How can cybersecurity protocols be used in virtual reality to protect minors?

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Abstract

The first virtual reality headset was created in 1968. Since then, virtual reality headsets have evolved with more advanced technological features that institutions such as educational or medical have implemented to serve different purposes. There are many advantages to the usage of the device, but it's also important to heed the potential negative impact virtual reality can have on a person, particularly children. The disciplines that will be discussed are psychology, cybersecurity, and legal studies, which show how many factors are impacted by the technology. Minors are the most vulnerable in society and are most likely to conform to patterns in their environment. Virtual reality manufacturers have failed to provide security regulations in the immersive world to protect minors from the potential harms inherent in the real-world shift to the augmented world that government officials must handle regarding technology crimes.

Keywords: virtual reality, psychology, legal studies, cybersecurity

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Introduction

Virtual reality is one of the most popular technological innovations in the world. A system manufactured in the 60s originally intended to assist professionals in training for real-life scenarios has shifted to being used for other purposes, which has caught the attention of many age demographics ranging from adolescents to seniors. Although virtual reality is considered to be useful across various disciplines, there are still critics regarding minors using the system because they can easily be influenced by outsiders and follow certain patterns of the world. Similar to computers and cellular phones, virtual reality is a technological device that contains software and hardware components that can be manipulated for a hacker to gain access to confidential information or exploit another individual. It's important to address the potential risk factors of virtual reality and provide practical solutions for manufacturers of virtual reality, government officials, parents, and users to implement to reduce vulnerabilities.

Psychology

This section will discuss how virtual reality technology affects humans, particularly adolescents, from a psychological standpoint. In layperson terms, psychology refers to the study of the mind and behavior. To understand the behavior aspect of this discipline, it's important to recognize the genetic makeup of the brain because the mind intertwines with the behavior of a person. There are various components that make up the brain, but only a few will be explained. The brain is composed of three main parts: the cerebrum, cerebellum, and stem. The cerebrum (front of the brain) controls a person’s speech and memory. The cerebellum is made to regulate

balance and coordination. Similar to the cerebrum, the brainstem regulates memory and body functions.

As organizations continue to produce technological items, people will continue to habitually practice turning to technology. Scholars have argued society has become addicted to technology that impacts other areas such as relationships, education, and, most importantly, sleep. The importance of sleep is to support healthy brain function and reduce the risk of chronic health problems, and many other benefits, but research has shown globally people do not get an adequate amount of sleep. According to Debra Bradley Ruder, most people exchange getting quality sleep for extra minutes of screen time. The author addressed the significance of good sleep, and the negative impacts connected to lack of sleep, particularly for minors (Ruder, 2024). Most technological devices illuminate blue light, which can alert the circadian rhythm to stay awake even when it's time to sleep. For minors to have little sleep on a continuous basis hinders them from reaching a deep REM, which is necessary for processing and storing information. In the long-term sense, lack of sleep will affect the frontal lobe that controls memorization and critical thinking skills (Ruder, 2024).

Many users of the technology have mentioned experiencing physical side effects from virtual reality. The technology involves the user planting a headset near their eyes to play a series of games in an imaginary world and hold remote controls. The side effects of the technology are due to a series of factors that make shifts in the brain. Author Beata Sokotowska explained the closeness of a person’s eye to the device alters the player’s perception that may cause the user to experience symptoms ranging from nausea to disorientation (Sokołowska, 2023), which is due to humans being able to use most of the five senses in the real world and not in a virtual world. A study conducted by Science Daily also highlighted the neurological differences of the brain in

the real world and the immersive world. The study consisted of researchers placing harnesses on rats and surrounding them with large television screens to create a virtual reality world and then placing the rats in a control environment with no virtual reality. The results concluded that in the virtual world, neurons in a part of the brain named the hippocampus acted randomly due to a lack of the five senses. The neurons in the real world follow a pattern and function smoothly (ScienceDaily, 2024).

Behavior is also a part of psychology that can be impacted due to virtual reality. The three areas that play a role in how a person perceives the world are technology, family, and education. Virtual reality systems allow users across the globe to interact with other players. As social creatures, it's good, but there are potential risks that are involved. The content a person sees online can possibly impact the belief system of the individual, leading them to live a certain way. Research has shown minors are susceptible to following certain patterns and beliefs from the three areas listed above. An author named Khanta discussed the potential threat for augmented reality systems based on predators acknowledging the rise of minors playing with the system to exploit them to promote their own agenda. These potential threats can range from sexual and/or terrorism-related activities (Khanta, K. 2024). Technology also puts minors in a vulnerable state because technology allows either for a person to be deceived by someone else or influenced to do something. Even though minors should know right from wrong, the lack of the frontal lobe being fully developed could cause cloudy judgment on life decisions.

