Serious Games for Improving Mental Health: Status and Prospects

Ying Huang[1,a,*]

[1]*Fuzhou University, Fuzhou, 350000, China*
a. YING.HUANG.2023@mumail.ie
*corresponding author

Abstract: With the rapid development of time and technology, the significance of digital game development cannot be underestimated. In today's era, games have permeated thousands of households, encompassing a wide range of genres. They are no longer solely entertainment products but also can be applied in education, medical care, learning, scientific research, and other fields. Research indicates that serious games (games designed to teach knowledge and skills or provide professional training and simulation) can effectively improve mental health. This review discusses the current status and future prospects of serious games in promoting mental health. It presents a comprehensive classification of serious games by integrating several literature resources, synthesizing information and data analysis to investigate their effectiveness in improving mental health outcomes. The findings show that serious games play a certain role in the treatment of mental illness. However, the current body of research is not without limitations, as there exists a dearth of controlled experiments comparing the efficacy of serious games to other types of games and investigating the effectiveness of gamification techniques. To address these gaps, researchers and designers should further prioritize approaches such as emotional design and participatory design. Additionally, leveraging emerging technologies like virtual reality can facilitate the development of adaptable game designs and methodologies that align with evolving societal needs.

Keywords: Serious games, mental health, user-centered, emotionalized design, virtual reality.

1. Introduction

Today, games have become an integral part of people's lives, and according to statista, the number of users in the "games" segment of the US media market is expected to continue to grow between 2024 and 2029, reaching 27.8 million users (+ 13.78%) [1]. Originally, serious games were defined as "games not primarily intended for entertainment," but as the game industry has evolved, the definition of serious games has expanded to include many areas. Serious games have also made some contributions to the field of mental health treatment. Research conducted by Tim, MH Li Indicates that games are effective in improving the mental health literacy of adolescents [2]. The purpose of this paper is to analyze the current situation and future prospects of serious games in improving mental health by comprehensively integrating information from various relevant literature resources through extensive data analysis. By using the Zen Garden as an example, the article illustrates how serious games can improve mental well-being. Additionally, this paper points out the lack of research

on the improvement of mental health in serious games and the obstacles to the application of serious games in psychological therapy. Finally, suggestions are proposed based on emotional design, participatory design, and the integration of serious games with virtual reality, aiming at enabling serious games better adapt to the pace of future society and the changing needs of users, so that serious games can better play a role in improving mental health.

2.   Overview of Serious Games

In recent years, with the rapid development of technology and society, the game market has also grown and grown, and games have become a common way for people to release pressure and find happiness. The number of games and players is increasing. According to `he Report on China's Game Industry from January to June 2024, the actual sales revenue of China's domestic game market from January to June 2024 was 147.267 billion yuan, an increase of 2.08% over the same period last year, and the growth trend was relatively stable. The number of game users reached a new high of 674 million, an increase of 0.88% year-on-year [3]. From a global perspective, there are approximately 3.09 billion active video game players [4]. The game industry is booming and has strong momentum, occupying a large part of people's lives, and the game is gradually popularized and generalized.

In 1400BC, serious games made their debut in ancient Egypt. Games that do not prioritize amusement are referred to as serious games. Serious games have a far wider range of applications than just the standard game market. They may be utilized to help with a variety of issues, including skill development, medical and health care, education and training, military combat, and much more. The main objective of the game is to raise the player's proficiency in a particular area.

Sheena M. Miller divides serious games into three categories in mental health treatment, namely Informative Game Playing, Therapeutic Game Designing, and Therapeutic Game Playing. The first is sort of Game Playing, which can let the players experience the psychological disease in the patient's life experience, a better and deeper understanding of the patient's heart. The second type is Therapeutic Game Designing. While experiencing the lives of patients, game designers can also design supplementary treatment processes by themselves, allowing patients to experience from different perspectives. The third category, Therapeutic Game Playing, combines therapeutic methods with games as an adjunct therapeutic process for mental health [5].

