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Exploring the Role of Virtual Reality and Metaverse in Treating Mental Health: Operating Models and Challenges in Adoption

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Abstract

The advent of virtual reality (VR) has introduced new avenues for treating mental health conditions such as post-traumatic stress disorder (PTSD), anxiety, and depression. These conditions have traditionally been managed with pharmacological and psychotherapeutic treatments. However, these treatments often present issues such as medicinal side effects, accessibility barriers like high cost, and geographical constraints. This study explores the potential of VR and metaverse to offer more accessible and engaging treatment alternatives. By analyzing the service models of XRHealth, Innerworld, and PsyTechVR, we aim to critically evaluate the efficacy of these technologies in mental health treatments and analyze associated challenges including accessibility, side effects, privacy, and security concerns. The findings aim to contribute to the ongoing discussion on digital health innovations and prescription digital therapy by providing a comprehensive analysis of cutting-edge virtual reality and metaverse technologies in overcoming traditional treatment barriers in treating mental health.

Keywords

Virtual Reality (VR), Metaverse, Cognitive Behavioral Therapy (CBT), Post-Traumatic Stress Disorder (PTSD), Immersive Therapy, Clinical Validation, Data Privacy

1. Introduction

Mental health disorders such as PTSD, depression, and anxiety affect millions of individuals globally and represent a significant challenge to traditional therapeutic approaches. Traditional treatment approaches for PTSD, anxiety, and depression

include pharmacotherapy and psychotherapy. For pharmacotherapy treatment, medications like selective serotonin reuptake inhibitors (SSRIs) and serotonin-norepinephrine reuptake inhibitors (SNRIs) are commonly prescribed [1]. Meanwhile, psychotherapy is a treatment that helps people identify and change unhealthy thoughts and emotions through talking either one-on-one or in a group. A common psychotherapy used for mental health treatment is cognitive-behavioral therapy (CBT).

While SSRIs, SNRIs, and psychotherapy have been effective, they still have limitations

like accessibility, side effects, and compliance on the part of the patient. CBT, for example, requires access to trained therapists, longer waiting times, and steady session attendance—obstacles intensified by social stigma and cost, particularly if insurance coverage is limited [2]. These obstacles require convenient, flexible substitutes to supplement mental health care.

Virtual reality (VR) is another emerging method for treating mental health. It produces computer-generated environments that individuals can interact with in simulated environments. VR therapy may be immersive—computer-generated, interactive sensory experience that transports a user into a simulated 3D world, replacing their physical surroundings using head-mounted displays that follow user movement—or non-immersive, as screen-based simulations using standard screen to display virtual environment such as flight simulators or video games [3]. For mental health treatment, VR employs immersive environments for delivering exposure therapy, stress reduction techniques, and other therapeutic interventions in a controlled and repeatable manner (**Figure 1**). Studies show that VR can significantly reduce symptoms of anxiety and depression, with patient testimonials highlighting the benefits of engaging, interactive treatment settings that diverge from traditional therapeutic environments [4].

Figure 1. VR headset to interact with a virtual environment.

The metaverse is a virtual world that uses VR, augmented reality (AR), and the internet to create immersive, interactive, three-dimensional spaces. The spaces enable users to communicate with one another in real time, recreating real-life experiences or creating entirely new ones. With advances in computing, artificial intelligence, and blockchain, the metaverse has increasingly been studied for applications in therapy for health care, including therapy and social support.

This article examines the possibility of how virtual environments through VR and metaverse technologies can help treat anxiety, depression, and PTSD. It examines the operating models of three leading companies—XRHealth, Innerworld, and PsyTechVR—and analyzes challenges such as cost, privacy, and clinical evidence. Lastly, this study aims to show how these technologies can act as a complement or reshape existing mental health care delivery systems through proposed solutions. To ensure methodological rigor, our analysis of VR and metaverse platforms for mental health care is based on clearly defined inclusion and exclusion criteria, with company selection guided by diversity of therapeutic applications, evidence of efficacy, and demonstrated scalability.

2. Background

Innovative technology in VR has recently expanded its utilization in mental health treatment. The addition of wireless headsets, eye tracking, haptic response modalities, and motion sensors has increased the level of immersion and interaction of VR environments. In addition, machine learning capabilities can develop these experiences dynamically through real-time adaptations based on the actions of users shape therapeutic interventions, enhancing therapeutic engagement [5]. VR is being used for exposure therapy by exposing patients to anxiety-provoking stimuli in a controlled environment for helping soften problematic behaviors. Trauma-related scenarios for PTSD can be recreated in a staged manner which allows for the safe emotional processing of trauma [6]. VR therapeutic approaches have also been employed in stress management, cognitive rehabilitation services, and mindfulness training, providing customizable and engaging therapeutic environments [7].

In consideration of recent developments in VR, some problems present unique challenges. The therapeutic impact of VR experiences will be influenced by the target condition (diagnosis & presentation), quality of the design of the VR program, and how users feel about the intervention in the first place (e.g., benefit, hype, etc.). Users may struggle with cybersickness which can diminish the desire to engage [8]. The simulation domains of VR therapy might lead to exacerbation of some symptoms, or disengagement from the intervention altogether if not thoughtfully designed. Development of VR experiences should be user-centered, with valuable perspective from professionals and end-users being employed to maximize the therapeutic design and usability [9].

The metaverse provides some new possibilities for the creation of therapeutic spaces. By combining VR, augmented reality (AR), and the ability to connect

through the internet, metaverse technologies provide shared virtual environments for interaction. By adding cloud-computing technologies and natural user interfaces, current developments in the metaverse incorporate real-time, self-directed social interaction, which can help to create and maintain long-term therapeutic spaces [10]. Metaverse advancements via AI and blockchain technology are increasing usefulness as AI assistants lead to personalized therapy, and blockchain technology locks sensitive data safely [11]. The meaningful future of virtual immersive therapies relies on technological advancements while anchoring the technology to the needs of patients.

3. Methodology

3.1. Criteria for Selecting Companies

From more than 10 leading companies that provide VR and metaverse based mental health solution, we chose three companies based on the following criteria.

3.1.1. Diversity of Applications

Each company represents a unique approach to virtual therapy. XRHealth focuses on immersive environments for rehabilitation[1], Innerworld emphasizes peer-led support groups through an immersive platform[2], PsyTechVR uses CB, exposure therapy and mindfulness training approaches for various mental disorders, providing a broad spectrum of VR applications within mental health[3].

3.1.2. Evidence of Efficacy

Preference was given to companies that have substantiated the effectiveness of their technologies through rigorous testing, including clinical trials and peer-reviewed research, ensuring that the analysis is grounded in verified results [12]-[14].