A solution for lack of sleep and side effects can be for the developers of virtual reality to use a cybersecurity protocol that allows the user to only play for a certain time on the headset. Most people play on a virtual reality headset for one to two hours, disregarding experts' recommendation to use the headset for only fifteen to thirty minutes and to take five- to ten-

minute breaks during sessions. A solution that virtual reality also can implement is a program that allows parents to view and/or block certain content. This can prevent children from accessing certain games while playing on virtual reality.

Cybersecurity

Like most technological innovations, there are cybersecurity weaknesses in virtual reality systems, leading to the innovation being breached. A top priority for virtual reality developers should be to protect the confidentiality of users' information and to provide a safe environment for all, but many articles have addressed the lack of security for many systems. An article titled Security and Privacy in Virtual Reality: A Literature Review highlighted that virtual reality systems keep records of personal information and track the behavior of a player. The article also gathered how Oculus VR, manufactured by Facebook, collects and shares private data when a user agrees to the terms and conditions. Another major risk regarding the protection of information in virtual reality is that information is decrypted in most virtual reality worlds. Information being decrypted allows an unauthorized user to see information clearly, potentially manipulating information (Kulal et al., 2022).

Furthermore, virtual reality manufacturers should also consider technical gaps in the device to improve security. The experiment conducted by Katrina Khanta addresses vulnerabilities in augmented worlds that are overlooked, such as insufficient content moderation and a weak reporting system (Khanta, K. 2024). The article also specifies the reason(s) these problems need to be addressed. A lack of content moderation gives hackers an opportunity to use certain slang terminology, emojis, and words to promote their ill agenda. This can lead to a minor being exposed to certain words and/or content while playing virtual reality. Another technical issue that many manufacturers of these innovations neglect to emphasize is reporting

systems. Khanta mentioned how many virtual reality headsets fail to track important information that would be recorded on most technological devices, like IP addresses, timestamps, or message exchanges (Khanta, K. 2024). The issue regarding weak reporting systems is that a lack of information can make it difficult for investigators of a cybercrime to find the culprit.

The need for advanced cybersecurity protocols is needed to mitigate risks. The article discussed various solutions to security and privacy issues most virtual programs are experiencing. As stated in this article, a major problem regarding privacy issues is based on a lack of encryption algorithms for information. The author address the solution would be for virtual reality developers to implement encryption algorithms, in addition to organizations communicating the disclosure of user information (Khanta, K. 2024). Encryption algorithms provide security to a user's information through a process of converting data into a secret code made to prevent hackers from viewing information. The study also revealed other options for the protection of security proposed using a systematic literature review. The authors highlighted how virtual reality developers can utilize security frameworks made to evaluate security and privacy threats (Khanta, K. 2024). Another procedure manufacturers can utilize is two-step authentication, which enables someone to verify themselves using another device. This procedure can add an extra level of security for users and notify them of any suspicious activity occurring with their account.

A cybersecurity solution that society does not recognize is the importance of cybersecurity awareness and training. Most cyberattacks stem from lack of knowledge and human error; therefore, many researchers propose the idea of cybersecurity awareness and training for all internet users, particularly minors. As technology continues to evolve, the presence of hackers also increases. Many studies have shown the more prepared a person is, the

better equipped they are to handle the situation. It's also important to incorporate methods parents, teachers, and researchers can utilize for themselves and for children to recognize a potential threat. Artificial intelligence is a technical tool most researchers use to promote risk awareness. The usage of artificial intelligence can also assist in monitoring inappropriate or harsh language of players, along with notifying parents or moderators of suspicious activity (Kaimara et al., 2021).

