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Virtual Reality, Metaverse and Mental Health

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ABSTRACT

Introducing the Metaverse, Augmented, and Virtual Reality will change people's ways of life and daily gestures. Floridi, in this regard, has coined the term "mangrove society" to indicate the living conditions of human beings suspended between online and offline.
In addition to changing lifestyle habits, introducing new technologies impacts many sectors of science, including psychology and treatments on psychological well-being. Studies and research on these new systems are in their infancy and show potential future developments and the limits they contain, such as the phenomenon of cybersickness and the impact that the new tools could have on physical and mental health. Furthermore, with new technologies, privacy-related problems are arising, and in part have already occurred, which should be carefully evaluated and regulated.

Keywords: cyberpsychology, cybersickness, metaverse, mental health, technological risks.

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Introduction

Contemporary society is going through a profound and intermittent digital revolution, acquiring technological devices more and more space in the life of human beings. The philosopher Luciano Floridi (2021) coined the term "mangrove society" to refer to the current condition of life of human beings, constantly connected to the web, characterized by a continuous interaction between physical and analogical reality and the virtual world and interactive (Floridi, 2015), or as he stated «Mangroves are born where the salty water of the sea and the freshwater of the river or rain mix in the brackish water. The mangrove society metaphorically indicates a society where online and offline are mixed in everyday experience (on life), and spaces are digital and analogical (infosphere). The world's population is increasingly migrating to the mangrove society» (Floridi, 2021).

This is the goal promulgated by Zuckerberg with the introduction of the Metaverse, as he stated in the letter sent to his employees in October 2021, namely to create a digital universe accessible through virtual reality (VR) and augmented reality viewers (AR), creating a digital alter ego in order to implement a fusion between real and virtual life. The introduction of this project by Mark Zuckerberg, owner and founder of the Meta company, made up of some of the most widespread and used social networks in the world population, has led humanity to deal with this innovative idea, raising a whole series of doubts and questions about the advantages and disadvantages that all this could determine in the life of human beings.

In Zuckerberg's imagination, inspired by science fiction literature, in particular by the cyberpunk current with the famous novels "Snow Crash" by Neal Stephenson (1992) and "Neuromancer" by Mel Gibson (1984), this innovative multi-user virtual world should constitute the technological future of human life, realizing a progressive incorporation of the user's body into the online digital experience. In general, every human being within this virtual world would be represented through an avatar that presents the specific characteristics and subjective parameters detected through specific technological devices defined as wearable devices or wearable sensors, capable of detecting the characteristics and movements of the subject in his real life and transfer them to the digital twin.

Unlike previous virtual worlds, such as the famous Second Life, created in the early years of the new Millennium, in which the user's visualization was based purely on non-immersive desktop screens, in the innovative Metaverse access should take place through virtual reality devices, called head-mounted displays or closed virtual reality viewers, capable of recreating realistic simulations of situations and events typical of everyday life, allowing users to be immersed in these digital scenarios and make them feel present, realizing what Lombard and Ditton already in 1997 had defined "perceptive illusion of non-mediation" that is the non-perception of the subject of the mediation of technology, feeling, in fact, physically present in the virtual environment.

One might commonly think that virtual reality is the latest generation of technology. However, in reality, this is not the case, as the prototypes of virtual systems were already developed in the 1960s, particularly the "Sensorama" by Morton Heilig and "The Sword of Damocles" by Ivan Sutherland. The modern meaning of Virtual Reality was coined by Jaron Lanier in 1989, with an absolute explosion of interest in this technology in the last decade of the last century, considering it the future of training, education and training, even advancing the possibility of receiving psychological treatments thanks to such virtual experiences.