3.1.3. Scale and Reach

The global reach and scalability of the companies' solutions were considered, as this affects the broader impact of VR therapies on mental health care practices worldwide [15] [16].

3.1.4. Clinical Relevance to Anxiety, PTSD or Mental Health Disorders

The global reach and scalability of the companies' solutions were considered, as this affects the broader impact of VR therapies on mental health care practices worldwide [17].

3.2. Exclusion Criteria

Exclusion criteria eliminated companies whose solutions focused solely on physical rehabilitation without a mental health component, wellness-oriented VR apps

[1]https://www.xr.health/au/services/.
[2]https://get.inner.world/science/.
[3]https://psytechvr.com/about-psytech-vr.

lacking clinical validation (e.g., meditation-only platforms), and technologies unrelated to anxiety, PTSD, or broader mental health disorders.

Table 1 lists the VR-based mental health platforms which are considered for the study. Focusing on three representative companies based on the above criteria allowed for a detailed analysis of therapeutic, clinical, and economic implications.

Table 1. VR-based mental health platforms.

Criteria	Application Type	Evidence of Efficiency	Scale/Reach	Relevance to Anxiety/PTSD
XRHealth	Immersive rehab (neurology, PTSD, anxiety)	Clinical trials; peer-reviewed studies	U.S., EU, Israel; insurance coverage	Yes
InnerWorld	Peer-led social VR groups	Pilot studies; peer-reviewed validation	Global access via VR headsets	Yes
PsyTechVR	CBT, exposure therapy, mindfulness	Early clinical validation; peer-reviewed	Multi-country scalable modules	Yes
Limbix	Adolescent depression VR	Clinical trial in anxiety	North America, Europe	Yes
Healium	Biofeedback-VR + immersive experiences for stress and anxiety	Clinical validation claims for reducing anxiety	Deployed in hospitals, schools; wellness & clinical settings	Yes
TRIPP	Mindfulness, guided meditation,	Limited validation	Widely accessible via mobile & VR headsets	Limited
SyncVR Medical	Workplace mental health and wellbeing	Limited VR validation	Australia, Europe	Limited
AppliedVR	Pain management (acute, chronic)	Clinical validation; extensive trials	US, Insurance Coverage	No
MindMaze	Stroke rehabilitation	Peer-reviewed neurological validation	Europe, Asia, U.S. partnerships	No
HorizonMind	Community-driven social VR	Limited validation	Large-scale reach via Meta platform	No

3.3. Data Sources

To ensure a comprehensive analysis, multiple data sources were used.

3.3.1. Academic Journals

Peer-reviewed journals were the primary source of theoretical and empirical re-

search. Articles were selected for their relevance to evaluating the effectiveness, accessibility, and safety of VR therapies [12]-[14].

3.3.2. Company Information

Reviewed all information published from the companies, including their website, white papers, case studies to gain insights into their operational models, target demographics, and strategic objectives[4].

3.4. Analysis Parameters

A comparative analysis was developed to evaluate the selected companies against the established criteria mentioned above.

3.4.1. Accessibility

Examining hardware and software requirements, cost implications, and geographic distribution to assess how accessible the VR solutions are to a broad range of users.

3.4.2. Side Effects

Evaluating the frequency, severity, and management of any physical and psychological side effects as reported in clinical trials and user feedback.

3.4.3. Privacy and Security

Analyzing how each company handles sensitive data, including adherence to healthcare privacy laws and measures taken to mitigate potential breaches.

3.4.4. Effectiveness

Measuring the therapeutic outcomes based on improvements in mental health conditions as detailed in clinical trials and user testimonials.

These parameters ensure a detailed and reliable evaluation of the impacts and challenges associated with implementing VR in mental health treatments.

4. Operating Model Analysis of XRHealth's, Innerworld, and PsyTechVR

4.1. XRHealth

XRHealth specializes in immersive, at-home VR therapy and real-time data analytics to provide personalized and interactive treatments for patients and healthcare providers. Their VR applications are designed to improve mental health treatment through interactive experiences that encourage user participation and incorporate movement-based activities. For patients, XRHealth's operating model is that the VR headset is sent to your home for the VR mental health therapy sessions and for tasks in between the sessions[5]. Specifically, XR Health is implementing metaverse therapy sessions (**Figure 2**). In these sessions, the therapists and clients

[4]https://www.xr.health/au/services/; https://get.inner.world/science/; https://psytechvr.com/about-psytech-vr.
[5]https://www.xr.health/us/services/mental-health/.

create their avatars and gather in 360-degree virtual rooms[6]. The avatars help add a level of anonymity that allow people to overcome hesitation, making it easier to share personal experiences and challenges. The therapists can still initiate exercises requiring physical engagement such as throwing and catching a ball.

Figure 2. Virtual, anonymous virtual therapy session.

Additionally, XRHealth has a variety of VR applications (Mindset, Luna, and Relax8)[7], each designed to address specific mental health needs. Mindset is a healing media center app that includes meditation and relaxation techniques. In the app, users can select different experiences such as Dolphins Healing Experience, Everest Experience, and Seals Healing Experience. Additionally, the users can select different paths such as calm, introspect, sleep, renewal, and energize. Luna helps with symptom management with CBT. It engages the brain using an AI therapist to assist in the mitigation of pain, hot flashes, and physical discomfort through distraction and supporting exercises. Relax8 focuses on breathing techniques and guided meditations for relaxation. For example, in the app, the user can practice tracing a specific path to help relieve stress. Each of these FDA registered applications use an immersive virtual environment along with an interactive game to help treat different aspects of mental health.

For healthcare professionals, XRHealth offers the eXperience Space, a VR environment that integrates VR technology with advanced data analytics to enhance patient care. The environment facilitates timely and effective relaxation and comfort for patients in stressful settings, such as hospital settings, by immersing them in calm virtual environments. eXperience Space also assists in reducing clinical burdens and improving patient outcomes by distracting and engaging content delivered at various stages of care to assist in diverting patients' attention away from body pain[8]. XRHealth's system has real-time analytics which monitors a patient's

[6] https://www.xr.health/us/blog/virtual-reality-support-groups-anonymous-group-therapy-from-the-comfort-of-home/.
[7] https://www.xr.health/au/services/.
[8] https://www.xr.health/experience-space/.

physiological and emotional responses throughout VR sessions. Such technologies provide valuable insights on processing speed, attention, decision-making process, and memory span, enabling providers to adjust treatment plans based on individual progress.

