IMMERSIVE VIRTUAL ENVIRONMENTS AND THEIR EFFECTS ON HUMAN PSYCHOLOGY

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Abstract

This research paper explores immersive technologies and their applications in psychology with the exigency of providing an extensive understanding of immersive technologies, extended realities and their connection with human psychology. The main focus is on Virtual Reality (VR) as it is currently the most advanced immersive technology. Immersive technologies are computer systems that create alternative realities by merging the human participant's physical surroundings and a digital reality created through visuals while imposing a sense of telepresence in this alternative reality on the participant. Previous studies have shown that VR has useful applications in psychology including many forms of treatments, clinical assessments and usages in academic studies. However, there are not many studies regarding the negative consequences virtual reality exposure on human psychology. The central question of this paper is if immersive technologies' usage in psychology a beneficial practice, considering their limitations and drawbacks. We report that while the long-term effects of virtual reality on our mental health are still a subject that requires heavy research and even though its unrestricted usage might cause symptoms such as derealization, depersonalization, isolation and addiction, with professional usage and supervision VR holds immense potential in psychology. Despite the risks, VR's immense value and potential cannot be overlooked. However, it is very crucial that professionals do not undermine and fully recognize the possible risks of VR exposure. Medical professionals must be acquainted with both the possibilities and challenges these technologies will present to professional practice and take precautions to minimize the challenges to ensure their appropriate development and utilization in the psychology field.

Keywords: immersive technologies, virtual reality, extended reality, telepresence, psychology, clinical psychology, mental health

Immersive technologies in which distinct experiences are created by merging the physical world with a digital or simulated reality are currently among the most influential modern technologies due to their wide range of applications and the enhanced user experience they offer.[1] Due to their ability to induce telepresence by introducing an alternative reality, they carry greater potential than any other simulative technologies in many fields and psychology is one of these. For more than half a century, the therapeutic potential of virtual realities has been anticipated, but the lack of graphical processing power hindered its application in the field of medical therapy until a decade ago. Nowadays, however, "the hardware required to operate virtual reality is even 100 times more affordable" and this means they will become even more influential in our daily lives very soon.[2] Nonetheless, just like any other technology, they have their own limitations and drawbacks. These facts render an extensive understanding of immersive technologies and their connection with human psychology crucial. Even though its unrestricted usage might cause symptoms such as derealization, depersonalization, isolation and addiction, with professional usage, and needed supervision, Virtual Reality holds much potential in the psychology field.

Immersive technologies have advanced to a point where they can be applied and benefited by a large range of fields with the sense of presence they offer with the compelling virtual experiences, and psychology is one of the many fields that can significantly benefit from these technologies using them to collect data in academic research, in psychological treatments and clinical evaluations. Immersive technologies feature Immersive Virtual Environments (IVE), which are specialized computer systems that generate an interaction between the human perceptual system and computer-generated displays, resulting in an

[1] Burtis, "An Introduction to Immersive Technologies," 1.
[2]Găină et al., "Perspective on the Double Edges of Virtual Reality in Medicine - Both Addiction & Treatment," 1.

extended virtual space. The system's visual, auditory, tactile and haptic modalities target the sensory organs of the human participant operating in this extended virtual space, creating a sense of presence.[3] This sense of presence is called telepresence, which is defined as "a psychological state in which even though part or all of an individual's current experience is manipulated by technology, the individual's perception fails to acknowledge the role of the technology in the experience"[4]. With the sense of telepresence and the compelling and engaging experiences immersive technologies offer, they will provide support in psychological education, counseling people in overcoming their phobias, and helping people recover mentally.[5] Immersive technologies and extended realities like virtual reality (VR) and augmented reality (AR), stand out from other simulative and visual technologies thanks to their ability to induce telepresence. The facts that IVE technologies are capable of inducing telepresence and that the movements in virtual space, and the perceptual alterations, are handled similarly by the brain to those in equivalent real-life spaces are the main reasons these technologies have particular relevance to the study of human behaviors and can be highly useful in psychology.[6]

One way to benefit from immersive technologies is to use controlled environments that can simulate different situations and settings in order to study and examine how and why people respond differently in various situations. The patients are exposed to different realities, which affects the way they feel emotions, and how they perceive their current realities. One example of that is how the sense of presence allows VR to reach and intensify users' experiences of emotions.[7] In Stanford's becoming homeless study, 560 participants

[3] Slater and Usoh. "Presence in Immersive Virtual Environment", 90.
[4]International Society for Presence Research (ISPR). "PRESENCE 2020, 18th Conference of the International Society for Presence Research (ISPR)."

[5] Riva. "Virtual Reality in Psychotherapy: Review." 220.