However, despite these optimistic forecasts, virtual reality was shelved in the first decade of the new millennium for several reasons: above all, the high cost of the devices, the reduced level of immersion and graphic realism achieved and the discomforts caused by users, including nausea, vomiting,

confusion, dizziness, pallor for which the term cybersickness has been defined, which is the digital version of motion sickness, commonly referred to as carsickness, seasickness, train sickness.
Only starting from the intuitions of Palmer Luckey, founder of the Oculus company, has there been a renewed attention to virtual reality and the construction of virtual reality viewers, capable of offering a degree of realism and a level of immersion unthinkable from devices built-in previously (Levy, 2022). It was Zuckerberg himself who acquired Luckey's company, founding the Meta company whose goal is to extend the real life of human beings and create a new type of Web, an Internet embedded in the users' bodies, which is represented by avatars and offers the opportunity to communicate with others, participate in events, concerts, explore architectural works in the most diverse places in the world, play, study and learn, work using the typical applications available in the various virtual reality viewers available today, remaining comfortably seated on the sofa at home.

Discussion

The possibility of using the Metaverse in the context of the intervention and promotion of the mental health of human beings finds justification in the various studies that have been carried out in the last thirty years using immersive and non-immersive virtual reality devices, as such experiences virtual allow to act, make decisions and learn from experience (Riva & Gaggioli, 2019).
As regards the mental health field, technology is increasingly acquiring a fundamental space, given the importance that this now assumes in the life of human beings, so much so that today we speak of "cyberpsychology" (Gordo-López, Parker, 1999). Virtual reality represents an emerging approach in the psychological sector, having been developed and implemented over time in several examples and studies, both to intervene in cases of pathology and to increase human well-being and quality of life. In particular, starting from the current of positive psychology, which underlines the importance of promoting well-being in humanity, different theoretical perspectives (Fogg, Cueller, Danielson, 2007; Riva et al., 2012; Calvo & Peters, 2014; Gaggioli et al., 2017) have supported the possibility of using technological devices, including virtual reality, to carry out interventions to support the well-being and quality of life of human beings.
In the panorama of virtual reality, the most significant examples concern the promotion of positive emotions (Baños et al., 2014), the building of positive relationships and the increase of empathy (Shin, 2018; Jones, 2021), the reduction of (Banakou et al., 2016; Banakou et al., 2018; Gonzalez-Liencres et al., 2020), managing stress and learning relaxation techniques (Soyka et al., 2016; Fagernäs et al., 2021; Modrego-Alarcon et al., 2021; Weibel et al., 2023).
Instead, the intervention of pathology, virtual reality systems and devices have been used as evaluation and treatment tools in various clinical conditions. In fact, since the first developments of virtual reality systems, several studies have appeared in scientific literature supporting the possibility of using these virtual scenarios as an option for intervention in subjects with anxiety disorders, in particular specific phobias (Rothbaum & Hodges, 1999; Czerniak et al., 2016; Donker et al., 2018; Rahani, Vard, & Najafi, 2018; Miloff et al., 2019; Elphinston et al., 2022), posttraumatic stress disorder (Rizzo et al., 2014; Deng et al., 2019) and social anxiety disorder (Kahlon, Lindner, Nordgreen, 2019; Emmelkamp, Meyerbröker, & Morina, 2020; Caponnetto et al., 2021) advancing the possibility of realizing typical exposure therapy to the feared phobic stimuli by immersing patients in virtual scenarios that realistically simulate everyday life situations and, simultaneously, using biofeedback techniques in virtual reality (Fernandez et al., 2019).

