

<https://doi.org/10.23913/ride.v12i24.1190>

Artículos científicos

Percepción de la esquizofrenia y el efecto de la psicoeducación con realidad virtual

Perception of Schizophrenia and the Effect of Psychoeducation with Virtual Reality

Percepção da esquizofrenia e o efeito da psicoeducação em realidade virtual

Jesús Antonio Álvarez Cedillo

Instituto Politécnico Nacional, México

jaalvarez@ipn.mx

<https://orcid.org/0000-0003-0823-4621>

Teodoro Álvarez Sánchez

Instituto Politécnico Nacional, México

talvarez@citedi.mx

<http://orcid.org/0000-0002-2975-7125>

Alexis González Vásquez

Instituto Politécnico Nacional, México

agonzalezv2100@alumno.ipn.mx

<https://orcid.org/0000-0002-7975-4993>

Resumen

En este artículo se realizó una investigación cualitativa basada en la teoría fundamentada y se aplicó la codificación mediante el *software* libre Tagette. Se parte del hecho de que el uso de herramientas de realidad virtual permite fortalecer los procesos de tratamiento y análisis a través de la psicoeducación. Se busca reducir el tiempo de terapia y enseñanza en los familiares y conocidos de los pacientes con trastorno de esquizofrenia. Se realizaron varias propuestas de entornos 3D, audios e imágenes en el escenario para buscar los estímulos



deseados en el usuario. Para esto se realizaron pruebas alfa y beta con la metodología de caja blanca y gris. Como resultados, surge un desarrollo tecnológico como una herramienta de apoyo a familiares directos del paciente, el cual muestra al usuario los padecimientos que puede llegar a tener en su vida cotidiana una persona con esquizofrenia. Se realizaron entrevistas en profundidad a 40 estudiantes, la mitad de ellos sin antecedentes de la enfermedad.

Palabras clave: educación, esquizofrenia, psicoterapia, realidad virtual.

Abstract

In this article, a qualitative research based on grounded theory was carried out and coding was applied using the free software Tagette. It is based on the fact that the use of virtual reality tools allows strengthening the treatment and analysis processes through psychoeducation. It seeks to reduce the time of therapy and teaching in relatives and acquaintances of patients with schizophrenia disorder. Several proposals for 3D environments, audios and images were made on stage to find the desired stimuli in the user. For this, alpha and beta tests were carried out with the white and gray box methodology. As a result, a technological development arises as a support tool for direct relatives of the patient, which shows the user the ailments that a person with schizophrenia can have in their daily life. In-depth interviews were conducted on 40 students, half of them without a history of the disease.

Keywords: education, schizophrenia, psychotherapy, virtual reality.

Resumo

Neste artigo, foi realizada uma pesquisa qualitativa baseada na teoria fundamentada e a codificação foi aplicada utilizando o software livre Tagette. Baseia-se no fato de que o uso de ferramentas de realidade virtual permite fortalecer os processos de tratamento e análise por meio da psicoeducação. Busca reduzir o tempo de terapia e ensino em familiares e conhecidos de pacientes com transtorno de esquizofrenia. Diversas propostas de ambientes 3D, áudios e imagens foram feitas no palco para encontrar os estímulos desejados no usuário. Para isso, foram realizados testes alfa e beta com a metodologia de caixa branca e cinza. Como resultado, surge um desenvolvimento tecnológico como ferramenta de apoio aos



familiares directos do paciente, que mostra ao usuário os males que uma pessoa com esquizofrenia pode ter em seu cotidiano. Foram realizadas entrevistas em profundidade com 40 alunos, metade deles sem histórico da doença.

Palabras-chave: educação, esquizofrenia, psicoterapia, realidade virtual.

Fecha Recepción: Agosto 2021

Fecha Aceptación: Febrero 2022

Introduction

In 2020, the estimated population of Mexico was just over 126 million inhabitants. In that same year, it was calculated that, of this figure, 5.7% had a disability or some mental problem or condition, that is, 7,168,178 Mexicans (National Institute of Statistics and Geography [Inegi], December 3, 2021). While the Senate of the Republic (December 7, 2017) estimated a few years ago that at least 14.3% of citizens suffered from generalized anxiety disorders, the most common mental health illness in the country, after depression and addictions, both with 9%. And as for schizophrenia, a World Health Organization (WHO) census conducted in Mexico estimated that 0.7% (nearly one million people) of the population had this disease (National Autonomous University of Mexico [UNAM], May 29, 2011).

