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REVIEW

Influence of virtual reality and augmented reality on mental health

Influencia de la Realidad virtual y aumentada en la salud mental

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ABSTRACT

Introduction: When the term artificial intelligence comes to mind, most people intuitively relate it to science fiction, especially those who are older and who had access to books, comics and impactful films on these topics, especially the film based on the story by Brian Aldiss and directed by Spielberg.
Method: A review of the literature was carried out in the month of January 2024 through access to the databases Scopus, PubMed, Dialnet, Scielo, and the search engine Google Scholar version 2022, with the strategies: ((health mental) AND (augmented reality)), ((mental health) AND (technological advances)) and ((medicine) AND (mental health) AND (augmented reality) AND (virtual reality) AND (technology)) and their translations into English language, limited the search to the last 5 years.
Results: Virtual reality has its origins in the Second World War, as a precedent for a request from the United States of America to the Massachusetts Institute of Technology, for it to create a flight simulator that would allow ground training for the navy; which gave birth to virtual reality. In 1960, the first multi-sensor simulator created by Morton Heilin was called Sensorama.
Conclusions: Virtual reality has positively influenced the restoration of mental health; Therefore, this development of technology has been a fundamental factor in many moments of scientific and technical development in the health sciences.

Keywords: Artificial Intelligence; Mental Mealth; Augmented Reality; Virtual Reality.

RESUMEN

Introducción: Cuando viene a la mente el término inteligencia artificial, la mayoría de personas lo relacionan intuitivamente con la ciencia ficción, especialmente los de mayor edad y que tuvieron acceso a libros, cómics y películas impactantes de esos temas, especialmente la película basada en el relato de Brian Aldiss y dirigida por Spielberg.
Método: Se realizó una revisión de la bibliografía en el mes de enero de 2024 a través del acceso a las bases de datos Scopus, PubMed, Dialnet, Scielo, y el gestor de búsquedas Google Scholar versión 2022, con las estrategias: ((salud mental) AND (realidad aumentada)), ((salud mental) AND (avances tecnológicos)) y ((medicina) AND (salud mental) AND (realidad aumentada) AND (realidad virtual) AND (tecnología)) y sus traducciones a la lengua inglesa, limitada la búsqueda a los últimos 5 años.
Resultados: La realidad virtual posee como origen a la segunda guerra mundial, como antecedente de una petición de los Estados Unidos de Norteamérica al Instituto de Tecnología de Massachusetts, para que este crease un simulador de vuelos que permitiera el entrenamiento en tierra de la marina; lo que dio nacimiento a la realidad virtual. En el año 1960 se denomina Sensorama al primer simulador de multisensores confeccionado por Morton Heilin.
Conclusiones: La realidad virtual ha influenciado de manera positiva en la restauración de la salud mental; por lo cual, este desarrollo de la tecnología ha sido un factor fundamental en muchos momentos del desarrollo científico técnico en las ciencias de la salud.

Palabras clave: Inteligencia Artificial; Salud Mental; Realidad Aumentada; Realidad Virtual.

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INTRODUCTION

The permanent use of new Information and Communication Technologies (ICT) in educational centres and, in general, in all current human activities has required that knowledge be permanently and uninterruptedly updated, giving rise to learning and relearning at all stages of human life based on the new competencies and technical skills that are acquired. Within the large set of ICTs, emerging or converging technologies have more applications as time passes, incorporated daily in people's daily actions.[1]

Google for Education has identified the emerging technologies incorporated by primary and secondary schools, seeking to create innovative and creative teaching methods to awaken students' interest, highlighting three: artificial intelligence, virtual reality and augmented reality. These are present in everyday life today, and "by 2022 it is estimated that, per month, there could be 2 billion mobile augmented reality users around the world".[1]

When the term artificial intelligence comes to mind, most people intuitively relate it to science fiction, especially those of us who are older and who have had access to books, comics and powerful movies on these subjects, especially the movie based on the story by Brian Aldiss and directed by Spielberg: Artificial Intelligence (AI) from 2001.[2]

According to Lowood, virtual reality is defined in the Encyclopedia Britannica as the use of computer modelling and simulation that allows an individual to interact with an artificial three-dimensional (3-D) visual or another sensory environment, based on the use of devices or hardware such as goggles, gloves and vests, in order to create complete immersion in the virtual environment and thus simulate a desired environment.[3]

Virtual reality has spread to all social and scientific sectors, from which medicine, especially in mental health, has not escaped, so it is necessary to characterize the influence of virtual reality and augmented reality on mental health.

