

Designing an app for screening the possible mental health issues in adolescents and PwDs

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Submitted by

KAPIL KUMAR SINGH (2100290120092)

PIYUSH MISHRA (2100290120118)

NAYAN PATHAK (2100290120112)

KAPIL CHAUHDHARY (2100290120091)

Supervised by

PROF. SHREELA PAREEK

Assistant Professor

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DEPARTMENT OF COMPUTER SCIENCE

KIET GROUP OF INSTITUTIONS, GHAZIABAD

**(Affiliated to Dr. A. P. J. Abdul Kalam Technical University, Lucknow,
U.P., India)**

DECLARATION

We hereby declare that this submission is our own work and that, to the best of our knowledge and belief, it contains no material previously published or written by another person nor material which to a substantial extent has been accepted for the award of any other degree or diploma of the university or other institute of higher learning, except where due acknowledgment has been made in the text.

Signature

Kapil Kumar Singh (2100290120092)

Piyush Mishra (2100290120118)

Nayan Pathak (2100290120112)

Kapil Chauhdhary (2100290120091)

17th Feb 2025

CERTIFICATE

This is to certify that Project Report entitled “**Designing an app for screening the possible mental health issues in adolescents and PwDs**” which is submitted by Kapil Kumar Singh, Piyush Mishra, Nayan Pathak, Kapil Chauhdhary in partial fulfillment of the requirement for the award of degree B. Tech. in Department of Computer Science of Dr. A.P.J. Abdul Kalam Technical University, Lucknow is a record of the candidates own work carried out by them under my supervision. The matter embodied in this report is original and has not been submitted for the award of any other degree.

Date: 17th Feb 2025

Supervisor: Prof. Shreela Pareek (Assistant Professor)

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the project.

17th Feb 2025

Kapil Kumar Singh (2100290120092)

Signature:

Piyush Mishra (2100290120118)

Signature:

Nayan Pathak (2100290120118)

Signature:

Kapil Chauhdhary (2100290120091)

Signature:

ABSTRACT

There is growing concern about the mental health of the nation's young, particularly teenagers, as the number of children and young people with anxiety or a phobia has exploded in recent years. Conventional methods of therapy are challenging to incorporate because of accessibility, participation, and treatment efficacy barriers. We describe the design of a system that (if successfully developed) will for the first time allow for fully automated potential mental health care by integrating principles behind AI and immersive VR exposure therapy. The platform includes VR therapy, peer-support chat rooms, and emotional assessment through AI to adopt an individual-centric strategy. The system helps users strengthen their ability to handle levels of fear and panic. Add to the mix the penetration of chatbots and peer-to peer communication along with personalized recommendations.

In today's fast world, people want another thing to add into the emotional train cars, even to the extent of borrowing virtual reality. When you have VR, you can put a shooter in the last place on earth less fraught with tension for a shooter, and from here the guy that's in control of that shooter can start to deal with his fucking demons on a personal level.

This research project explores the application of Artificial Intelligence (AI) and Virtual Reality (VR) in mental therapy. "We all know that diagnosis and customised assessment can be done on demand and in an instant, AI-powered chatbots and NLP (Natural Language Processing) models such as GPT-4o exist, what VR does is it gives you that immersive and regulated environment in which treatment can take place. Through VR exposure therapy, a patient can confront his fear/ phobia in a controlled and safe environment and that is why the success rate of the therapy is higher. With the inclusion of AI-driven diagnostic technology and VR therapy, it delivers a complete and accessible, personalized mental health care solution.

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LIST OF ABBREVIATIONS

Abbreviation	Word
VR	Virtual Reality
VRET	Virtual Reality Exposure Therapy
AI	Artificial Intelligence
CBT	Cognitive Behavioural Therapy
SCL-90	Symptoms Check List - 90
API	Application Programming Interface
HTTPS	Hyper Text Transfer Protocol Secure
NLP	Natural Language Processing

MAPPING WITH SDG GOALS

SDG 3: Good Health and Well-Being

- **Mental Health:** The project makes a powerful contribution towards the management of mental health struggles by providing VR-based exposure therapy for phobias and anxiety that is both fun and effective.
- **Early Intervention & Support:** The AI-based mood forecasting system enable to discover mental health problems in its early stage and users receive support accordingly.
- **Community Healing:** Live peer-support chat rooms provides a safe space for members to share and help reduce feelings of isolation.
- **Therapy on Tap:** The platform provides affordable, tech-enabled therapy that could be accessible to individuals who otherwise wouldn't have access to traditional counseling services.

SDG 9: Industry, Innovation, and Infrastructure

Promote inclusive and sustainable industrialization and foster innovation.

- **Technology Adoption:** Utilizes advanced technology i.e., VR, AI, and ML to care mental health.
- **Digital Healthcare:** The project supports the digitalization of the health sector by delivering a technology-based care offering for mental health.