Díaz (2013) mentions that the word stigma was used in ancient Greece (stigma, στίγμα) to refer to the tattoo that was marked with hot iron on the body of the guilty or sick. This warned society that the wearer was dangerous/corrupt/contagious, in order for them to be observed and avoided, especially in public places. This term is still used today because, for various reasons, stigmatization is still practiced socially.

In the past, the treatment of schizophrenia took place mostly in closed institutions (American Psychiatric Association [APA], 2020). However, Lopez et al. (2008) mention that, thanks to the efforts of the scientific community, psychiatry has achieved psychosocial rehabilitation. This implied that families and society assumed a more important role in the rehabilitation of a patient with schizophrenia, which included, of course, care and coexistence with the patient. Currently, it is essential for the treatment of schizophrenia to include family psychoeducation (Cuevas and Moreno, 2017), in order to know the most effective ways of reacting to the different behaviors that the patient may manifest (Kaplan and Sadock, 1996). On the other hand, Morrison (2001) talks about how in the family group there is a varied load of feelings in different phases: fear, sadness, shame, guilt, insecurity, bewilderment and even hostility towards the sick person.

For as long as mental illness has existed, whether it is physical trauma or problems from birth, patients have lived with disturbances in their psyche, which has forced the majority to live as refugees, exiles or humiliated. Flores, Chávez and Rodríguez (2018) explain that, by not acting according to the rule and adjusting naturally (what they describe as "normal" behavior), society classifies them as strangers and they are labeled as dangerous.

According to Barrera and Baeza (2010), society establishes which of these people should be marked and which one should remain unmarked. These judgments (which are created at first sight) generate the virtual social identity. A generated image of the simulated individual, which labels the individual, either for better or worse.

The stereotype of the mentally ill generates a perception of dangerousness and fear, which brings difficulty and, sometimes, most of the time, prevents a person with these disorders from reaching the status of a full-fledged citizen (Novella and Huertas, 2010). As Chan (2011) shows, these problems exist from the family nucleus, where, due to the constant mark of society, shame and secrecy arise from family members, which leads to isolation and deterioration. The studies by Loubat, Lobos, and Carrasco (2017) and Macedo, Marques, and Queirós (2015) mention that suffering from a mental disorder has a negative influence on all areas of daily life: greater difficulty finding a job, a house, and maintaining social relationships (friends or partner), among others. This prevents a real insertion in society and limits psychosocial rehabilitation.

The problem not only explores the limitation of rehabilitation. There are other psychological risks that could result from social exclusion. Muñoz, Pérez, Crespo and Guillén (2004) list some of these cases, such as cognitive problems or self-punitive behaviors. This suggests that a person with a mental disorder has more aggressive conditions in more aggressive and unpleasant environments. If society infers about this type of person, they would have a better and faster reintegration into society. Munoz et al. (2004) also catalog the behavior of society in three main factors that cause stigmatization: the ignorant individual, negative prejudice and exclusion (discrimination). And they explain that ignorance generates prejudice and prejudice leads to discrimination. In the face of ignorance fear, fear and mistrust appear. However, Fresán et al. (2001) reveal that having limited knowledge about disorders is just as detrimental as having no knowledge about the disorder. The experiments of Fresán et al. (2001) carried out on psychology students revealed that they express greater rejection and consider more radical treatments for people who, although they did suffer from a mental disorder, lived in society without problems. This may be the result of teaching only



symptoms and conditions of a person with mental disorders without considering the individual himself. These experiments suggest promoting regular contact with patients and not limiting it to psychiatric settings. However, this is not done due to extra costs, transportation logistics, stay or even how it will influence the visit of students to people in treatment. From this deficiency, the proposal of the use of virtual reality technologies is born.

There are multiple approaches in simulations for virtual reality (Pérez, 2011). Pardo (2012) explains how these simulators have evolved over time: their perspective from mere entertainment has expanded to generate advances in areas such as education, medicine, architecture, sports, engineering and clinical psychology. For example, the work of Rosenberg, Baughman and Bailenson (2013) managed to show an increase in the altruistic activities of users who participated in a superhero simulation. Virtual reality even offered the ability to fly, skills worthy of a superman. Thus, when leaving the simulation, they noticed that the user was still willing to help the people around him.