4.2. Innerworld

Innerworld uses the metaverse to deliver Cognitive Behavioral Immersion (CBI), its flagship group-based cognitive behavioral skills training program. CBI was developed to overcome barriers such as stigma, access, and cost, and integrates evidence-based CBT best practices with immersive technology to create a virtual support community[9]. Users join live group classes with trained coaches, where they learn CBT skills to enable them to manage depression, anxiety, and other mental illnesses. The platform allows users to attend CBI sessions through VR headsets for a fully immersive experience or through flat-screen devices like computers and smartphones. Anonymity features, such as the option to design avatars and select usernames, allow for a stigma-free space in which users can openly share experiences and practice therapy skills (**Figure 3**) [17]. With daily sessions and availability on several devices, CBI provides an interactive and flexible virtual mental health support system.

Figure 3. Group session for virtual therapy in social setting.

Innerworld has conducted an observational study to evaluate how effective CBI is in reducing symptoms of depression and anxiety. The study included 127 participants who had depression or anxiety and attended at least two sessions. The results were that depression symptoms decreased from an average score of 16.44 at the first session to 11.62 by the tenth session. [13] Additionally, anxiety symptoms dropped from an average score of 14.79 at the first session to 11.29 by the tenth session as shown in **Figure 4**.

[9]https://get.inner.world/science/.

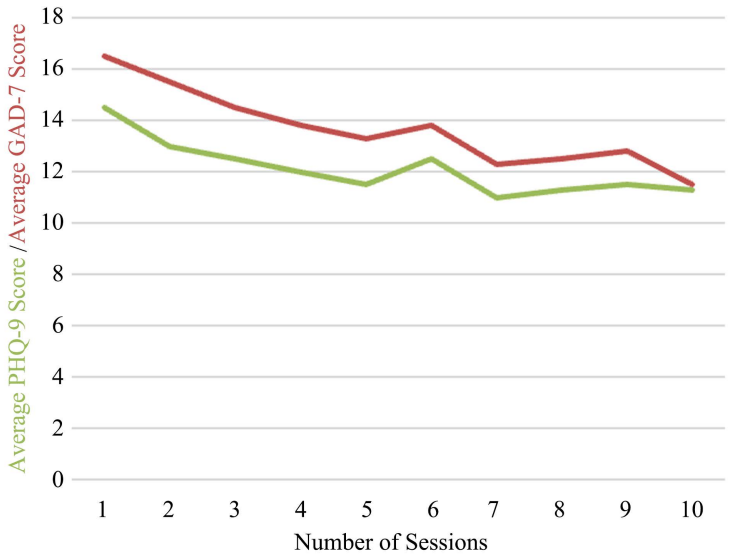

Figure 4. Symptoms of depression and anxiety over the course of 10 CBI sessions in Innerworld.

4.3. PsyTechVR

PsyTechVR utilizes CBT and Eye Movement Desensitization and Reprocessing (EMDR) evidence-based VR solutions to support broad range of mental health issues. Their operating model integrates virtual coaching, guided therapeutic environments, and psychoeducational simulations based on modern psychological principles and neurocognitive research. The platform is designed by psychologists, neuroscientists, and educators, ensuring that its applications are both scientifically grounded and user centric [18]. One of PsyTechVR's main features is the "Travel Therapy" module, which allows users to immerse themselves in tranquil, nature-based environments such as beaches, mountains, or forests. This approach uses environmental psychology to promote relaxation, reduce anxiety, and alleviate stress. These experiences serve as a therapeutic adjunct to structured programs such as CBT or mindfulness-based interventions [19].

PsyTechVR also offers interactive CBT-based simulations that allow users to confront phobias, practice social interactions, and build coping strategies in a controlled virtual environment. For instance, users with social anxiety can participate in graded exposure scenarios, such as attending a virtual meeting or engaging in conversation with a virtual stranger, helping them gradually reduce avoidance behaviors. PsyTechVR is unique in its hybrid use of micro-training modules and LMS-integrated educational paths, which helps users with psychological literacy. These modules are accessible via VR headsets and can be used by professionals in clinical, educational, or research settings[10]. Unlike some VR companies focused on highly clinical conditions like psychosis, PsyTechVR emphasizes a broad-spectrum approach—targeting everyday stress, emotional resilience, self-regulation, and burnout.

[10]https://psytechvr.com/vr-training-in-university-and-school.

The platform is designed to be highly scalable and accessible. It supports multi-device access (standalone VR, desktop, and mobile), making it easier for therapists, educators, and individuals to adopt the technology globally. PsyTechVR also includes built-in analytics for tracking progress and customizing therapy, allowing real-time adaptation of difficulty, duration, or type of intervention (Table 2).

Table 2. Analysis summary of operating models.

Criteria	XRHealth	Innerworld	PsyTechVR
Primary Focus	Rehabilitation, stress relief, and pain management	Depression and anxiety treatment	Broad spectrum approach targeting anxiety, phobias, PTSD, addiction, emotional resilience, and self-regulation.
Technology Used	VR and AR with AI integration	Metaverse platform accessible via VR headsets or flat-screen devices	VR with cognitive-behavioral therapy EMDR (Eye Movement Desensitization and Reprocessing)
Care Delivery	Remote VR sessions with real-time data analytics	Live group sessions hosted by coaches	Automated, protocolized VR treatments
Unique Features	AI-powered personalized therapy, real-time biometrics	Web-based social support, anonymity via avatars, and daily session availability	Clinically validated programs, developed by psychologists, neuroscientists, and educators,
Target Audience	Older adults and GenZ, as well as clinicians	Men hesitant to seek traditional therapy	XRaaS-Extended-Reality-as-a-Service solution targeting mental distant patients, health counselors and psychotherapist.
Clinical Validation	Over 1 million completed XR sessions.	Observational published study showing significant symptom reduction.	Clinical validation by professionals and evidence.
Unique Applications	Pain management, cognitive therapy, stress relief	Daily live sessions for CBT skills training	Treatment for psychosis patients, social engagement therapy for anxious avoidance.

5. Analysis of Adoption Challenges

The integration of VR into mental health treatments, as demonstrated by XRHealth, Innerworld, and PsyTechVR, presents numerous innovative opportunities but also brings several challenges that must be carefully managed to ensure the effective and ethical deployment of these technologies.

5.1. Accessibility

5.1.1. Hardware and Software Requirements

XRHealth offers two VR Headset Options. One option is to loan the headset for $150 per month to use the services and then the headset is returned once the services are completed. The other option is to buy a VR headset and 12 months of

XRHealth monthly therapy support applications access and tech assistance for $1440[11]. This cost is high for everyday users and therefore limits accessibility. However, reducing the number of sessions from 12 traditional CBT sessions to 8 VR and CBT sessions can result in a cost saving of $600 per patient.