In the field of subjects with eating disorders (DCA), virtual reality devices and systems have been used both for the evaluation of the symptoms and ideas relating to food and one's own body present in these patients and as an intervention tool to modify the representation of one's body and the eating behaviours of individuals with ED (Riva, 1998a, 1998b, 2011; Ferrer-García & Gutiérrez-Maldonado, 2012; Riva, Dakanalis, 2018; Serino, Polli & Riva, 2019; Monthuy-Blanc et al., 2020; Nameth et al., 2021; Riva, Malighetti, Serino, 2021).
Even in the case of subjects with pathological addictions, with and/or without substances, virtual reality systems have been used, offering them the possibility of evaluating the stimuli that trigger craving behaviour towards the meaning or the addictive behaviour from which to start to achieve progressive, systematic desensitization between the motivations and the conditioned response to decrease until the addictive behaviour ceases (Segawa et al., 2020; Ding et al., 2020; Hernández-Serrano et al., 2020; Mazza et al. al., 2021; Langener et al., 2021; Liu et al., 2022).
In the field of rehabilitation, virtual reality devices have been used in integration with wearable sensors as tools to carry out a more ecological assessment of the difficulties and deficits presented by an individual with an acquired or congenital impairment of their cognitive and/or motor functioning, at the to obtain more information on which to base the rehabilitation treatment (Rizzo et al., 2004). The possibility offered by virtual reality to recreate realistic simulations of situations and events of everyday life, challenging to play in traditional evaluation contexts, guarantees the opportunity to evaluate the specific difficulties encountered by patients during their daily lives to obtain a profile of strengths and weaknesses adequate and individualized on a specific individual (Negut et al., 2016). In this sense, the possibility of carrying out the standard neuropsychological tests in virtual scenarios has been confirmed, such as, for example, the "ObReco-360" (Pieri et al., 2022) for the evaluation of memory capacity or the "Virtual Reality Everyday Assessment Lab" (Kourtesis et al., 2021) which represents a prototype of a neuropsychological battery in virtual reality capable of assessing different areas of cognitive functioning, including memory capacity, attention and executive functions.
Furthermore, virtual reality devices in integration with wearable and tracking sensors also allow the creation of specific individualized and personalized rehabilitation programs for a specific patient, guaranteeing the latter the opportunity to train in the correct management of the activities that he commonly faces in the course of daily life, favouring the development of greater autonomy and the generalization of the results achieved to real life (Riva et al., 2020). Already within the social virtual world of "Second Life", Dr D. Craig Kerley has created the "Center for Positive Mental Health", in which, by embodying itself in its digital representation, he offered the possibility to the users of this multi-user virtual environment to carry out avatar therapy sessions (Lazzeri, 2017). Although this digital world was not yet based on immersive virtual reality devices, this concretely represents an anticipation of what could be achieved in the union between Metaverse and mental health.
In the contemporary context, several companies and start-ups are developing software capable of realizing virtual therapies such as, for example, the US "XRHealth", developed in 2016, which offers the possibility, by wearing a virtual reality viewer, to immerse oneself in a digital clinic where you can carry out various treatments based on your difficulties and needs, comfortably from home, accompanied by a digital therapist, carrying out the intervention through the specific apps implemented in the viewer. Alternatively, in the European context, the English "OxfordVR", founded in 2017 by one of the significant promulgators of the use of virtual reality in the context of mental health, Daniel Freeman, based on the studies he carried out with his research group at the University of Oxford to demonstrate the effectiveness of this technology to intervene on pathological conditions.
In the Italian panorama, one of the most excellent examples is offered by the start-up "Become-Augumented Life", born in 2018, interested in the realization of training interventions for

professionals and researchers in the field of health and in the development of virtual reality applications and augmented to be introduced into professional practice.
The attempt that unites these innovative companies is probably to overcome the limits, particularly the reduced therapist-patient interaction in digital therapies based on desktop screens, widely used during the Covid-19 pandemic (Torous et al ., 2020). In this context, several researchers and studies (Rizzo & Koenig, 2017; Usmani et al., 2022; Wiederhold & Riva, 2022; Yang et al., 2022; Cerasa et al., 2022; Petrigna & Musumeci, 2022) have underlined the advantages of virtual reality and the future Metaverse in the field of health, including the reduction of costs necessary for traditional treatments, the reduction of travel and the possibility of carrying out therapies comfortably from home, continuous monitoring guaranteed by wearable devices, artificial intelligence algorithms for personalizing treatment and diagnosing through automated systems, the opportunity to carry out specific exercises in simulated, safe and realistic contexts of real experiences by incorporating oneself into digital representations of oneself and exploiting the Proteus effect.