3.   The Roles and Concerns of Serious Games and Limitations

Suenderhauf claims that games can enhance the plasticity or function of brain regions afflicted by serious mental illness. This is supported by "the Systematic Review of Serious Games," which was conducted by Christiane Eichenberg and Markus Schott after a study 15 papers on the topic. Whether used in conjunction with medical care or as a stand-alone intervention, serious games improves mental health [6]. Participants in serious game settings experienced considerably fewer symptoms of anxiety and depression than those in commercial game control circumstances, according to a comprehensive assessment of serious and commercial video games for the treatment or prevention of disorders in children and adolescents. Pallavicini noted that video game training appears to be promising in improving cognitive skills in trainees, while showing initial efficacy in improving emotional skills in healthy adults, such as inducing positive emotions and reducing stress [7]. Several studies have shown that serious games have a positive effect on improving mental health, but the current research is still incomplete [8].

However, as society has evolved and the medium has faced increased scrutiny, public opinion on video games and their merits in various aspects remains divided. According to RH Ibrahim and AK Ghanim, many parents believe that video games affect their children's academic performance and make them more aggressive, that video games are a waste of time, and that games are now widely

accepted as entertainment [9]. Nevertheless, it is worth considering whether incorporating video games into mental health treatment is deemed acceptable for the general public.

Moreover, the current research is not supported by very general evidence, lacking experiments comparing serious games with gamified and non-gamified games, and lacking experiments comparing serious games with other games. In addition, the game is designed by the designer, and each individual is different, so whether the game can apply to each patient's condition and is effective. These are all issues that need the cooperation and comprehensive efforts of society, game designers, therapists, and others.

4. Analysis of the Specific Case: The Zen Garden App

Competitive memory training (COMET) therapy is gamified into Zen Garden, a treatment for low self-esteem problems that can result in anxiety, depression, eating disorders, and even self-harm and suicidal behavior. Comet therapy aims to restore constructive and positive self-references in circumstances that set off the negative feelings and beliefs linked to low self-esteem. In order to help users feel less anxious, Zen Garden integrates natural noises into the garden in an engaging and participatory fashion, with a primary focus on the gaming experience and a soothing tone. The user is urged to plant, gather, and record positive self-resources (such as tales, images, and music), which are then added to each plant. The garden is divided into many zones, each of which represents a bad thinking. The beauty of the garden increases as more positive information is added by the user.

During the fist week of the game, players will work with a a therapist to identify negative self-images, plant a flower to symbolize a good self-image, and contribute self-reference tales. Players will examine and uphold more tales, images, and songs--such as ones that depict real-life instances of their positive attributes, like lending a helping hand--daily using the Zen Garden app during the course of the next four weeks. The therapist will next offer relevant feedback, which the client can study again to reaffirm good self-perceptions. By making clients' functional positive self-opinions more emotionally apparent and improving their retrieval of these opinions from long-term memory, COMET training seeks to increase self-esteem by reversing the retrieval of the original dysfunctional negative self-opinions [10]. Serious game creators can gamify their creations in a number of ways to help improve mental health.

5. Suggestions for Serious Game's Improvement

5.1. Emotional Design

Based on Wang Yi's research into the emotional design method of serious games, the fundamental experience of these games can be categorized into three levels: game expression, game mechanism, and game narrative. Emotional design is also divided into three levels: game theme design, gameplay design, and game story design. After analyzing examples of serious games created to promote environmental awareness, Wang Yi concludes that an emotional design strategy with a focus on the core gaming experience and the three elements of game theme, gameplay, and game story has proven to be highly effective [11].