In an experiment carried out with people suffering from eating disorders, whose focus was the treatment of body image, a virtual mirror was projected where it appeared to generate a virtual incarnation as similar as possible to the user's real body, and with a series of exercises the user got used to the body he saw in the mirror. This treatment began by increasing or reducing sizes: it offered the user the opportunity to choose her size and obtain responses similar to those experienced in the real world. (Vilalta, Pla, Ferrer y Gutiérrez 2015).

There is another approach created in the area of clinical psychology and virtual reality called virtual embodiment. Macedo et al. (2015) adopted this approach and created a virtual model that replaces the user's body and allows, colloquially, "putting yourself in someone else's shoes", which successfully generates the feeling of ownership in this body illusion. .

Such a situation, a controlled study, allows for therapy or user experimentation. As Valmaggia, Day and Rus-Calafell (2016) mention, there are multiple virtual reality systems: from showing an image with a monitor or projector (desktop systems) that generate a small degree of presence (explained later), whose purposes are generally educational, to systems with a high degree of immersion, which use position and movement sensors, 8D audio and situations according to the context that the user could experience in real life.

Veling, Pot-Kolder, Counotte, van Os and van der Gaag (2016) consider presence to be the sensation of being in a place. The cinema or the theater, although they generate a high level of immersion, fail to generate the "sensation of presence" because the user sees himself

as an external element of the events that occur in front of him. Virtual reality changes that factor, since it gives the user the opportunity to participate in an entire reliable, realistic scenario, where he can make (controlled) decisions.

In this regard, Maples, Bunnell, Kim and Rothbaum (2017) describe the sensation of presence based on two principles:

- 1) Immersion: it is the depth with which a person can enter a virtual environment; there are multiple factors that come to be used and coordinated to generate a high degree of immersion, sounds projected in 8D, 3D images, whose depth is generated with the use of both eyes, controlled climates depending on the situation, control of the virtual scenario depending on the user's movement, etc.
- 2) Interaction: a controlled environment whose control remains with the developer but which apparently offers free will to the user so that he can make decisions and even take responsibility for his actions.

Both factors are of vital importance in virtual reality. The greater the immersion and interaction, the greater the sense of presence in the environment.

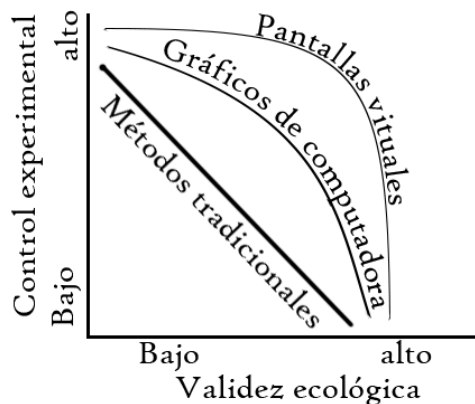
Everything in these environments is created and controlled at the discretion of the specialists, and it has been discovered that any factor added or eliminated in the environments can generate a different behavior in the users (Veling et al., 2016). For example, a study reveals how simply changing the sex of the avatar used by the user can generate different behavior in situations where the user needs to ask for help. If the avatar was female, they resorted more to requests for help, which was reduced in the case of being a man, regardless of the actual gender of the user. Valmaggia et al., (2016) take as a basis the psychological idea that men must show themselves strong before society, so he cannot afford to ask for help, while women can afford that vulnerability.

Currently, complex systems, mechanisms and models have been created that allow these "illusions" to help the individual in any of their clinical or mental illnesses (Ferrer et al., 2017). These studies bring with them improvements that are not observed in traditional treatment methods. Look at figure 2.

This is generated due to the experimental control that a specialist can generate in the patient, avoiding any complication and focusing on the desired stimuli, combining internal validity (excluding alterations that may occur in the results due to factors unrelated to the experiment) and external validation (extension of variables, but population reduction to try

to maintain control of results). The balance of both validations is known as ecological validity.

Figura 1. Balance entre validez interna y externa



Fuente: Loomis, J. M., Lippa, Y., Klatzky, R. L., & Golledge, R. G. (2002)

Problem Statement

Strengthen the processes of treatment of schizophrenia and analysis through psychoeducation to reduce the time of therapy and teaching in relatives and acquaintances of patients after being treated using virtual reality tools.