[6] Foreman, Norman. "Virtual Reality in Psychology," 225.
[7] Stanford University, "Virtual Reality Can Help Make People More Empathetic," https://news.stanford.edu/2018/10/17/virtual-reality-can-help-make-people-empathetic/.

were exposed to a series of virtual reality simulations in which they played the role of someone who lost their job and had to experience homelessness.[8] The study found that participants who underwent the experience through VR exhibited higher levels of empathy and understanding towards the challenges faced by homeless individuals when compared to individuals who experienced the same from PC or other visual technologies. [9] This suggests that immersive technologies, such as virtual reality, have the potential to intensify human emotions thereby exerting a strong influence on individuals' emotional states and experiences. Hence, by using VR to create virtual environments that simulate various scenarios, researchers can observe how individuals react and behave under intensified and realistic virtual situations and gain precious insight into human psychology and for that reason, it is a significant tool for clinical therapy.

While there is no debate on VR being a very significant tool for psychotherapy, some sources suggest that a class of applications in the psychology field depend on presence and necessitate the utilization of virtual environments to effectively conduct diverse forms of treatments.[10] VR is a necessary tool for some areas in psychology because patients need to experience certain scenarios for the treatments to be conducted efficiently and virtual realities provide psychotherapists with the needed realistic and convincing experiences and induce telepresence on patients. According to a paper from the 2020 International Conference on Computer Information and Big Data Applications (CIBDA), Application of Virtual Reality Technology in Clinical Psychology, researchers were able to achieve outcomes that would have been otherwise unattainable without the utilization of extended realities.[11] For example,

[8] Stanford University, "Virtual Reality Can Help Make People More Empathetic," https://news.stanford.edu/2018/10/17/virtual-reality-can-help-make-people-empathetic/.
[9]Stanford University, "Virtual Reality Can Help Make People More Empathetic," https://news.stanford.edu/2018/10/17/virtual-reality-can-help-make-people-empathetic/.
[10] Sanchez-Vives, Maria & Slater, "From presence to consciousness through virtual reality", 10.

[11] Liu and Tang, "Application of Virtual Reality Technology in Clinical Psychology".

they accomplished treating patients with schizophrenia with positive symptoms and concluded that VR treatment can competently diminish the delusions and hallucinations of schizophrenia patients, which was not a result gained as effectively through traditional treatments.[12] This therapy technique also helped patients adapt to their hallucinations and improve their social functions by working on these in virtual environments.[13] Another noteworthy usage of VR and its ability to induce telepresence is in the treatment of phobia and anxiety disorders. Emmelkamp and his colleagues conducted a controlled investigation comparing virtual reality exposure therapy and real exposure therapy for fear of heights, and the results showed that both treatments were equally successful.[14] However, when compared to real-exposure therapy, virtual exposure therapy had many advantages because it prevented patients from having excessively strong fear reactions, and it was obviously far more economical and convenient because it guaranteed the safety of patients without losing any effectiveness due to its realistic nature.[15] It provided the same feeling of presence and exposure, without the safety risks and excessive reactions. VR is also a significant aid in treating post-traumatic stress disorder (PTSD) by simulating traumatic scenarios and facilitating the processing of patient traumas.[16] With the perfectly observable controlled environments VR creates, it also plays a substantial role in psychological assessment. The majority of the traditional psychological assessment techniques are performed in laboratory conditions and cannot accurately replicate real-life situations, so they lack the generalizable results that predict behavior outside of the lab, thus have little ecological validity. The VR assessment method, however, has a very high level of ecological validity since it can imitate real-life circumstances to increase the authenticity of the participants' experiences by

[12] Liu and Tang, "Application of Virtual Reality Technology in Clinical Psychology," 401.
[13]Liu and Tang, "Application of Virtual Reality Technology in Clinical Psychology," 401.
[14] Liu and Tang, "Application of Virtual Reality Technology in Clinical Psychology," 400.
[15] Liu and Tang, "Application of Virtual Reality Technology in Clinical Psychology," 400.
[16] Liu and Tang, "Application of Virtual Reality Technology in Clinical Psychology," 400.

inducing presence.[17] Thus, it can be stated that immersive technologies like VR play an essential role in psychotherapy and clinical psychology due to their ability to simulate specific scenarios and provide convincing experiences.

One cannot deny that because of the false sense of presence virtual realities induce, they might also cause unwanted consequences for humans' mental health. It was stated earlier in the paper that VR has the potential to intensify users' experiences of emotions. This can result in the intensification of negative emotions as well. A survey asked people about their past experiences with VR and found that certain VR content, like scary figures, caused individuals to feel intense unpleasant emotions that lasted a long time.[18] While the survey findings indicated that VR experiences can produce strong negative feelings, other forms of media can have similar effects.[19] However, another story found out that people who had played a video game in VR experienced stronger negative emotions than those who had played it in 2D on the laptop did. VR made them feel like they were really a part of the game, and this made them feel more responsible and therefore more ashamed of their actions during the VR experience. These feelings of shame and responsibility in the virtual world can further result in decreased mental health and cases of depression, anxiety disorders, just like it would do in our actual reality.[20] Another aspect of extended realities is addiction. Since these realities are upgraded versions of the actual reality, users tend to develop addictions towards them, which then also results in severe cases of depression, and other psychological disturbances.[21] Just like other technologies, immersive technologies have their problems as

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[17] Liu and Tang, "Application of Virtual Reality Technology in Clinical Psychology," 401.