Legal Studies

In this article, many problems regarding virtual reality issues have been shown in a psychological and cybersecurity context. It's also important for society to acknowledge the connection between technology and the government. As virtual reality is being utilized and beneficial in a variety of industries, there are ethical concerns with the device. Author James S. Spigel discussed four ethical concerns of the device that have been previously discussed in this article. A concern the author highlighted is the lack of privacy and security. Virtual reality headsets record additional information such as patterns of eye movement and reflexes, which are a "kinematic fingerprint" of a person compared to traditional technological innovations (Spiegel, 2017). This can contribute to a lot of danger for government officials, educational institutions, and, most importantly, children that are using virtual reality because it allows hackers to distort, deceive, or simply do a plethora of malicious activities.

A feature of virtual reality is that the device allows users to communicate with other users using voice chat or a chat box. The potential issue with this feature is an individual is allowed to say inappropriate language or encourage a minor to share personal information, and the government may be prohibited from charging that individual due to First Amendment rights. The First Amendment states that "Congress shall make no law respecting an establishment of religion

or prohibiting the free exercise thereof; or abridging the freedom of speech, or of the press; or the right of the people peaceably to assemble, and to petition the Government for a redress of grievances (congress.gov)." An important question regarding the usage of virtual reality, the government, and the First Amendment is where the line is drawn for a person saying inappropriate speech online or an adult user asking a minor where they are located? Another question would also be when can law enforcement intercede for sexual or violent content displayed in the immersive world? An article conducted by Bagheri addresses using Supreme Court cases to show the speech expression and/or content that is protected by the First Amendment (Bagheri, 2017).

In the Supreme Court case *Brown v. Entertainment Merchants Association,* the Supreme Court argued that violence in games is considered "creative expression" and protected by First Amendment rights (Bagheri, 2017). The Supreme Court fails to acknowledge how minors are active in virtual reality environments and are influenced by the world around them. Manufacturers of virtual reality should also be held accountable for the type of content displayed to children. As mentioned in this article, a cybersecurity issue with virtual reality systems is that there is no established procedure to verify the age of a person. Additionally, the Supreme Court case Spence v. Washington discussed certain acts that would not be a violation of the First Amendment. The author states that the court case pertaining to a virtual reality environment would consider a picture of a burning flag to not be in breach of the First Amendment because freedom of speech is protected in virtual worlds (Bagheri, 2017).

The protection of United States citizens' information is a priority for the government because they are not only protecting data from average hackers but also different regions in the world that want access to information that is confidential to America. A solution to guarding data

is to use privacy protection regulation. This regulation would ensure that technology companies are following security regulations and reporting breach incidents immediately to law enforcement that can help the government reduce litigation. An article conducted by Bagheri examines how in Europe, informational privacy is protected as a fundamental human right (Bagheri, 2017), which has been shown to reduce litigation and lower cyberattacks. Research has also shown that adaptation to privacy rights can motivate consumers and developers to make it a custom to consistently update programs (Bagheri, 2017).

In this article, the issue of First Amendment rights hindering government officials from interceding in speech and/or expression in virtual reality environments is discussed. The process of regulating intellectual property, torts, and the First Amendment can be a little more challenging because these are fundamental rights of humans that cannot be removed by states and federal authorities. Author Bagheri argued the First Amendment and torts should not be subject to new regulation until the passage of time reveals potential concerns that might merit regulation (Bagheri, 2017). This issue has contributed to a constant debate between legislators on how to approach inappropriate speech or images in immersive environments. According to Bagheri, the wait-and-see approach is the most suitable for these legal issues because strict regulations can stifle players and developers of virtual reality (Bagheri, 2017). This approach is handled on a case-by-case basis and can possibly change depending on legal issues regarding technology rising or reducing, but its complexity has swayed lawmakers to emphasize the importance of virtual reality organizations self-regulating security issues through terms and conditions to protect data.

Conclusion

The purpose of this article is to discuss the cybersecurity protocols that can be used in virtual reality to protect the rights of minors through the scope of addressing the potential risk(s) of virtual reality systems and implementing practical recommendations to protect minors from the dangers of the technology. The article focused on cybersecurity, psychology, and the law to examine the research topic. The psychology section discussed the pattern of the brain. The cybersecurity problems addressed are the lack of encryption algorithms and regulation programs. The legal issues stemmed from the government not regulating or avoiding certain topics. To conclude, these potential risk factors will continue to be a problem as technology advances, but there are methods that society can utilize to secure minors and mitigate risks, such as security protocols that all players must agree to before using the system, and virtual reality developers can add programs that limit screen time on the headset. Developers can also utilize programs to view and block certain content to shield minors and help law enforcement in case a cyber breach happens.

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