Innerworld offers a subscription for $20 a week, which includes experienced personalized support through groups led by licensed therapists. There are 60-minute weekly sessions designed for small groups and aim to align with the person's unique needs. Additionally, Innerworld has a licensed therapist-led membership plan called Membership Plus, where users gain access to Inner Circle, a feature offering four therapist-led skills groups each month. Innerworld offers three tiers of membership—free, membership, and membership plus—ranging from zero to $120 a month for users to choose the plan that best fits their budget and needs [20]. This price is significantly lower than traditional therapy sessions, which typically cost $100 to $200 per session.

PsyTechVR offers subscription-based access to its VR mental health therapy platform at $199/month, positioning itself as a tech-forward alternative to traditional therapy. PsyTechVR primarily delivers self-guided, immersive VR experiences developed in collaboration with mental health professionals. PsyTechVR's single-tier model focuses on scalable virtual exposure therapy using a unique, gamified approach suited for those preferring independent, technology-driven treatment[12].

5.1.2. Demographic Barriers

XRHealth's users are mainly between the ages of 65 - 75. In Australia, most of its treatment is focused on autism and ASD. Additionally, in America, it has seen interest among Gen-Z for mental health challenges and anxiety. It is also deployed in European markets in Spain and has expanded to the UK [21].

Innerworld has broad appeal across various demographics but is particularly effective in engaging populations hesitant to seek traditional therapy due to stigma or cost concerns. The anonymity provided by avatars lowers barriers for individuals who may feel intimidated in traditional therapeutic settings. However, the platform explicitly states that it is not a substitute for therapy and does not cater to individuals under 18 or those requiring crisis intervention[13]. This limitation excludes certain vulnerable groups who may benefit from more intensive or immediate support.

PsyTechVR represents a significant advancement in making mental health therapy more accessible through technology. Accessing PsyTechVR requires a compatible VR headset, such as the Meta Quest, and a subscription fee of $120 per month or buying the complete bundle cost more than $2000. However, physical requirements, potential sensory discomfort, financial costs, the need for professional oversight, and limited clinical validation are factors that may affect its ac-

[11]https://www.xr.health/pricing/.
[12]https://psytechvr.com/vr-trainings-with-doctors.
[13]https://get.inner.world/science/.

cessibility and effectiveness for some users [18].

5.2. Data Security and Privacy

Data privacy is an important concern in the adoption of VR and metaverse-based mental health therapy. All three companies comply with standard healthcare data regulations such as HIPPA and GDPR. However, there are differences in implementation and transparency.

XRHealth performs the functions of both a data processor and data controller. It collects biometric data, usage information, and billable data. The company informs users of their rights based on privacy laws around the world. XRHealth claims to secure user data in accordance with third-party contractual agreements, and they use several secure protocols. The concern is that the use of third-party processors puts user data in a precarious situation, which gives rise to trust issues.

Innerworld's privacy policy is designed to safeguard user information. The website collects personally identifiable information (PII) such as names, email addresses, and IP addresses to provide and improve its services. Innerworld does not sell or trade user data but may share it with third-party service providers when necessary to finish its services or meet legal requirements. Additionally, the website uses cookies and tracking technologies to improve the user experience and grants users' access to, correction of, or erasure of their data on request[14].

PsyTechVR collects data when users are participating in therapy such as health inputs and session logs. While not directly selling user data, PsyTechVR may share it with third-party providers or in the event of corporate restructuring. Security measures like encryption are used to protect data, though users are reminded that no online system is entirely secure. Users retain rights to access, correct, or delete their data and may contact the company with privacy concerns[15].

5.3. Side Effects

5.3.1. Cybersickness Risks

Some of the virtual environments in XRHealth, such as the floating meditation environment, have the potential to induce cybersickness in some patients. This risk is avoided by XRHealth through its patented biometric feedback system, which real-time adjusts parameters like brightness and contrast to enhance the comfort of the user and restrict cybersickness. The system is an extension of XRHealth's overall strategy towards personalizing VR for therapy, as detailed in their patent [22].

Innerworld's use of calming virtual environments, such as lakes and campfires, reduces the risk of cybersickness compared to more action-oriented VR environments. These fixed, visually soothing environments are designed to encourage relaxation and limit sensory conflict that might cause discomfort from lengthy usage [17].

[14]https://inner.world/privacy.html.
[15]https://psytechvr.com/hipaa.

PsyTechVR designs its therapy environments with clinical guidance to enhance comfort and minimize cybersickness. The VR experiences prioritize safety and realism, simulating real-life therapeutic scenarios with controlled movement and sensory input to reduce overload. While formal trial results like are not widely published, PsyTechVR highlights strong engagement through its collaborations with doctors and mental health professionals, suggesting positive reception and usability in practice [23].

5.3.2. Psychological Risks

For XRHealth, its virtual immersive environments, similar to those that are used for treating PTSD, sometimes induce augmented physiological responses, including the elevated heart rate among older patients. It is a risk because VR exposure therapy's vivid and realistic simulations expose the patient to trauma stimuli[16]. However, XRHealth reduces such risks by allowing therapists to control the level and pace of exposure such that patients are not overwhelmed or overexposed. Experiments have shown that gradual and controlled exposure reduces the risk of re-traumatization while enhancing therapeutic gains, as evidenced by clinical trials conducted jointly with the U.S. Veterans Association [24].

Innerworld's peer-supported mental well-being platform uses anonymous avatars to foster connectedness while avoiding social anxiety. However, for those with severe anxiety or PTSD, unmoderated peer spaces can potentially be distressing if the interactions or discussions are too much or triggering in nature [17]. To offer a solution to this, Innerworld offers guided environments like mindfulness sessions and guide-led groups that are trained through its Membership Plus membership level. These structured sessions aim to provide the users with greater psychological distress tendencies a safer and more supportive environment.

PsyTechVR applies evidence-based therapeutic techniques, including CBT, to treat mental health issues like phobias, anxiety, and PTSD through immersive VR scenarios. These environments—designed in collaboration with medical professionals—expose users to controlled, fear-inducing stimuli (e.g., confined spaces or public speaking), which may cause short-term physiological responses like elevated heart rate (**Table 3**). To manage these reactions, PsyTechVR provides guided, gradual exposure within its modules, prioritizing patient safety and comfort[17].

Table 3. Summary of adoption challenges.

Challenge	XRHealth	Innerworld	PsyTechVR
Hardware and software requirements	Requires a VR headset, which can be rented for $150/month or purchased for $1440 annually, making it costly for users.	More accessible with VR and non-VR options (smartphones, computers), reducing reliance on expensive headsets.	Subscription cost of 199 USD per month includes VR headset and biosensors with security deposit.

[16]https://www.xr.health/us/services/mental-health/.
[17]https://www.xr.health/us/services/mental-health/.