[18]Lavoie, Main, Corey King, and Danielle King. "Virtual Experience, Real Consequences: The Potential Negative Emotional Consequences of Virtual Reality Gameplay." 70.

[19]Lavoie, Main, Corey King, and Danielle King. "Virtual Experience, Real Consequences" 70.

[20]Lavoie, Main, Corey King, and Danielle King. "Virtual Experience, Real Consequences" 70-71.

[21] GĂINĂ et al., "Perspective on the Double Edges of Virtual Reality in Medicine - Both Addiction & Treatment," 364.

well. However, these are not disadvantages that outweigh the benefits we gain from VR and can be decreased with proper guidelines.

There are more extreme effects of VR and addiction to VR on human psychologies are symptoms of derealization, depersonalization and reality confusion. The results of an experiment conducted by Peckmann et al. showed that users experienced significantly stronger increases of depersonalization/derealization symptoms immediately after VR gaming rather than PC gaming.[22] However, while the study provided data about how VR exposure can cause DPDR symptoms, there is no evidence that these DPDR effects last in the long run.[23] Other disturbances frequently reported by VR users are dizziness, vertigo or nausea, which are also known as cybersickness or simulator sickness. However, it is also known that the majority of cybersickness symptoms are not extreme and are not long-lasting.[24] Even though there are such drawbacks of immersive technologies, it is undeniable that through the use of immersive technologies like virtual reality, psychologists are now provided with improved tools that will assist them gain greater insight into human behavior thus providing more effective treatments. Despite the potential risks, VR's immense value and potential cannot be overlooked. However, to overlook the drawbacks of these technologies would be a big mistake either, hence professionals have to implement appropriate guidelines, and ensure responsible usage to effectively mitigate these risks of VR and fully harness its power.

The consequences of immersive technologies can vary greatly for individuals and society, depending on how people use them and interact with them; hence, the risks of VR should not be undermined by VR users and professionals that benefit from VR.[25] "Weighing

[22]Peckmann et al. "Virtual Reality Induces Symptoms of Depersonalization and Derealization," 1.

[23] Peckmann et al. "Virtual Reality Induces Symptoms of Depersonalization and Derealization," 1.

[24]Lavoie, Main, Corey King, and Danielle King. "Virtual Experience, Real Consequences: The Potential Negative Emotional Consequences of Virtual Reality Gameplay." 70.

[25]Greengard, Samuel. *Virtual Reality*, 185.

the specific risks of VR exposure, integrating safeguards into applications, and introducing transparency into how data is collected and used" is necessary so that we can actually benefit from immersive technologies.[26] Possible side effects of how VR can lead to psychological disorders, cyber-bullying, etc. were stated earlier in the paper and these prove how establishing a social and legal framework for dealing with extended realities is a necessity. It is crucial to set rules, regard ethical concerns, and safety measures in order to reduce the dangers of unrestrained usage. "Prioritizing the physical, emotional, and psychological safety of its userbase" has to be a mandatory ideal for extended reality (XR) developers.[27] In that sense Metaverse and extended reality developers should take action to prevent cyberbullying, or extensive usage of VR. Basic implementations such as time limits, or consultation services for users exceeding a several time limit on the VR would be very helpful in that sense. However, with all this said, the first and most important step to ensuring safe usage of VR is educating the users. Users should be properly informed about the risks of VR usage before any alternative reality interactions. Being aware of their emotional states and stopping the interaction in case of any unwanted results, such as feeling overwhelmed, anxious, or distressed, is crucial. Additionally, while immersed in VR, it's vital to keep aware of your actual surroundings to avoid accidents or collisions with items or people. While it is essential to acknowledge and address the potential disadvantages of immersive technologies, with the necessary precautions and safety guidelines, these risks are not inevitable, and they can be efficiently reduced to ensure its utilization as a valuable tool in various sectors including psychology.[28]

[26]Greengard, Samuel. *Virtual Reality*, 185.
[27] Hinduja. "The Metaverse: Opportunities, Risks, and Harms."
[28] Joshi et al., "Implementing Virtual Reality technology for safety training in the precast/ prestressed concrete industry," 1-2.

Being able to interact with a virtual space created by a combination of senses and the computer-generated images and sounds is one of the highest point technology can reach. It's like stepping into a different reality where you can see, hear, and even feel things that aren't actually there -it seems like science fiction to many. However, VR is no longer fiction, it has become a part of our reality today, affecting many areas of modern life due to its the ability to induce presence and create realistic experiences, and in the years to come, it will drive progress and innovation that will mold the future.[29] However, it's important to acknowledge that prolonged and unregulated usage of VR can sometimes lead to negative psychological symptoms such as derealization, depersonalization, isolation, and addiction. However, the fact that IVE technologies are capable of inducing presence is one of the main reasons they stand out from other technologies regarding their effectiveness on human psychology. Despite these potential risks, the immense value and potential of VR make it too valuable to ignore. When utilized under professional direction and supervision virtual reality has the potential to strengthen therapeutic approaches, raise standards of mental health treatment, and develop psychology as a whole.

[29] Iberdrola. "Virtual Reality, the Technology of the Future,"https://www.iberdrola.com/innovation/virtual-reality.

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