THE RISKS AND EFFECTS OF VR ON CHILDREN'S COGNITIVE AND PSYCHOLOGICAL DEVELOPMENT

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The industry of VR (Virtual Reality) has made remarkable strides in recent decades, such that its applications range from entertainment to being eventually use as an educational tool. As a result, it has reached a younger audience, namely children. As particularly vulnerable users, it is, therefore, crucial to consider not only the possibilities but also the potential impact on their psychocognitive development in order to safely adapt it to their developing brains. This paper will therefore examine scenarios that have been integrated into immersive experiences, as well as some of the effects of this type of software on children when applied to VR. Thus, problems related to addiction, distorted perception of reality and trauma will be addressed. Additionally, it will suggest possible solutions to address the corresponding issues. Finally, since the definition of "child" may vary depending on cultural background and beliefs, this essay uses the definition of "child" declared by the United Nations (United Nations, 2022), which states that a child is any person under the age of eighteen.

Addiction to VR and other Behavioural Consequences

Let us first address the concerns about addiction and behavioural disruption. As with many technologies that are still in their early stages, there is much yet to learn about VR devices and their effects on humans. Even so, Virtual Reality can become a source of addiction, especially among younger people, who have already grown up surrounded by technology and are dealing with similar issues, albeit with different types of hardware. For example, a paper cited in Kuss et al. (2018, p. 142) suggests that "smartphone addiction is more prevalent in younger adolescents in comparison to adults (Haug et al. 2015), indicating that younger individuals may be particularly at risk for developing problematic mobile phone use". While this example only relates to smartphones, it shows that younger individuals are more susceptible to developing technology addiction than their adult counterparts. Similarly, immersive technologies can pose a similar risk to the youth, as they employ similar strategies

to current software to keep their users entertained for as long as possible. The strong sense of presence and lack of sunlight can further cause users to become unaware of the outside world, and lose track of time. An example of this is the lack of windows and natural sunlight in various casinos, which, among other things, is said to cause gamblers to continue playing and spending more money in casinos because they lose the sense of time (Sykes et al., 2012). Not to mention that this could lead to other types of consequences, ranging from addiction to disruption in sleep patterns and difficulty concentrating (Kaimara, Oikonomou and Deliyannis, 2021, p. 699). Fortunately, there are ways to combat these addictive tendencies. Madary and Metzinger (2016, p.13) proposed a system in which the users would be informed of the amount about time they spend on HMDs (Head-mounted displays), specifically while gaming, and use NPCs (non-player characters) to encourage players to take breaks. It is also crucial to involve parents in their children's engagement with technology by educating them and helping them set limits on their children's daily use of any type of device (Hilčenko and Jakovljević, 2019, pp. 239-240). This is not to say that VR should be discouraged at this young age, but that it should be used in moderation and even adapted for educational purposes through fun activities for children. Research by Lamb et al. (2018, p. 166) has shown that 3D simulations and games had a more positive impact on students' performance when compared to 2D software, opening up a world of possibilities for approaching children's engagement with virtual reality.

Distinguishing Reality from Simulation

On the other hand, Virtual Reality is becoming increasingly realistic as the years go by. Improvements in graphics and the sense of immersion are challenging our perception of reality and sometimes even making it difficult to distinguish what is real and what is a simulation. This could be especially challenging for young children, who are still developing and have not yet grasped the full extent of their actions and their consequences. As a result,