Continued

Demographic Barriers	Primarily serves older adults (65 - 75) and Gen Z, but high costs limit broader adoption.	Appeals to younger users hesitant to seek traditional therapy but excludes those under 18 and individuals needing crisis intervention.	Targets who prefer independent, technology-driven treatment.
Data Security and Privacy	Collects biometric and therapy session data, follows HIPAA/GDPR, but relies on third-party processors, raising security concerns.	Uses anonymous avatars to reduce stigma but still collects user data, leading to privacy concerns.	Encrypts user data and uses multi factor authentication but acknowledges risks in internet-based therapy.
Cybersickness Risks	Some environments (e.g., floating meditation) can induce cybersickness, but biometric feedback helps adjust VR parameters.	Lower risk due to calming virtual environments, but lengthy sessions may still cause discomfort.	Uses VR headset with biosensors which may induce cybersickness
Psychological Risks	PTSD exposure therapy may trigger distress if not carefully controlled, but therapists can moderate exposure levels.	Unmoderated peer spaces could be distressing for users with severe anxiety or PTSD.	VR-based CBT for phobias and PTSD can briefly increase anxiety but is structured to minimize long-term distress.

6. Discussion and Recommendation

The adoption of VR and metaverse-based mental health treatments is expected to grow due to cost-effectiveness and growing efficacy through clinical validation. As shown in Figure 5, the metaverse for mental health market is expected to increase from $2.42 B in 2023 to $20.04 B in 2034. The potential of VR and metaverse in mental health care is enormous, but challenges like accessibility, side effects, privacy, and psychological risks must be overcome for safe and effective use. Below are solutions and strategies to overcome these challenges.

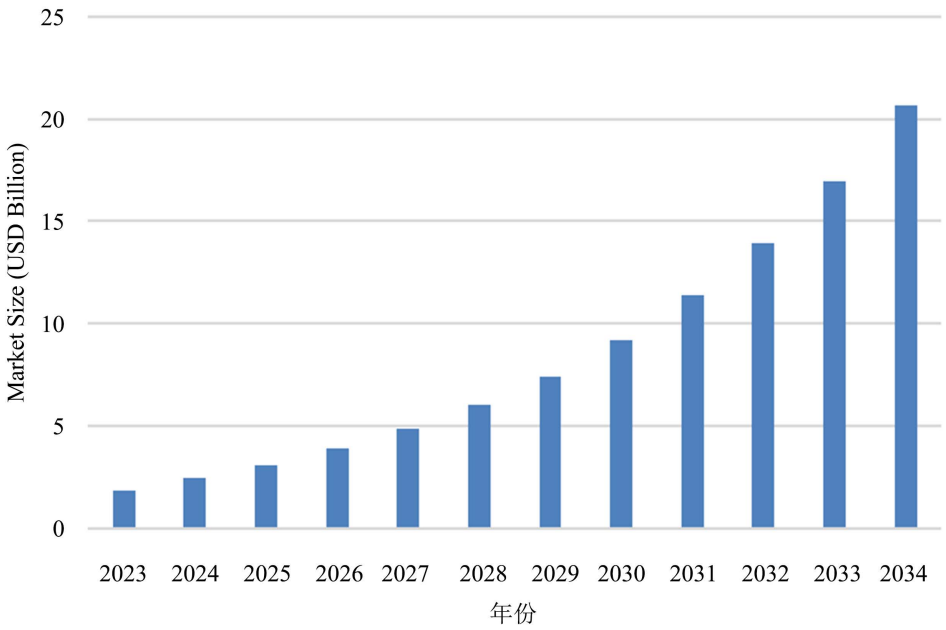

Figure 5. Growth in metaverse for mental health market size from 2023 to 2034.

6.1. Accessibility and Affordability

To increase access and improve affordability, corporations must make partnerships with public health systems, non-profits, and insurers to create subsidized pricing models. Public health systems like the NHS can negotiate bulk license agreements or co-fund infrastructure to lower cost while insurers can expand reimbursement channels such as Medicare's coverage for VR-based therapies like AppliedVR's RelieVRx. Nonprofit organizations can help offset costs for poor patients by securing grants or providing free or low-cost hardware via community programs [25]. Additionally, investing in a lighter, cheaper headsets can help reduce the technological divide for underserved communities. Easy controls, such as voice commands and big, high-contrast screens, would eliminate technical barriers for the technologically illiterate [26]. Community-based solutions to this technology divide can help as well. Having VR booths with guided software in places such as libraries and community centers can deliver treatments to low-income communities without requiring them to own hardware [27].

6.2. Minimizing the Side Effects

VR and metaverse therapy can help prevent cybersickness by using adaptive technology like XRHealth's biometric feedback system. This system adjusts brightness, sensitivity, and latency based on user feedback to avoid discomfort. Research shows that the provision of stable reference points and the diminishment of visual motion can significantly lower the chances of nausea [28]. PsyTechVR uses gradual immersion protocols, starting with short sessions and gradually increasing in duration [III]. Such protocols are particularly beneficial for individuals new to VR therapy or those with heightened sensitivity to immersive experiences. Physical safety protocols are also important, including clear therapy rooms, headset adjustments, regular session breaks, and ergonomic options. In patients prone to motion sickness, anti-nausea medication like meclizine or Dramamine may be administered under the supervision of a doctor to minimize symptoms [29]. XRHealth's real-time analytics also allow therapists to monitor physiological responses. Additionally, psychological readiness assessments are used to identify vulnerabilities and support users with debriefing practices. These protocols enhance safety and reduce emotional distress in VR-based mental health interventions.

6.3. Data Security and Privacy

To ensure data security in VR therapy, organizations like XRHealth and PsyTechPR can use encryption algorithms like AES-256 and multi-factor authentication (MFA) to protect sensitive patient data [30]. User-managed privacy controls, such as Innerworld's ability to edit, delete, or limit data, can provide patients with control over their data. Furthermore, integrating interactive mechanisms—such as videos or quizzes educating users on privacy threats—can bridge the gap be-

tween informed consent and actual awareness of data implications, resolving immersive technology-specific challenges. Regular audits and incident response measures are crucial for maintaining security integrity, including risk analysis, policy audits, and employee training on cybersecurity best practices. Incident response strategies should have specific procedures for detection, containment, and recovery from intrusions as well as adherence to regulatory requirements [31].

6.4. Personalization with AI

AI-individualized treatment plans are revolutionizing VR therapy by utilizing machine learning algorithms to create tailored therapeutic environments based on patient information such as heart rate, behavioral characteristics, and session outcome [32]. These systems can prescribe calming simulations for anxiety and structured cognitive-behavioral therapy scenes for depression. Therapists can use XRHealth's AI Reports & Analysis to get tangible data from sessions to better personalize the treatment. Additionally, real-time emotional feedback systems based on AI, such as facial recognition and voice analysis, help therapists measure patient emotions in real-time, helping them develop more effective treatments [33]. Another way AI can be used is AI virtual coaches, which deliver customized CBT content in interactive VR environments. They guide patients through exposure therapy situations to address conditions like social anxiety or phobias. Integrating these systems with empathetic interaction capabilities—such as human-like dialogue simulation and emotional response—can enhance the experience to be more engaging and supportive [34]. These AI-based coaches reduce reliance on human therapists while maintaining high efficacy in treatment outcomes.