In the process of game design, game designers should pay attention to physical characteristics such as appearance, feel, and sound,, and carry out emotional design on the inner level of players; At the behavioral level, designers should pay attention to the player's vision, hearing, and touch, guide the perception, and stimulate the player's psychological activities; On a reflective level, most players will use most of their cognitive abilities to rationalize the game after it's over, which will give game designers the opportunity to make reflective designs based on the player's pride and ownership of the game. Therefore, the game design should fully consider the emotions of users, so that the emotions of

users can deeply resonate with the development of the game, so that the design of serious games can achieve better education or learning effects [12].

5.2. Participatory Design

Maria R. Dekker and Alishia D. Williams identified 20 serious games used to prevent, treat, or supplement existing therapies for anxiety or depression. Half (N = 10; 50% of games are based on the target end user (N = 7; 70%) or fully participatory co-design roles (N = 3; 30%). Less than half of games (45%) include users in the beta phase [13]. In participatory design (PD), the user is involved in all stages of the process, including planning, designing, implementing, and testing the game. According to Ann DeSmet, participatory design (PD) is a great way to improve the effectiveness of serious games, as it can create games that are more in line with user preferences. PD is more effective when applied to game dynamics, levels, and game challenges. By observing the user's participation in the design process and gaining insights into user needs, preferences, and behaviors, game designers can better understand the real needs of users and design products that are more humane, and meet user expectations, and provide better services.

However, different levels of user participation will have different impacts on the results. For example, it is more effective for users to participate in the design of the game as information providers or game testers, but if users participate in more trivial aspects, such as aesthetic components, it may reduce the efficiency of the designer and backfire. Therefore, we need to further study how to integrate PD into serious game design and make overall planning and design to improve the effectiveness of serious games developed by PD [14].

5.3. Combined with Virtual Reality

Games and the products combined with virtual reality (VR) have appeared in the public's vision; the game has changed from a 2D plane to surround three-dimensional, giving the game players a sense of immersive immersion to create a more exciting and wonderful game experience.

The combination of serious games and VR technology can transform users from passive observers to active participants, allowing users to be immersive and learn in an exploratory way, which is very suitable for serious games with the purpose of education, training, and building capacity. VR technology can provide users with an unprecedented sense of immersion and presence, which has been applied in medical, educational, and military fields. In addition, VR technology can also provide users with a high degree of interaction. According to a review of immersive virtual reality serious games to enhance learning and training, compared to traditional methods of learning and training, the combination of VR and serious games can stimulate user interest and motivation to learn, allow users to engage at a higher level and more deeply, can make the learning of skills more efficient, and can make serious games more effective in improving mental health [15].

However, this reasoning has only been verified in some cases, and more experimental demonstration is still needed. At the same time, VR technology still needs further improvement and development. At present, VR technology cannot provide users with a high resolution, and the immersion is not deep enough, which discounts the user experience, and VR equipment will bring users uncomfortable necks and motion sickness [16]. There is still a long way to go in the future, and it requires multi-party cooperation and joint efforts to bring a better user experience to users.

6. Conclusion

After reviewing rigorous research, the following conclusions are drawn from the efficacy of serious games in improving mental health. In this paper, the author has integrated and deeply analyzed 14 existing pieces of literature and relevant data. The pertinent studies have proved the effectiveness of

serious games in improving mental health, while certain practices and experiments have also shown initial results. However, because games are still mainly used as entertainment in people's lives, not everyone can accept and recognize their use in mental health treatment. Moreover, the existing literature and experiments are still imperfect, lacking systematic experiments on the comparative analysis of multiple serious games. In addition, the design and use of serious games in terms of mental health still need to be improved, and there is room for improvement. For example, emotional design can be more suitable for users' psychology and emotions, focusing on the three elements of game theme, gameplay, and game story. And participatory design allows users to participate in all stages of the game, including planning, design, implementation, and testing, which can better create games that match user preferences. At the same time, serious games can be combined with virtual reality technology, which can provide users with an immersive game environment, make users feel more involved and interactive, improve the effectiveness of serious games in treatment, teaching, and other aspects, and bring users a better user experience. The design of serious games needs to evolve and keep pace with The Times to better capture the changing and new needs of users to provide a better gaming experience and improve mental health more efficiently. Future research can focus on user-centered ways to improve user experience and the part that integrates with modern high technology to improve mental health more effectively.