General purpose

Develop a technological proposal that describes and explains the experience of treating schizophrenia before, during and after the patient's close environment has been trained.

Sample and selection criteria

The study sample consisted of the data obtained from 40 informants, 20 with a family history related to the disease and 20 without any history, who agreed to participate in this study using our technological tool in Mexico City.

In qualitative research, the number of subjects per quantity loses meaning; the richness and variety of the data obtained is what determines the theoretical saturation of the sample.

Methodology

Qualitative research is defined as any type of research that produces results and discoveries in which statistical procedures or other means of quantification are not used (Foucault, 1999).

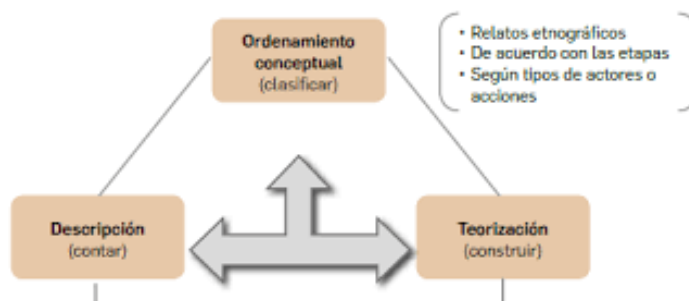
Qualitative analysis refers to rational and non-mathematical reinterpretation to discover keywords or concepts and relationships in raw data and then organize them into a theoretical scheme (Alveiro, 2013). These qualitative methods are used in particular substantive areas about which little or much is known, but new knowledge is sought (Shen et al., 2020).

There are three main components to qualitative research:

- 1) The data, which can come from different sources, such as interviews, observations, documents, records and films.
- 2) The procedures used to interpret and organize the data, such as:
 - a) conceptualize,
 - b) reduce the data,
 - c) elaborate categories, in terms of their properties and dimensions and
 - d) relate the data through a series of propositional sentences. The previous four points are known as encoding.
- 3) Written and verbal reports, they can be presented as articles in scientific journals, in talks (for example, in congresses) or as books.

According to the purpose of this study, the methodology used for data analysis is the grounded theory proposed by Glaser and Strauss (1967) and described by Campo and Labarca (2009), as shown in Figure 2.

Figura 2. Teoría fundamentada propuesta por Glaser y Strauss (1967)



Fuente: Glaser y Strauss (1967)

For Glaser and Strauss (1967), grounded theory is a research method in which theory emerges from systematically collected data. It does not start with a preconceived theory, but from the data the theory will emerge with the purpose of resembling reality. Since the purpose of the aforementioned authors was to create new ways of understanding reality and expressing them theoretically, then, the methods would help to build theories. Given the above, grounded theory is the appropriate method for this study.

For this investigation, the in-depth interview was applied to 40 informants. For data analysis and coding, the free software for qualitative analysis Taguette (Roy, Cordy and Koschke, 2009) was used. After performing the data analysis, results were obtained and compared with the most relevant studies on the subject under investigation in order to detect trends.

To elaborate the data analysis, Taguette stores the information in nodes, which are structured in hierarchies or trees creating topologies. According to the methodology used, we seek to find the elements that form the keywords or properties and with these create the categories.

Likewise, Taguette uses the constant comparison technique, that is, as the encoding is generated, the information found in a text is continuously compared against other encoded texts. The categories and properties that emerge from the analysis are combined with the key concepts that are being searched for. From the main keywords, it is possible to search for more data to strengthen the initial theory.

Taguette also shows when the theoretical saturation has been reached, that is, the super saturation of the elements and categories that are being analyzed. This allows you to focus the search on saturated elements and search the documents for those nodes that have not yet reached that level. The word frequency shown in Figure 3 arose from the data entered for this study.

- 4) Sound.
- 5) Creation of the application in virtual reality.
- 6) Generate virtual scenarios.
- 7) Simulate what a patient experiences.
- 8) User tests.
- 9) Determination of the parameters and collection of data from users using a questionnaire.
- 10) User reaction to the experiments.

Developing

Based on the video game development of Maples et al. (2017), the creation of a scenario was sought that triggered in users the sensation of hearing voices from different places. The voices would argue with each other or prompt the user to perform a series of tasks. Visually, it was considered to place the user in small rooms that would cause discomfort for a period of two minutes. It is worth mentioning that it was planned that the indications given by the voices would not change the outcome of the scenario in any way, as they were simply invalid voices. Given this approach, several scenario proposals were developed and the situation was evaluated with greater effect.