6.5. Improved Clinical Validation

Strict clinical trials are crucial for establishing trust in VR and metaverse-based psychiatric therapies. Models like the VR-CORE model, aligned with the FDA's Phase I-III framework, introduce scientific rigor through VR1 studies, VR2 feasibility and proof of concept trials, and VR3 randomized controlled trials [35]. Large-scale trials, such as OxfordVR's gameChange program, validate therapeutic efficacy and build confidence among clinicians, patients, and regulators [12]. Additionally, utilizing validated tools like the PHQ-9 in depression or GAD-7 in anxiety provides consistency from trial to trial as shown in tests for mental health promotion in pregnant women [36]. Compliance with global standards such as HIPAA and GDPR for protecting data again assures stakeholders about the confidentiality of patients and ethical basis [37]. Furthermore, the application of blockchain technology for encrypting clinical trial data further makes the information more transparent, tamper-resistant, and unauthorized access-resistant [38]. Such steps together improve the credibility of VR and metaverse therapies in mental health treatment (**Table 4**).

Table 4. Summary of recommendations.

Healthcare Professionals		
Recommendation	**Example**	**Why it Matters**
Organize accredited CME (Continuing Medical Education) programs about metaverse and VR mental health treatments.	The American Psychiatric Association hosting a workshop on VR exposure therapy for anxiety disorders, featuring live VR demonstrations.	Enhances clinician knowledge and confidence in metaverse-based mental health treatments.
Use VR and metaverse platforms with adjustable exposure situations within evidence-based CBT structures.	A licensed psychologist using VR tools in therapy sessions for social anxiety disorder patients.	Enhances patient engagement, allows individualized therapy at scale, and supports hard-to-reach therapeutic conditions.
Co-design VR modules with mental health clinicians to be utilized by patients between in-person or teletherapy sessions.	A therapy clinic that works with XRHealth to create VR modules practiced independently between weekly therapy sessions.	Extends therapeutic reach and enhances overall treatment adherence between sessions.
Policymakers		
Recommendation	**Example**	**Why it Matters**
Draft VR-specific healthcare privacy legislation that augments HIPAA and GDPR, including biometric data like eye-tracking and emotional response.	European Commission proposing an addition to GDPR that explicitly addresses biometric and emotional tracking data collected through VR therapy software.	Preserves patient confidentiality and fosters public trust in VR mental health treatments.
Implement reimbursement codes for VR therapy programs under public health insurance programs.	NIH funds a five-year study comparing Innerworld's metaverse-based CBT in rural U.S. populations. UK's NHS testing VR therapy programs for PTSD and offering them at no out-of-pocket cost to veterans.	Ensures treatments are tested in real-world populations, unbiased, and increases health equity.
Imposes FDA-style approval processes including clinical trials before the marketing of VR therapies.	U.S. FDA establishing a Digital Health Center of Excellence clearing all immersive mental health platforms before commercial availability.	Decreases cost barrier for vulnerable populations and accelerates adoption of effective treatments. Prevents only evidence-based treatments from reaching the market, protecting patients and encouraging quality of innovation.
VR Companies		
Recommendation	**Example**	**Why it Matters**
Partner with public health infrastructures and producers to minimize hardware costs and improve compatibility with existing devices.	Oculus partnering with healthcare providers to offer discounted headsets to low-income populations or rural communities.	Makes VR accessible to disadvantaged populations and eliminates cost barriers for widespread adoption.
Develops VR applications optimized for flat screens and smartphones, enabling those without headsets to access therapeutic content.	Innerworld with a flat-screen version of their VR mental health app to allow users to participate in social settings on standard devices.	Expands the availability of VR mental health treatment to users who don't have access to VR hardware.

Continued

Employ end-to-end encryption, decentralized data storage, and regular security audits to protect patient data.	XRHealth developing AI-driven VR software that adapts CBT sessions to align with user emotions in real time. MindMaze employing blockchain-base data management systems to secure and preserve integrity of VR therapy data.	Personalization enhances therapeutic effectiveness and patient engagement and enhances outcomes. Establishes trust with users and clinicians, maintaining adherence to legal requirements such as GDPR and HIPAA, and avoids data breaches.
Invests in R&D to create innovative features such as immersive meditation rooms or emotional resilience training programs in the metaverse.	Creating a meditative VR environment in the metaverse that gives users a space to practice mindfulness in reaction to stress in high-density urban environments.	Opens new markets, introduces diverse audiences, and establishes brand awareness as a leader in mental health VR solutions.
Researchers		
Recommendation	**Example**	**Why it Matters**
Conduct and design studies that track patients' progress over a number of years, assessing the sustainability of VR therapy outcomes. Do these studies across different age groups, ethnicities, and levels of mental health severity.	A 5-year longitudinal study examining the efficacy of VR and metaverse treatment in elderly PTSD patients to track long-term recovery rates.	Provides robust evidence of the long-term efficacy of VR therapies, critical for clinical uptake and ensures metaverse and VR treatment is effective across a broad range of users, making them more inclusive and equitable.
Develop and validate new technologies or algorithms that reduce physical discomfort or emotional distress during VR sessions.	Research into adaptive VR systems that modify field-of-view and sensory cues based on user feedback to prevent nausea.	Improved user experience increases the viability of VR therapy and increases its application in real-world settings in diverse populations.
Collaborate with healthcare facilities and standards bodies to create globally accepted performance and effectiveness standards for VR mental health treatments.	Collaboration with NIST or IEEE to create a VR Mental Health Evaluation Framework for trials.	Standardizing measurements guarantees uniformity across studies, allowing for improved comparison of study findings and quicker incorporation of VR into clinical practice.

7. Conclusions

7.1. Summary of Findings

The analysis of XRHealth, Innerworld, and PsyTechVR highlights the potential of VR in mental health treatment but also highlights limitations that need to be addressed for widespread adoption. XRHealth, while innovative in its inclusion of biometric feedback, may trigger distress in PTSD simulations and lacks controlled trials for clinical validation. Innerworld creates calm, avatar-based social spaces, but unmoderated interactions may unsettle anxious users. PsyTechVR emphasizes gradual exposure and professional guidance, while Innerworld relies on secondary research without controlled trials. Pricing influences accessibility, with Innerworld offering budget-friendly options and XRHealth relying on advanced hardware and higher subscription fees. All platforms adhere to GDPR and HIPAA standards, but third-party processors introduce potential vulnerabilities. To overcome challenges, actionable measures include reducing hardware costs, enhanc-

ing device compatibility, and integrating AI-based personalization. Ethical concerns like privacy and data protection must be addressed through robust encryption methods and user-controlled privacy settings. The establishment of global mental health communities in the metaverse could revolutionize support networks.