"Children are less able to distinguish what is real from what is imaginary compared to adults, may confuse VR experiences with those that occur in the physical world and identify with avatars" (Kaimara, Oikonomou and Deliyannis, 2021, p. 717). Hence, VR presents a new obstacle to this issue, as it creates realistic or even impossible scenarios that allow users to experience all kinds of settings and abilities. Consequently, it may expose children to situations where the outcomes of their actions would not be realistic and therefore create confusion as to what responses would be reasonable in real life. To explain this, let us consider the example Standen and Brown (2006, p. 249) proposed, which examines a situation involving a vehicle. In a simulation where the user is hit by a simulated car, the physical danger is not properly conveyed by the simulation. Virtual Reality provides the viewer with a safe and controlled environment where the component of real danger and injury is removed, creating a considerably risky simulation to show a child. Due to the possibility that children may not be able to understand the risk of such situations in real life, it may pose a threat to their perception and response to danger. The solution relies primarily on one factor, education. It is crucial to involve adults in educating children and teaching them the physical limitations of virtual experiences, as well as the distinction between reality and its simulated counterpart. As Kaimara, Oikonomou and Deliyannis (2021, p. 729) stated, "the human experience and adults' role is crucial to help children understand the difference between fantasy and reality". However, a study conducted by Dixon et al. (2019, p. 638) using a life-like interaction in VR showed some effectiveness in teaching children with ASD how to cross a street. Keeping in mind that the researchers were also aware of the lack of research into the safety aspects for children. Nonetheless, this demonstrates that if approached correctly and with the child's perceptions in mind, these types of simulations can actually be extremely beneficial in educating youngsters about real-life events and learning to overcome them in a safe, interactive environment.

Abuse and Trauma in VR Platforms

The last point that needs to be addressed is the trauma caused by abuse and exposure to inappropriate content. Like many trends nowadays, the VR industry has infiltrated the social media space, having provided its users with apps such as VRChat or vTime XR to promote social interaction whilst immersed in all kinds of environments. Consequently, it has also encountered numerous obstacles that have already been addressed by its 2D counterparts. Since VR is a young industry, there is still much to be regulated and developed, especially when it comes to these immersive social platforms, and as a result, there have been some incidents that put children's well-being at risk. One example lies in an undercover investigation conducted by a researcher in VR chat, where they posed as a 13-year-old girl (Crawford and Smith, 2021). The encounter unveiled sexually explicit comments, actions and environments, that encouraged and even coerced by male, older users in these virtual spaces, despite knowing full well that this individual was supposedly 13 years old. Ergo, this recent investigation has exposed the lack of regulation and censorship that still exists on VR social platforms today. Subsequently, these findings show that it can be dangerous for children to hang out on such platforms without any guidance or proper security systems to prevent such incidents. Situations like this can lead to child sexual abuse, which "can have a very serious impact on physical and mental health, as well as later sexual adjustment. Depending on the severity of and number of traumas experienced, child sexual abuse can have wide-reaching and long-lasting effects." (The National Child Traumatic Stress Network, 2018). Moreover, due to the immersive nature of VR, the effects can be exponentially worsened as the user has a more realistic experience and, making it more difficult to overcome these tragedies. According to MetaQuest (Oculus, n.d.), their headsets are targeted at ages 13 and above. However, this is clearly not enough to address the underlying issue, which is considered systemic at this point. The solution lies in creating secure systems that filter out inappropriate

content and bring the users responsible for these incidents to justice. If tackled correctly, the benefits are worth the time invested in perfecting such platforms. The way we experience social interaction will be enriched by VR and 360-degree videos, enhancing remote collaboration and shared experiences (Gunkel et al., 2018, p. 498).

In conclusion, the VR industry should acknowledge the ramifications of its hardware and software on children and their right to remain safe in these and other types of virtual scenarios. To achieve this, there must be a determination to change and reflect on current practices, as well as inform their audiences. Only then will Virtual Reality truly be able to participate in our lives as a reliable source of entertainment and learning for all ages. Nonetheless, despite the apparent risks outlined by this essay, the industry requires further research to better understand and corroborate such arguments. Currently, there is insufficient data to support all of these ideas, which is acknowledged in many of the papers used throughout this essay. It is, therefore, crucial for this field to continue testing and gathering more information that helps us better grasp the consequences of such technologies. Nevertheless, there is much to consider based on what society has learned from other industries with similar approaches and problems. By understanding what went wrong before, we can prevent similar incidents from happening again.

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