Conclusion

In addition to the advantages offered, it is also necessary to consider the limitations present in the research that has tried to investigate virtual systems' effectiveness in mental health and the risks that the future Metaverse could determine.
Recent reviews (Carl et al., 2019; Emmelkamp et al., 2020; Fagernäs et al., 2021; Langener et al., 2021; Bailey et al., 2022; Riva, 2022) interested in observing The effectiveness of virtual reality interventions in various pathological conditions, while demonstrating the validity and ability to determine positive changes in potential patients, have underlined the presence of few studies, small samples, the frequent use of research methods and designs that are not perfectly valid, of the possible development of symptoms of cybersickness, of the absence of evaluations on the long-term risks for the physical and/or psychological health of the users.
Regarding the risks of the future Metaverse on the health of human beings, there may be "derealization" and "depersonalization" disorders (Peckmann et al., 2022), cybersickness found in virtual reality (Ramaseri et al., 2022), the increase in conditions of internet addiction, social media and online gaming (Bojic, 2022), the avoidance of real life with the consequent social withdrawal (Usmani et al., 2022) and digital dysmorphism (Lazzeri, Stingone, 2022).
However, what determines the most significant concerns are the risks to the safety and privacy of users, especially about the possibility of carrying out psychological therapies. Suppose this innovative immersive virtual world wants to create specific spaces and environments where users can access therapies and interventions, incorporating themselves into avatars based on user data obtained through wearable devices and tracking sensors.
In that case, there is a need to maintain maximum confidentiality, preventing this data from being disseminated and/or violated (Cerasa et al., 2022).
To understand the importance of this theme, it is enough to think of what happened to the users of some psychological support applications, such as "Cerebral" and "BetterHelp", by sharing patient data with third parties for marketing activities, have led to the proliferation on the web of strictly personal information, thus threatening their privacy and security (Bernardi, 2023).
Furthermore, there are also the risks associated with potential hacker attacks, as has already happened to the Finnish company "Vastaamo" and its users of online psychological therapy services, who following a cyber-attack on the platform, were blackmailed and saw the publication of their medical

records and personal information on the web (Masucci, 2021).
There are several dangers that a potential user can encounter by immersing himself in this virtual world, including theft of sensitive passwords, external access to his own virtual experience, the possibility of tracing the home or places frequented daily by an individual, stalking or virtual espionage, outright digital abuse and harassment, theft or replication of one's identity in the virtual context, modification of the boundaries of virtual reality headsets with the potential for real physical damage and induction of cybersickness through malware that modify the frame rate.
This highlights the need to protect users' privacy and guarantee their safety, both from a technological and legislative point of view, especially when considering the possibility of psychological treatments in virtual reality and the Metaverse.
Regarding the technical aspects, developers are called upon to find suitable solutions, implementing security and data protection systems to make access inaccessible to potential malicious parties. However, above all, there is a need for national and international institutions to implement restrictive and specific legislation for this innovative digital immersive life in order not to be found unprepared (as happened with the first advent of the Internet and social networks) by acting with a prevention perspective.
Therefore, considering the risks that the possibility of carrying out interventions on mental health in the context of the Metaverse and those related to technological development runs, Bernardelli, Riva and Bettiga (2022) underline the duty of future professionals in the psycho-technological field to:
- actively participate in training programs based on the appropriate use of psycho technologies, thus learning the basic technological skills and the potential risks associated with the use of such tools;
- educate and help potential patients in the appropriate and positive use of digital tools in order to avoid critical and adverse events and experiences for their psycho-physical well-being;
- provide information and suggestions to developers and institutions about risks to users' health, safety and privacy with the common objectives of limiting damage and promoting the correct and beneficial use of technology;
- use only systems, devices and applications whose effectiveness has been scientifically demonstrated without causing damage to the well-being and quality of life of potential users-patients;
- collaborate and work together with professionals belonging to other scientific sectors in order to promote the development of more effective and efficient methodologies and tools.
Ultimately, as Cerasa et al. (2022, p. 5) highlighted, the Metaverse in the context of psychology, neuroscience and mental health can be defined as “Social VR-AI mediated”. The hope is that in the future, psychologists, engineers and computer scientists will be able to work together to build and develop new platforms capable of simulating real-life situations to facilitate the task of psychologists and psychotherapists both in the context of the development of new skills and to improve the mental health of individuals.

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