7.2. Limitation

The finding relies heavily on company-sponsored studies and limited independent research, which may introduce bias. XRHealth has FDA registration only for select therapies, while PsyTechVR and Innerworld primarily report outcomes from internal or small-scale studies. Robust, independent clinical trials and regulatory validation remain limited, and future work should prioritize external evidence to corroborate reported outcomes.

7.3. Final Thoughts

VR and metaverse technologies offer a scalable and personalized solution to traditional mental health barriers, such as stigma, cost, and long wait times. With a national median wait time of 67 days, these technologies have the potential to become mainstream care delivery solutions [39]. However, challenges like affordability, access, side effects, privacy, and clinical efficacy need to be addressed. Collaboration among clinicians, researchers, policymakers, and developers can revolutionize mental health care by leveraging AI-enabled personalization and metaverse-enabled worldwide networks.

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Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

References

[1] Gosmann, N.P., Costa, M.d.A., Jaeger, M.d.B., Motta, L.S., Frozi, J., Spanemberg, L., *et al.* (2021) Selective Serotonin Reuptake Inhibitors, and Serotonin and Norepinephrine Reuptake Inhibitors for Anxiety, Obsessive-Compulsive, and Stress Disorders: A 3-Level Network Meta-Analysis. *PLOS Medicine*, **18**, e1003664. https://doi.org/10.1371/journal.pmed.1003664

[2] Churchill, R., Moore, T.H., Caldwell, D., Davies, P., Jones, H., Furukawa, T.A., *et al.*

(2010) Cognitive Behavioural Therapies versus Other Psychological Therapies for Depression. *Cochrane Database of Systematic Reviews*, No. 10, CD008698. https://doi.org/10.1002/14651858.cd008698

[3] Thorp, S.O., Rimol, L.M., Lervik, S., Evensmoen, H.R. and Grassini, S. (2024) Comparative Analysis of Spatial Ability in Immersive and Non-Immersive Virtual Reality: The Role of Sense of Presence, Simulation Sickness and Cognitive Load. *Frontiers in Virtual Reality*, **5**, Article 1343872. https://doi.org/10.3389/frvir.2024.1343872

[4] Fodor, L.A., Coteț, C.D., Cuijpers, P., Szamoskozi, Ş., David, D. and Cristea, I.A. (2018) The Effectiveness of Virtual Reality Based Interventions for Symptoms of Anxiety and Depression: A Meta-Analysis. *Scientific Reports*, **8**, Article No. 10323. https://doi.org/10.1038/s41598-018-28113-6

[5] Halkiopoulos, C. and Gkintoni, E. (2025) The Role of Machine Learning in AR/VR-Based Cognitive Therapies: A Systematic Review for Mental Health Disorders. *Electronics*, **14**, Article 1110. https://doi.org/10.3390/electronics14061110

[6] Kothgassner, O.D., Goreis, A., Kafka, J.X., Van Eickels, R.L., Plener, P.L. and Felnhofer, A. (2019) Virtual Reality Exposure Therapy for Posttraumatic Stress Disorder (PTSD): A Meta-Analysis. *European Journal of Psychotraumatology*, **10**, Article ID: 1654782. https://doi.org/10.1080/20008198.2019.1654782

[7] Gao, D., Su, Y., Zhang, X., Li, H. and Luo, H. (2024) The Application of Virtual Reality Meditation and Mind-Body Exercises among Older Adults. *Frontiers in Psychology*, **15**, Article 1303880. https://doi.org/10.3389/fpsyg.2024.1303880

[8] Oh, H. and Son, W. (2022) Cybersickness and Its Severity Arising from Virtual Reality Content: A Comprehensive Study. *Sensors*, **22**, Article 1314. https://doi.org/10.3390/s22041314

[9] Lundin, R.M., Yeap, Y. and Menkes, D.B. (2023) Adverse Effects of Virtual and Augmented Reality Interventions in Psychiatry: Systematic Review. *JMIR Mental Health*, **10**, e43240. https://doi.org/10.2196/43240

[10] Shi, F., Ning, H., Zhang, X., Li, R., Tian, Q., Zhang, S., *et al.* (2024) A New Technology Perspective of the Metaverse: Its Essence, Framework and Challenges. *Digital Communications and Networks*, **10**, 1653-1665. https://doi.org/10.1016/j.dcan.2023.02.017

[11] Huynh-The, T., Gadekallu, T.R., Wang, W., Yenduri, G., Ranaweera, P., Pham, Q., *et al.* (2023) Blockchain for the Metaverse: A Review. *Future Generation Computer Systems*, **143**, 401-419. https://doi.org/10.1016/j.future.2023.02.008

[12] Freeman, D., Lambe, S., Kabir, T., Petit, A., Rosebrock, L., Yu, L., *et al.* (2022) Automated Virtual Reality Therapy to Treat Agoraphobic Avoidance and Distress in Patients with Psychosis (Gamechange): A Multicentre, Parallel-Group, Single-Blind, Randomised, Controlled Trial in England with Mediation and Moderation Analyses. *The Lancet Psychiatry*, **9**, 375-388. https://doi.org/10.1016/s2215-0366(22)00060-8

[13] Ezawa, I.D., Hollon, S.D. and Robinson, N. (2023) Examining Predictors of Depression and Anxiety Symptom Change in Cognitive Behavioral Immersion: Observational Study. *JMIR Mental Health*, **10**, e42377. https://doi.org/10.2196/42377

[14] Freeman, D., Reeve, S., Robinson, A., Ehlers, A., Clark, D., Spanlang, B., *et al.* (2017) Virtual Reality in the Assessment, Understanding, and Treatment of Mental Health Disorders. *Psychological Medicine*, **47**, 2393-2400. https://doi.org/10.1017/s003329171700040x

[15] Stephen, J. (2024) XRHealth Acquires NeuroReality to Bolster Therapeutic Offerings. https://www.xrtoday.com/virtual-reality/xrhealth-acquires-neuroreality-to-bolster-therapeutic-offerings/

[16] Huffman, A. (2024) Innerworld and VHA Launch Innovative Mental Health Partnership to Support Veterans. https://news.clearancejobs.com/2024/03/15/innerworld-and-vha-launch-innovative-mental-health-partnership-for-veterans-using-virtual-reality/

