtual reality would affect their “intention to donate time and money towards a social cause”, by playing a virtual reality ball throwing game that is a pre-rendered animation. The results that came from this study were that those that were socially excluded felt that the ball was being tossed to them less frequently than the socially included group. Then, this would in turn reveal more data that the socially excluded group that used virtual reality had a slight increase of time donation, guilt, and responsibility, but money donation had no difference between the two. These studies imply that organizations could plan to use virtual reality in the future, especially once it becomes more of the norm, to get more promotion and attention from people they need time and money from. Essentially, I believe that virtual reality can be used as a medium for advertisement and be a good investment for both businesses and people to get more involved socially.

Privacy

With technology comes the issue of privacy, which is more prevalent when virtual reality was created to track your body movements. In an article written by the director of the Outlaw Center for Immersive Behavioral Science at Concordia University, Jessica Outlaw, and the Head of Immersive Simulation Program at the National Human Genome Research Institute, Susan Persky, titled “Industry review boards are needed to protect VR user privacy”, an example of human privacy is given where the individual named Riley, had their privacy invaded. Riley was someone that had bought a virtual reality setup and was playing a maze video game. After playing for 20 minutes, he had “2 million points of data about his body movement” recorded and sold to a life insurance company, which he was declined from getting because the data revealed that he had “behavioral movement patterns...[that were seen] in the very early stages of dementia”. This was then extended to his sister as she got “rejected for life and long-term care insurance policies, as dementia tends to run in families” (Outlaw and Persky). While virtual reality is fun and interesting to experience, the fact is that there are almost “no standards or regulations” on how “data is collected, used or shared”, meaning all the millions of data being tracked for the virtual reality application can be used both for and against individuals. In Riley’s case, it was used against him and his sister and prevented them from getting a life care insurance because of signs of dementia. Furthermore, while data is normally anonymized with these tracking devices, it is still possible to use all the unique signs of the body movement to identify people, as “gaze, head direction, hand position, height, and other behavioral and biological characteristics” can be and were actually used to identify individuals with “8 to 12 times better accuracy than chance” (Outlaw and Persky), indicating that individuals have little to no privacy when using virtual reality headsets. The article then gives some solutions to this, along with the

idea that there be “an independent voice in VR... that advocates for the protection of users” (Outlaw and Persky), to make more users comfortable with virtual reality technology. Thus, it can be said that privacy in relation to virtual reality needs to be worked on as there is no governing board that enforces or regulates anyone’s privacy as of now.

Conclusion

In conclusion, while virtual reality does bring great benefits to society as it is right now, especially with the various beneficial psychological effects that it has on individuals, it still has too many physiological and privacy drawbacks that can hinder individuals from considering it, such as the lack of care for cybersickness and users’ anonymity and private data that need to be improved on in the future of virtual reality before it can truly be described as a leap in technology.

Bibliography

- Fagan, Kaylee. "Here's What Happens to Your Body when You've Been in Virtual Reality for Too Long." *Business Insider*, 4 Mar. 2018, www.businessinsider.com/virtual-reality-vr-side-effects-2018-3. Accessed 23 Jan. 2022.
- Gerçeker, Gülçin Ö., et al. "Effects of Virtual Reality on Pain, Fear and Anxiety During Blood Draw in Children Aged 5-12 Years Old." *Journal of Clinical Nursing*, vol. 29, no. 7-8, 30 Dec. 2019, pp. 1151-1161, *Wiley Online Library*. doi.org/10.1111/jocn.15173.
- Kandaurova, Maria, and Seung H. Lee. "The effects of Virtual Reality (VR) on charitable giving: The role of empathy, guilt, responsibility, and social exclusion." *Journal of Business Research*, vol. 100, 2019, pp. 571-580, *ScienceDirect*. doi.org/10.1016/j.jbusres.2018.10.027.
- Moates, Callum. "Virtual Planet: The Societal Impacts of VR." *GMW3*, 20 July 2021, www.gmw3.com/2021/07/virtual-planet-the-societal-impacts-of-vr/. Accessed 21 Jan. 2022.
- Outlaw, Jessica, and Susan Persky. "The Hidden Risk of Virtual Reality - and What to Do About It." *World Economic Forum*, 29 Aug. 2019, www.weforum.org/agenda/2019/08/the-hidden-risk-of-virtual-reality-and-what-to-do-about-it/. Accessed 22 Jan. 2022.
- Yildirim, Caglar. "Don't make me sick: investigating the incidence of cybersickness in commercial virtual reality headsets." *Virtual Reality*, vol. 24, no. 2, 20 Aug. 2019, pp. 231-239, *EBSCOhost*. doi:10.1007/s10055-019-00401-0.