3D or binaural sound was considered (Veling et al., 2016), projection of sounds with the ability to generate the sensation of movement in a real environment, with the intention of simulating in the user listening to multiple voices moving around them. Tests of two recorded audios with written scripts were used, both with multiple voices arguing. The indicators obtained are shown in table 1 and 2.

These audios were compared through surveys applied to 30 computer science students to determine if the audios were able to bother, confuse or scare listeners.

Tabla 1. Se muestran los indicadores de voces discutiendo prueba 1

	Sonido de voces (dando instrucciones al usuario), lo que genera en la gente...				
	Nulo	Poco	Medio	Algo	Mucho
Incomodidad	12	3	7	5	3
Confusión	3	13	7	3	4
Miedo	5	8	5	11	1

Fuente: Elaboración propia

Tabla 2. Se muestran los indicadores de voces discutiendo prueba 2

	Sonido de voces (discutiendo entre ellos), lo que genera en la gente...				
	Nulo	Poco	Medio	Algo	Mucho
Incomodidad	2	3	2	18	5
Confusión	2	7	9	7	5
Miedo	5	3	5	9	8

Fuente: Elaboración propia

The polls show greater discomfort and confusion when hearing various voices fighting. Some users even mentioned feeling a little scared when the voice spoke directly to them. Although this could be favorable to show what certain patients experience, it could be more detrimental to the perception that is wanted to be generated (Fresán et al. 2001).

Two 3D scenarios were developed for the VR environment, one calm and pleasant and the other more aggressive and depressing for users. As with the recordings made, the aim is to generate discomfort and confusion in the user without reaching the point of causing fear.

A positive result was obtained with both scenarios, so the aggressive and depressive scenario was chosen, since it generated support with the environment of the audios. Both scenarios are shown in figures 5 and 6, respectively.

Figura 5. Escenario agresivo



Fuente: Elaboración propia

Figura 6. Escenario tranquilo



Fuente: Elaboración propia

The equipment chosen for the experiment was the Oculus Rift glasses. These glasses must use a computer (Table 3) to display the virtual environment and perform the tests smoothly.

Tabla 3. Características de visor de RV al año 2018

	Oculus Rift	
	Recomendado	Mínimo
Tarjeta gráfica	NVIDIA GTX 1060 o superior	NVIDIA GTX 1050 Ti o superior
CPU	Intel i5-4590 o superior	Intel i3-6100
Memoria RAM	8 GB o más	8 GB o más
Puertos USB	1 puerto USB 3.0	1 puerto USB 3.0
Sistema operativo	Windows 10	Windows 10

Fuente: <https://www.oculus.com/rift>

Result analysis

A questionnaire was carried out (before and after the simulation) to compare their results. Questions were made with a rating ranging from one to five, where one corresponded to totally disagree and five to totally agree. Look at table 4 and 5.

The volunteers for the experiment were 40 high school students, with an average age of 18 years, in a range of 17 to 20, 12 women and 18 men, with no relatives with a history of any mental disorder evaluated, both were part of our study.

Tabla 4. Cuestionario antes de la simulación

	1	2	3	4	5
Las personas con trastornos mentales deberían ser aisladas.	35 %	40 %	10 %	5 %	10 %
Conviviría con una persona con esquizofrenia por mucho tiempo.	45 %	30 %	15 %	5 %	5 %
Experimenta vergüenza contando que un familiar tiene esquizofrenia.	60 %	25 %	15 %	0 %	0 %
Las personas con trastornos mentales deberían poder trabajar con otras personas.	25 %	15 %	45 %	10 %	5 %
Es razonable que un empleador despida a personas con trastornos mentales.	5 %	25 %	40 %	25 %	5 %
Las personas con esquizofrenia deben recibir el mismo trato que los demás.	0 %	15 %	30 %	5 %	50 %