[17] Lobell, K. (2023), Virtual Reality Platform Innerworld Offers a Safe Space for Peer-Led Mental Health Support. https://www.success.com/innerworld-mental-health-support/

[18] Roddick, D.G. (2025) Understanding VR for Cognitive Behavioral Therapy (CBT): Techniques and Benefits. https://psytechvr.com/vr-for-cognitive-behavioral-therapy

[19] Andreev, D. (2022) Self-Guided Travel Therapy Training in VR for Mental Wellness. https://psytechvr.com/travel-therapy-in-vr

[20] Takahashi, D. (2024) Mental Health App Innerworld Adds Membership Tier with Licensed Therapists. https://gamesbeat.com/mental-health-app-innerworld-adds-membership-tier-with-licensed-therapists/

[21] Spiro, J. (2024) XRHealth Is Taking Physical Patient Care into the Digital World. https://www.calcalistech.com/ctechnews/article/h1pbeqgor

[22] XRHealth (2024) XR Health Secures Utility Patent for Groundbreaking Virtual and Augmented Reality Telecommunication Platforms. https://www.prweb.com/releases/xr-health-secures-utility-patent-for-groundbreaking-virtual-and-augmented-reality-telecommunication-platforms-302271954.html

[23] Panatonni, L.M. (2025) Exploring the Impact of Virtual Reality Therapy on Depression. https://psytechvr.com/vr-therapy-depression

[24] XRHealth (2024) XRHealth and VA St. Louis Healthcare System Partner to Provide VR Therapy to Veterans. https://www.prnewswire.com/news-releases/xrhealth-and-va-st-louis-healthcare-system-partner-to-provide-vr-therapy-to-veterans-300988923.html

[25] Kouijzer, M.M.T.E., Kip, H., Bouman, Y.H.A. and Kelders, S.M. (2023) Implementation of Virtual Reality in Healthcare: A Scoping Review on the Implementation Process of Virtual Reality in Various Healthcare Settings. *Implementation Science Communications*, **4**, Article No. 67. https://doi.org/10.1186/s43058-023-00442-2

[26] Veras, M., Labbé, D.R., Furlano, J., Zakus, D., Rutherford, D., Pendergast, B., *et al.* (2023) A Framework for Equitable Virtual Rehabilitation in the Metaverse Era: Challenges and Opportunities. *Frontiers in Rehabilitation Sciences*, **4**, Article 1241020. https://doi.org/10.3389/fresc.2023.1241020

[27] Korte, M. (2020) The Digital Revolution and Its Impact on Human Brain and Behavior. *Dialogues in Clinical Neuroscience*, **22**.

[28] Rouhani, R., Umatheva, N., Brockerhoff, J., Keshavarz, B., Kruijff, E., Gugenheimer, J., *et al.* (2024) Towards Benchmarking VR Sickness: A Novel Methodological Framework for Assessing Contributing Factors and Mitigation Strategies through Rapid VR Sickness Induction and Recovery. *Displays*, **84**, Article ID: 102807. https://doi.org/10.1016/j.displa.2024.102807

[29] Zhang, L., Wang, J., Qi, R., Pan, L., Li, M. and Cai, Y. (2015) Motion Sickness: Current Knowledge and Recent Advance. *CNS Neuroscience & Therapeutics*, **22**, 15-24. https://doi.org/10.1111/cns.12468

[30] Lake, K., Mc Kittrick, A., Desselle, M., Padilha Lanari Bo, A., Abayasiri, R.A.M., Fleming, J., *et al.* (2024) Cybersecurity and Privacy Issues in Extended Reality Health Care Applications: Scoping Review. *JMIR XR and Spatial Computing*, **1**, e59409.

https://doi.org/10.2196/59409

[31] Jabin, M.S.R. (2024) Operational Disruption in Healthcare Associated with Software Functionality Issue Due to Software Security Patching: A Case Report. *Frontiers in Digital Health*, **6**, Article 1367431. https://doi.org/10.3389/fdgth.2024.1367431

[32] Thakkar, A., Gupta, A. and De Sousa, A. (2024) Artificial Intelligence in Positive Mental Health: A Narrative Review. *Frontiers in Digital Health*, **6**, Article 1280235. https://doi.org/10.3389/fdgth.2024.1280235

[33] Olawade, D.B., Wada, O.Z., Odetayo, A., David-Olawade, A.C., Asaolu, F. and Eberhardt, J. (2024) Enhancing Mental Health with Artificial Intelligence: Current Trends and Future Prospects. *Journal of Medicine, Surgery, and Public Health*, **3**, Article ID: 100099. https://doi.org/10.1016/j.glmedi.2024.100099

[34] Wei, S., Freeman, D. and Rovira, A. (2023) A Randomised Controlled Test of Emotional Attributes of a Virtual Coach within a Virtual Reality (VR) Mental Health Treatment. *Scientific Reports*, **13**, Article No. 11517. https://doi.org/10.1038/s41598-023-38499-7

[35] Birckhead, B., Khalil, C., Liu, X., Conovitz, S., Rizzo, A., Danovitch, I., *et al.* (2019) Recommendations for Methodology of Virtual Reality Clinical Trials in Health Care by an International Working Group: Iterative Study. *JMIR Mental Health*, **6**, e11973. https://doi.org/10.2196/11973

[36] Lee, B., Lim, H.J., Park, J., Kim, K., Suh, H., Lee, B.D., *et al.* (2024) Efficacy of Virtual Reality Program for Mental Health Promotion in Pregnant Women. *Clinical Psychopharmacology and Neuroscience*, **23**, 32-41. https://doi.org/10.9758/cpn.23.1127

[37] Al-Kfairy, M., Alrabaee, S. and Alfandi, O. (2024) Ethical Pathways in VR and the Metaverse: Frameworks for Responsible Innovation. 2024 2*nd International Conference on Intelligent Metaverse Technologies & Applications* (*iMETA*), Dubai, 26-29 November 2024, 9-17. https://doi.org/10.1109/imeta62882.2024.10807903

[38] Ali, S., Abdullah,, Armand, T.P.T., Athar, A., Hussain, A., Ali, M., *et al.* (2023) Metaverse in Healthcare Integrated with Explainable AI and Blockchain: Enabling Immersiveness, Ensuring Trust, and Providing Patient Data Security. *Sensors*, **23**, Article 565. https://doi.org/10.3390/s23020565

[39] Sun, C., Correll, C.U., Trestman, R.L., Lin, Y., Xie, H., Hankey, M.S., *et al.* (2023) Low Availability, Long Wait Times, and High Geographic Disparity of Psychiatric Outpatient Care in the Us. *General Hospital Psychiatry*, **84**, 12-17. https://doi.org/10.1016/j.genhosppsych.2023.05.012