METHOD

A review of the literature was conducted in January 2024 through access to the databases Scopus, PubMed, Dialnet, Scielo, and the search manager Google Scholar version 2022, with the strategies: ((mental health) AND (augmented reality)), ((mental health) AND (technological advances)) and ((medicine) AND (mental health) AND (augmented reality) AND (virtual reality) AND (virtual reality) AND (technology)) and their translations to the English language, limiting the search to the last five years -from 2020 to 2024-, in Spanish, English or Portuguese languages. Theoretical methods were used, such as analysis-synthesis for the introduction and development and deduction-induction for structuring the conclusions. The articles selected were those that allowed open access, had the full length of the manuscript and were relevant to the topic addressed in the authors' opinion, resulting in 21 research studies distributed in original articles, literature reviews and theses.

DEVELOPMENT

History of virtual reality

The origin of virtual reality dates back to the Second World War, as a result of a request from the United States of America to the Massachusetts Institute of Technology to create a flight simulator for ground training of the navy, which gave birth to virtual reality. In 1960, the first multisensor simulator made by Morton Heilin was called Sensorama.[4]

In 1965, Ivan Sutherland proposed creating a system called "The Ultimate Display", which would allow dual stereoscopic television viewing. Despite the non-existence of the possibility of responding to head movements by the terminal to obtain new perspectives, it made the user feel inside the television; later, in 1968, Sutherland, together with Harvard University, created the first viewer that would use visual and augmented reality, called "The Sword of Damocles", a very primitive viewer that consisted of a mechanical arm attached to the ceiling that allowed the visualization of simple floating abstract images received by two cathode ray tubes, which could be exposed from various angles depending on the movement of the individual's head, however, although the movements allowed were very limited, it is one of the great advances for virtual reality.[5]

In 1971, the prototype of a virtual reality feedback system, GROPE II, was presented, showing complex molecules in the third dimension. In 1975, Myron Krueger achieved an artificial reality that he called Videoplace, an operating system where the silhouettes of the participants were captured by a camera, which was used directly on a large screen, allowing them to interact with each other in a 2D space with an immediate flow of movement, which evolved into the Kinect system.[6]

CAVE (Cave et al.), developed in 1992, is a mixed scientific visualization system with virtual reality. Instead of using an HMD, the participant must wear shutter glasses, which conceives stereoscopic pictorial representations of the walls of a room, thus asserting superior quality and resolution of the images, thus cooperating a more extended field of view as a sequel to the improvement of the aforementioned HMD-based systems. Augmented reality came into its own in 1992, working in parallel with VCASS and a transparent HMD that superimposed virtual three-dimensional objects on real objects, enhancing human vision.[6,7]

In the early 90's, estimated as the golden decade for the world of video games, Nintendo launched its Virtual Boy video game console in 1995, allowing several technology companies to grow and reach more ground to show the user an environment closer to virtual reality.[7]

Currently, the most quoted and best-reviewed company in the market is HTC, where its image quality, frame fluidity and graphics resolution make it clear that virtual reality is something more than 360 videos, manifesting more than routines, in which the movement of the head takes over the typical movement of the mouse in video games, something more that we assume than what is commonly experienced in a traditional physical controller, thus presenting the new evolution of virtual reality.[8]

Augmented Reality and Virtual Reality

Digital or disruptive technologies such as augmented or extended Reality, Virtual Reality and extended or mixed Reality have

gained notoriety and penetration in higher education institutions, as evidenced by the annual reports of the Horizon Report, which reached its consolidation last year.[9,10]

Campos Soto et al.[11] states that ICTs have become a key element in the educational process in recent years, emphasizing the renewal of active learning methodologies since they have two peculiarities: omnipresence (they can be used from any place and at any time) and coordination (they adapt to the specifics of the teaching and learning processes), which, added to innovative experiences of augmented or extended Reality and Virtual Reality, deeply enhance the learning process.

Cabero Almenara et al.[9] point out that with extended Reality, people do not detach themselves from physical Reality, externalizing full interaction, while with virtual Reality, they detach themselves completely from physical Reality and interact in an environment built essentially for this purpose; there is a miscellany of both, which is extended or mixed Reality. Thus, it can be seen that in extended Reality, physical and virtual data are combined through images, videos, and animations; on the other hand, virtual Reality works with virtual data that replace physical data, not forgetting that both show three common characteristics: immersion, navigation and interaction.

In a similar sense, Martínez Pérez et al.[12], as well as Montenegro Rueda and Fernández Cerero[13], state that extended Reality, as pointed out by Ronald Azuma at the end of the last century, allows us to reach Reality without replacing it. On the contrary, virtual Reality immerses a person in a non-real context, isolating him/her from the world around him/her. Moreno Martínez and Galván Malagón[14], following other authors such as Di Serio, Ibáñez and Delgado, indicate that extended Reality is characterized by three basic properties: a) Combination of real and virtual objects in a real environment; b) Alignment of real and virtual objects with each other; and c) Interactive execution in real-time.