References

[1] Statista. (2024) Number of video game users in the United States from 2019 to 2029, Available at: https://www.statista.com/forecasts/1277728/physical-or-digital-core-gamers-in-the-us

[2] Li TM, Chau M, Wong PW, Lai ES, Yip PS. (2013) Evaluation of a Web-Based Social Network Electronic Game in Enhancing Mental Health Literacy for Young People J Med Internet Res 15.5: e80.

[3] people.cn, (2024). The China Game Industry Report from January to June 2024. http://jinbao.people.com.cn/n1/2024/0726/c421674-40286248.html

[4] Josh Howarth, (2024). How Many Gamers Are There? (New 2024 Statistics). https://explodingtopics.com/blog/number-of-gamers

[5] Sheena M. Miller. (2015) The Potential of Serious Games as Mental Health Treatment. University Honors Theses. Honors Theses: 148.

[6] Eichenberg, C., Schott, M. (2017) Serious Games for Psychotherapy: A Systematic Review. Games for Health Journal, 6.3: 68.

[7] Pallavicini, F., Ferrari, A., Mantovani, F. (2018) Video Games for Well-Being: A Systematic Review on the Application of Computer Games for Cognitive and Emotional Training in the Adult Population. Front. Psychol., Human-Media Interaction, 9: 2127 .

[8] Fleming T, Sutcliffe K, Lucassen M, Pine R, Donkin L. (2022) Serious games and gamification in clinical psychology. In: Asmundson GJG, editor. Comprehensive clinical psychology. 2nd ed. Oxford: Elsevier, 77–90.

[9] H Ibrahim, R., Kareem Ghanim, A., A.Alsaeed, H (2020) Impact of Electronic Games on the Behavior of Children and their Academic Achievement upon Schools in Mosul City. Indian Journal of Forensic Medicine and Toxicology, 14.1: 536.

[10] Siriaraya P, Visch V, Boffo M, Spijkerman R, Wiers R, Korrelboom K, Hendriks V, Salemink E, van Dooren M, Bas M, Goossens R. (2021) Game Design in Mental Health Care: Case Study–Based Framework for Integrating Game Design Into Therapeutic Content, JMIR Serious Games, 9.4: e27953.

[11] Wang, Y. (2023) Research on emotional design methods of serious games, Computer and Information Technology, Changsha, Hunan Province, 31.5: 12. Available at: https://www.cnki.com.cn/Article/CJFDTOTAL-DNXJ202305022.htm

[12] Nizar Baharom, S., Hoe Tan,W., Zaffwan Idris, M. (2014) Emotional Design for Games: The Roles of Emotion and Perception in Game Design Process. International Journal of Multimedia and Ubiquitous Engineering, 9.10: 387-398.

[13] Maria R. Dekker, and Alishia D. Williams. (2017) The Use of User-Centered Participatory Design in Serious Games for Anxiety and Depression. Games for Health Journal, 6.6: 58.

[14] DeSmet, A., Thompson, D., Baranowski, T., Palmeira, A., Verloigne, M., De Bourdeaudhuij, I. (2016) Is Participatory Design Associated with the Effectiveness of Serious Digital Games for Healthy Lifestyle Promotion? A Meta-Analysis. J Med Internet Res, 18.4: e94.

[15] Checa, D., Bustillo, A. (2020) A review of immersive virtual reality serious games to enhance learning and training. Multimed Tools Appl 79, 5501–5527.

[16] Hamad, A. and Jia, B. (2022). 'How Virtual Reality Technology Has Changed Our Lives: An Overview of the Current and Potential Applications and Limitations', Int. J. Environ. Res. Public Health, 19.18: 11278.