Fuente: Elaboración propia

Tabla 5. Cuestionario después de la simulación

	1	2	3	4	5
Las personas con trastornos mentales deberían ser aisladas.	65 %	20 %	5 %	0 %	5 %
Conviviría con una persona con esquizofrenia por mucho tiempo.	20 %	25 %	15 %	30 %	10 %
Experimenta vergüenza contando que un familiar tiene esquizofrenia.	70 %	30 %	0 %	0 %	0 %
Las personas con trastornos mentales deberían poder trabajar con otras personas.	10 %	10 %	40 %	25 %	15 %
Es razonable que un empleador despida a personas con trastornos mentales.	40 %	25 %	10 %	25 %	0 %
Las personas con esquizofrenia deben recibir el mismo trato que los demás.	0 %	20 %	15 %	5 %	65 %

Fuente: Elaboración propia

Shame, fear and coexistence are the points that were considered from the investigation. As in the work of Fresán et al. (2001), it was obtained that the lack of knowledge generates rejection towards those people who are considered dangerous due to the fact that they do not have knowledge of what a patient suffers. The initial survey shows that a considerable group would reject people with schizophrenia, but they do not have the knowledge to give a reason for this position. After experimenting in the virtual reality environment and a debriefing that reaffirmed what was learned, there was an improvement in these students' acceptance of people with disorders. But they remain reluctant to the idea of living together continuously.

Discussion

Among the results obtained, it stands out that 65% of the sample indicates that people with mental disorders should be isolated, while only 30% consider that they would live with a person with schizophrenia for a long time. Undoubtedly, society labels people with this disease and gives them a mark that is difficult to get rid of.

Despite the scarcity of studies on the use of virtual reality in schizophrenia, our results are similar to those obtained in the literature (Fresán et al., 2001). However, in these studies no statistically significant differences were found in the attention and memory domains.

In recent years, specific programs have been developed in computer systems that are effective in improving cognition related to schizophrenia and capable of influencing the type of treatment and motivation, fundamental aspects in the choice of targeted interventions.

Our study has some limitations: the results should be interpreted as the result of the interaction of the drugs and the virtual reality treatment, this is because all the patients have a psychopharmacological treatment, with very long evolution times, so it would be convenient include patients with shorter evolution times.

Conclusions

Environments can be developed in a simple way that trigger different stimuli in the user and alter the perception of multiple elements. It also allows users to be informed and educated to eliminate stigmas generated towards other individuals.

Despite having favorable results in virtual reality environments, it was necessary to use a session to reinforce knowledge or correct ideas that could arise in the user. This is limited to independent use by family members or acquaintances of a patient, but reduces training time that would normally be handled with psychoeducation. It also opens the door as future work to eliminate assistance and provide complete psychoeducation in virtual sessions.

Future work

The benefits of virtual reality allow to relieve symptoms or improve treatment; In itself, increasing the subjective benefits implies an increase in the interest of the patients. Immersive technologies such as augmented reality will make it possible to face situations where shock therapy is carried out.

The incursion of new technologies in such a short time and in constant evolution raises concerns in researchers related to therapy, due to the uncertainty of where the data will reside. Some of them need reassurance, training, and in-depth knowledge about technology, but in general, bringing technology into therapy sessions is something they don't mind.

As for virtual reality, this technology can be scalable for efficient treatment. Currently, many configurations require a lot of technical support and very specialized people. The cost of technology is an additional challenge. The cost comes from the design of the setting and the treatment that works.

Acknowledgment

We appreciate the facilities granted to carry out this work to the National Council of Science and Technology (Conacyt), the National Polytechnic Institute (IPN) and the Secretariat for Research and Postgraduate Studies (SIP), with the project SIP 20210388. To the Interdisciplinary Unit of Engineering and Social and Administrative Sciences and the Center for Research and Development of Digital Technology. Likewise, to the Researcher Performance Stimulus Program (EDI) and to the Commission for the Operation and Promotion of Academic Activities of the National Polytechnic Institute (Cofaa).