Augmented Reality in Medicine

Just a few years ago, this concept began to take fields within medicine, gaining strength in different spheres of it:[15,16,17,18]

Medical use in surgical operations

Augmented Reality in medicine facilitates the preparation and performance of surgical operations, although it is true that, in this sense, it is still a technology that needs to be developed. Among other advantages, it helps to choose the most convenient technique for the operation and serves as a guide during the process by providing relevant information.

Visualization and analysis of clinical data

It facilitates the visualization of all types of clinical data. It even allows the projection of real-time images taken from ultrasound or CT scans. All this results in much more agile and accurate analysis and reduces the risk when performing surgical interventions.

Diagnosis of diseases

Visualizing images in augmented Reality makes it possible to detect diseases or conditions that might otherwise be difficult to find—for example, tumours are hidden or in areas that are difficult to access.

Use in rehabilitation therapies

Augmented Reality in medicine can also be applied during rehabilitation processes. It allows safe virtual situations to be designed and visualized, which can be applied in Reality to improve patient recovery.

Training for healthcare professionals

Undoubtedly, one of the main applications of augmented Reality in the health sector is and will be the training of professionals. It allows theoretical knowledge to be practiced in a real virtual setting. This increases the interaction of students, improves their skills and reduces the cost of materials such as mannequins.

Treatment of psychological problems

Another application of augmented Reality in medicine is to serve as a treatment for addictions or phobias. An example is an application designed by Phobos Center to treat spider phobia using virtual projection of these insects.

Virtual reality in mental health

The WHO defines mental health as a state of well-being in which each individual develops his or her potential, can cope with the stresses of life, can work productively and fruitfully, and can contribute something to his or her community.[19]

The great advantage of virtual reality is the use of the sensation of reality, where the mind and body behave and react as if it were a real situation, knowing that it is a non-real computer environment, which allows it to be much easier to face complex situations through virtual reality, compared to those generated in real life, in addition to testing new intervention strategies with controlled environments, allowing the verisimilitude of everyday experiences.[20]

Technological addictions (TA) are a set of disorders that accompany the technological advances that define the digital era. Recent findings show promising therapeutic and psychopharmacological treatments for a wide range of TAs. Stimulants, antidepressants, and cognitive therapies may be effective for virtual gaming disorder. While in other disorders, the impact of virtual reality has served as an adjunct in treatments chosen by therapists today, treatments that are becoming increasingly more profound.[21]

From this first analysis, the need arises to approach human beings from different points of view, especially with the arrival of the COVID-19 pandemic; our subjects were forced to adapt to new ways of overcoming the difficulties of life, one of them mental disorders that gave no respite and that, on the contrary, were triggered by the confinement and lack of interaction.[4]

CONCLUSIONS

Virtual reality has positively influenced mental health restoration; therefore, technology development has been a fundamental factor in many moments of scientific and technical development in the health sciences.

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CONFLICT OF INTEREST

None.

AUTHORSHIP CONTRIBUTION

Conceptualization: Felipe Machuca-Contreras, Carlos Oscar Lepez, Carlos Canova-Barrios.
Formal analysis: Felipe Machuca-Contreras, Carlos Oscar Lepez, Carlos Canova-Barrios.
Research: Felipe Machuca-Contreras, Carlos Oscar Lepez, Carlos Canova-Barrios.
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Drafting - proofreading and editing: Felipe Machuca-Contreras, Carlos Oscar Lepez, Carlos Canova-Barrios.

REFERENCES

1. Villalobos López JA. Marco teórico de realidad aumentada, realidad virtual e inteligencia artificial: Usos en educación y otras actividades. Emerging Trends in Education. 2024; (6)12: 1-17. DOI: https://doi.org/10.19136/etie.a6n12.5695

2. Moré M. 10 tecnologías emergentes que tienes que conocer si eres emprendedor. IEBS. 2022: Disponible en: https://cutt.ly/kwFu0eD

3. Lowood HE. Virtual Reality. Enciclopedia Británica. 2022. Disponible en: https://www.britannica.com/technology/virtual-reality

4. Granda Verdugo SA. Realidad virtual y la salud mental: Revisión Sistemática. [Tesis de grado] Universidad del Azuay, Cuenca, 2023. [acceso 22/01/2024]. Disponible en: https://dspace.uazuay.edu.ec/handle/datos/12663

5. EVE Museos e Innovación. Breve Historia de la realidad Virtual. 2020. Disponible en: https://evemuseografia.com/2018/03/30/breve-historia-de-la-realidad-virtual/

6. Kashif M, Ahmad A, Bandpei MAM, Gilani SA, Hanif A, Iram H. Combined effects of virtual reality techniques and motor imagery on balance, motor function and activities of daily living in patients with Parkinson's disease: a randomized controlled trial. BMC Geriatrics. 2022; 22(1): 381. DOI: https://doi.org/10.1186/s12877-022-03035-1

7. Sousa Ferreira R, Campaneri Xavier R, Rodrigues Ancioto A. La realidad virtual como herramienta para la educación básica y profesional. Revista Científica General José María Córdova. 2021; 19(33): 223-241. DOI: https://doi.org/10.21830/19006586.728

8. Sarasso E, Gardoni A, Tettamanti A, Agosta F, Filippi M, Corbetta D. Virtual reality balance training to improve balance and mobility in Parkinson's disease: a systematic review and meta-analysis. Journal of Neurology. 2022; 269(4): 1873–1888. DOI: https://doi.org/10.1007/s00415-021-10857-3

9. Cabero Almenara J, Valencia Ortiz R, Llorente Cejudo C. Ecosistemas de tecnologías emergentes: realidad aumentada, virtual y mixta. Tecnología, Ciencia y Educación. 2022; 23: 7-22. DOI: https://doi.org/10.51302/tce.2022.1148

10. Instituto Andaluz de Tecnología. Inteligencia artificial: Qué es, tipos, técnicas, ventajas. 2020. Disponible en: https://iat.es/tecnologias/inteligencia-artificial/

11. Campos Soto M, Ramos Navas M, Moreno Guerrero A. Realidad virtual y motivación en el contexto educativo: Estudio bibliométrico de los últimos veinte años de Scopus. Alteridad. 2020; 15 (1): 47-60. DOI: https://doi.org/10.17163/alt.v15n1.2020.04

12. Martínez Pérez S, Fernández Robles B, Barroso Osuna J. La realidad aumentada como recurso para la formación de la educación superior. Campos Virtuales. 2021 [acceso 15/01/2024]; 10(1): 9-19. Disponible en: http://www.uajournals.com/ojs/index.php/campusvirtuales/article/view/644/426

13. Montenegro Rueda M, Fernández Cerero J. Realidad aumentada en la educación superior: posibilidades y desafíos. Tecnología, Ciencia y Educación. 2022; 23: 95-114. DOI: https://doi.org/10.51302/tce.2022.858

14. Moreno Martínez N, Galván Malagón M. Realidad aumentada y realidad virtual para la creación de escenarios de aprendizaje de la lengua inglesa desde un enfoque comunicativo. Didáctica, Innovación y Multimedia. 2020 [acceso 17/01/2024], 38: 1-16. Disponible en: https://dimglobal.net/revistaDIM38/DIMAR38ra.htm

15. Solarte Correa PL, Sabater-Navarro JM, Aguilar Larrate EM, Vivas Al-bán ÓA, Vicente-Samper JM. Uso de la realidad aumentada como apoyo a un sistema de navegación en neurocirugía. 2020; :51-56. DOI: https://doi.org/10.17979/spudc.9788497497565.0051

16. Bravo Pino ÁM, Villamar Coloma MA, Arias Camacho ÁG, Jurado Fernández CA. (2022). Software educativo y el aprendizaje de lengua y literatura en 15 estudiantes con discapacidad intelectual. Revista Venezolana de Gerencia. 2022; 27(97): 29-43. DOI: https://doi.org/10.52080/rvgluz.27.97.3

17. Rodrigo-Yanguas M, Martin-Moratinos M, Menendez-Garcia A, Gonzalez-Tardon C, Royuela A, Blasco-Fontecilla H. A virtual reality game (the Secret Trail 14 of Moon) for treating attention-deficit/hyperactivity disorder: Development and usability study. JMIR Serious Games. 2021; 9(3): e26824. DOI: https://doi.org/10.2196/26824

18. Núñez Acurio EE. Desafíos y oportunidades del empleo de la realidad aumentada en la salud, revisión sistemática. [Tesis de Grado] Universidad de Guayaquil, Guayaquil, 2021 [acceso 20/01/2024]. Disponible en: https://dspae.ups.edu.ec/handle/123456789/20930

19. Delgado Catalán S, Arias Astray A, Sotomayor Morales E. Jóvenes con discapacidad intelectual en la universidad: entre la sobreprotección y la autodeterminación. Siglo cero. 2022; 53(2): 145–165. DOI: https://doi.org/10.14201/scero2022532145165

20. Baghaei N, Chitale V, Hlasnik A, Stemmet L, Liang HN, Porter R. Virtual reality for supporting the treatment of depression and anxiety: Scoping review. JMIR Mental Health. 2021; 8(9): e29681. DOI: https://doi.org/10.2196/29681

21. Hildebrand AS, Roesmann K, Planert J, Machulska A, Otto E, Klucken T. Self-guided virtual reality therapy for social anxiety disorder: a study protocol for a randomized controlled trial. Trials. 2022; 23(1): 395. DOI: https://doi.org/10.1186/s13063-022-06320-x