References

- Alveiro, D. (2013). La teoría fundamentada como metodología para la integración del análisis procesual y estructural en la investigación de las representaciones sociales. *CES Psicología*, 6(1), 122-133. Recuperado de <https://www.redalyc.org/articulo.oa?id=423539419008>.
- American Psychiatric Association [APA]. (2020). *The American Psychiatric Association Practice Guidelines for the Treatment of Patients with Schizophrenia* (3rd ed.). Washington, United States: American Psychiatric Association Publishing.
- Barrera, S. and Baeza, U. (2010). La realidad virtual aplicada a la explotación sostenible del patrimonio arqueológico. Un caso de éxito: la cueva de Santimamiñe. *Virtual Archaeology Review*, 1(1), 69-72.
- Campo, M. y Labarca, C. (2009). La teoría fundamentada en el estudio empírico de las representaciones sociales: un caso sobre el rol orientador del docente. *Opción*, 25(60), 41-54.
- Chan, S. W. (2011). Global Perspective of burden of family caregivers for persons with schizophrenia. *Archives of Psychiatric Nursing*, 25(5), 339-349.
- Roy, C. K., Cordy, J. R. and Koschke, R. (2009). Comparison and evaluation of code clone detection techniques and tools: A qualitative approach. *Science of Computer Programming*, 74(7), 470-495.
- Cuevas, J. J. y Moreno, N. E. (2017). Psicoeducación: intervención de enfermería para el cuidado de la familia en su rol de cuidadora. *Enfermería Universitaria*, 14(3), 207-218.
- Díaz, M. (2013). *Afrontando la esquizofrenia. Guía para pacientes y familiares*. Madrid, España: Enfoque Editorial.
- Ferrer, M., Gutiérrez, J., Pla, J., Vilalta, F., Riva, G., Clerici, M., Ribas, J., Andreu, A., Fernandez, F., Forcano, L., Riesco, N., Sánchez, I., Escandón, N., Gomez, O., Tena, V., Dakanalis, A. (2017). A Randomised Controlled Comparison of Second-Level Treatment Approaches for Treatment-Resistant Adults with Bulimia Nervosa and Binge Eating Disorder: Assessing the Benefits of Virtual Reality Cue Exposure Therapy. *European Eating Disorders Review*, 25, 479-90. Retrieved from <http://doi.wiley.com/10.1002/erv.2538>.

- Flores, A. A., Chávez, G. y Rodríguez, J. M. (2018). Educación 4.0: Transformación del aula tradicional en las escuelas de educación básica en México. En Redine (ed.), *Conference Proceedings Edunovatic 2018* (pp. 144-148). Eindhoven, The Netherlands: Adaya Press.
- Foucault, M. (1999). *Obras esenciales*. Barcelona, España: Paidós.
- Fresán, A., Apiquian, R., Ulloa, R. E., Loyzaga, C., García, M. y Gutiérrez, D. (2001). Ambiente familiar y psicoeducación en el primer episodio de esquizofrenia: resultados preliminares. *Salud Mental*, 24(4).
- Glaser, B. G. and Strauss, A. L. (1967). *The Discovery of Grounded Theory: Strategies for Qualitative Research*. Hawthorne, United States: Aldine de Gruyter.
- Instituto Nacional de Geografía y Estadística [Inegi]. (2020). Encuesta Nacional de Ocupación y Empleo (ENOE), población de 15 años y más de edad. México: Instituto Nacional de Geografía y Estadística. Recuperado de <https://www.inegi.org.mx/programas/enoe/15ymas/>.
- Instituto Nacional de Geografía y Estadística [Inegi]. (3 de diciembre de 2021). Estadísticas a propósito del Día Internacional de las Personas con Discapacidad (datos nacionales). Comunicado de prensa. Recuperado de https://www.inegi.org.mx/contenidos/saladeprensa/aproposito/2021/EAP_PersDisca p21.pdf.
- Loomis, J. M., Lippa, Y., Klatzky, R. L., & Golledge, R. G. (2002). Spatial updating of locations specified by 3-D sound and spatial language. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 28(2), 335–345. <https://doi.org/10.1037/0278-7393.28.2.335>.
- López, M., Laviana, M., Fernández, L., López, A., Rodríguez, A. M. y Aparicio, A. (2008). La lucha contra el estigma y la discriminación en salud mental. Una estrategia compleja basada en la información disponible. *Revista de la Asociación Española de Neuropsiquiatría*, 28(101), 43-83.
- Loubat, M., Lobos, R. y Carrasco, N. (2017). Estigmatización de la persona con esquizofrenia y consecuencias para el proceso de rehabilitación: un estudio en profesionales de la salud mental. *Límite*, 12(39), 15-25.
- Macedo, M., Marques, A. and Queirós, C. (2015). Virtual reality in assessment and treatment of schizophrenia: A systematic review. *Jornal Brasileiro de Psiquiatria*, 64(1), 70-81.

- Maples, J. L., Bunnell, B. E., Kim, S-J., Rothbaum, B. O. (2017). The use of virtual reality technology in the treatment of anxiety and other psychiatric disorders. *Harvard Review of Psychiatry*, 25(3), 103-113.
- Novella, E. J. y Huertas, R. (2010). El síndrome de Kraepelin-Bleuler-Schneider y la conciencia moderna: una aproximación a la historia de la esquizofrenia. *Clínica y Salud*, 21(3).
- Sadock, B. J. and Sadock, V. A. (1996). *Kaplan & Sadock. Sinopsis de psiquiatría. Ciencias de la conducta/Psiquiatría clínica*. Buenos Aires: Edición Panamericana.
- Shen, M-H., Yang, C-T., Wu, C-C., Huang, H-L., Lin, Y-E., Shyu, Y-I. and Chung, S-C. (2020). Resuming Normal Life as a Family Caregiver During Drip-Like Recovery of Older Persons with Cognitive Impairment Recovering from Hip Surgery: A Grounded Theory. *Journal of Nursing Scholarship*, 52(3), 250-260.
- Morrison, J (2001). *DSM-IV Made Easy*. New York, United States: The Guilford Press.
- Muñoz, M., Pérez, E., Crespo, M. y Guillén, A. I. (2004). *Estigma y salud mental. Análisis del rechazo social que sufren las personas con enfermedad mental*. Madrid, España: Editorial Complutense.
- Pardo, M. (2012). The importance of the avatar gender in training simulators based on virtual reality. Paper presented at the 18th ACM conference on Innovation and Technology in Computer Science Education. Canterbury, July 1-3, 2013.
- Pérez, F. (2011). Presente y futuro de la tecnología de la realidad virtual. *Creatividad y Sociedad: Revista de la Asociación para la Creatividad*, (16).
- Rosenberg, R. S., Baughman, S. L. and Bailenson, J. N. (2013). Virtual Superheroes: Using Superpowers in Virtual Reality to Encourage Prosocial Behavior. *PLoS ONE*, 8(1).
- Senado de la República. (7 diciembre de 2017). 14.3% de la población mexicana padece trastornos de ansiedad. Comunicado de prensa. Recuperado de <http://comunicacion.senado.gob.mx/index.php/informacion/boletines/39699-14-3-de-la-poblacion-mexicana-padece-trastornos-de-ansiedad.html>.
- Universidad Nacional Autónoma de México [UNAM]. (29 de mayo de 2011). Adultos jóvenes, los más afectados por la esquizofrenia. Boletín UNAM-DGCS-319. Recuperado de https://www.dgcs.unam.mx/boletin/bdboletin/2011_319.html.
- Valmaggia, L. R., Day, F. and Rus-Calafell, M. (2016). Using virtual reality to investigate psychological processes and mechanisms associated with the onset and maintenance



of psychosis: a systematic review. *Social Psychiatry and Psychiatric Epidemiology*, 51(7), 921-936

Veling, W., Pot-Kolder, R., Counotte, J., van Os, J. and van der Gaag, M (2016). Environmental Social Stress, Paranoia and Psychosis Liability: A Virtual Reality Study. *Schizophrenia Bulletin*, 42(6), 1363-1371.

Vilalta, F., Pla, J., Ferrer, M., and Gutiérrez, J. (2015). Terapia de exposición mediante realidad virtual en los trastornos alimentarios: presente y futuro. *Tesis Psicológica: Revista de la Facultad de Psicología*, 10(2), 12-37.

Rol de Contribución	Autor (es)
Conceptualización	Jesús Antonio Álvarez Cedillo.
Metodología	Alexis González Vásquez
Software	Teodoro Álvarez-Sánchez.



Validación	Alexis González Vásquez.
Análisis Formal	Jesús Antonio Álvarez Cedillo ,Teodoro Álvarez Sánchez (IGUAL).
Investigación	Jesús Antonio Álvarez Cedillo ,Teodoro Álvarez Sánchez (IGUAL).
Recursos	Alexis González Vásquez
Curación de datos	Teodoro Álvarez-Sánchez.
Escritura - Preparación del borrador original	Jesús Antonio Álvarez Cedillo.
Escritura - Revisión y edición	Alexis González Vásquez
Visualización	Teodoro Álvarez-Sánchez.
Supervisión	Jesús Antonio Álvarez Cedillo.
Administración de Proyectos	Jesús Antonio Álvarez Cedillo.