SDG 17: Partnerships for the Goals

Enhance the means of implementation and renew the global partnership for sustainable development.

- **Partnerships with Health Care Providers:** The project may collaborate with hospitals, mental health clinics and NGOs to deliver digital therapy services.
- **Educational Partnerships:** Universities and schools may work with the platform to assist students in dealing with anxiety and stage fear.
- **Company Partnerships:** Companies can add the platform to their wellness offerings to lower employee stress and raise productivity.
- **Public-Private Partnership (PPP):** Platform can be in partnership with government health departments to provide mental health services in remote locations

CHAPTER 1

INTRODUCTION

1.1. Background and Significance

Mental conditions are today considered as a major public health problem of the 21st century. There are nearly 970 million people with a mental disorder globally, of whom close to 300 million are attributable to anxiety disorders (WHO, 2021). Adolescents — that's the age group roughly between 10 and 19 years old, according to the W.H.O. — are especially vulnerable since they are struggling with rapid changes in their body, brain and social stratification. Most, if not all, phobias, including "school refusal, failure, social relationships, blushing, and overall quality of life" fears, tend to emerge at this age and they can be serious;" including performance-based anxieties such as stage fright. Although traditional modes of delivery of CBT and exposure therapy are delivered effectively in clinical settings, they are also underutilized as a result of cost, stigma, and geographic barriers to access. Technology including...) Allergists now have access to technology including VR (Virtual Reality) and AI (Artificial Intelligence) that can address this treatment gap at scale.

Introduction Recent technological developments have had a major impact on virtually all domains of health care, including mental health care. Virtual Reality (VR) and Artificial Intelligence (AI) are emergent technologies that can allow personalized and motivating interventions in the rehabilitation process. This tech provides safe, immersive spaces for users to confront fears, test out coping strategies and track progress on overall mental health.

The innovation of this Phase I effort is in the introduction of VR and AI technologies, into the same platform, giving individuals control and participation in the therapeutic process of their anxiety, phobia, or stress in a more timely and effective manner. It is a revolution in the way we look at conventional treatments, and a new view of mental health for those who would not receive help any other way.

1.2. Introduction to Project

In this paper, we present VR-Based Mental Health Support Platform as a complete software system--designed to help users to address psychological issues (e.g., anxiety with stage fright, atelophobia, and other types of related stress) using an immersive, technology-supported course of action. The app uses Virtual Reality (VR) exposure therapy to gradually plunge the user into anxiety-inducing situations within a controlled environment, at its simplest. If they can mimic scenarios such as the type of public speaking, they would do in a packed auditorium, taking flights in a plane or crossing a very tall bridge, they will be able to "practice" in a very real way, build confidence and monitor how they are doing over time. Sessions are tailored to an individual user's triggers and comfort, and over time the device adjusts its intensity and complexity based on user resilience.

In the background, the platform has running, a set of sophisticated AI — mood-prediction algorithms that observe and interpret indirect signals in your behaviour and physiological

activities — how much do you talk or don't you talk, the tone of your voice, how you report stress — that it can use to figure out your emotional profile in real time. Based on this profile, the system makes recommendations for potential evidence-based strategies to address this profile, such as focused breathing, decreasing muscle tension, and taking a brief mindfulness break. These personalized interventions could be delivered as part of VR sessions, or stand-alone to assist and help users.

Peer support: In order to facilitate community and support for each other, peer-support chatrooms with text and voice channels are provided as part of the platform. It is in moderated groups, organized by theme like “Overcoming Stage Fright,” “Flying Without Fear” or “Daily Anxiety Management,” that users share experiences, trade tips or offer a sympathetic ear to one another. Expert moderation and the proactive use of tools assist when starting up a conversation but can only go so far in protecting against abuse and can not do anything about what happens outside the comfort of the Muslim Mingle community.

The result is an all-in-one mental health toolkit, delivered in the form of immersive VR exposure therapy, AI powered mood tracking and a community driven support network, giving users the power to take a proactive stance on well-being. Our detailed progress dashboards enable you to see your improvement over time, tracking statistics such as anxiety scores, sessions completed and community progress. Therapists/counsellors may receive the data in an encrypted format, if the user desires so, contributing to an enriched care model, which marries the classical therapy with effective digital interventions.

Lastly, this VR-Supported Mental Health Platform provides accessibility of high quality mental health interventions to the users worldwide by implementing them in a more interactive and personal manner for Each Client. There is support for a range of devices The device also works with a wide range of popular devices; smartphones, standalone VR headsets, or on desktop computers – wherever those that need the treatment actually are at the time. “It is really exciting to see these cutting-edge technologies combined with AI and social support in a way that will scale user-centric mental health care to people when and where they need it.” The organisation wants this programme to prove to be the catalyst for scaling user-centred care for mental health globally.

1.3. Project Category

This research spans across several interdisciplinary areas and demonstrates the novel and high impact of technology driven mental health intervention.

- **Tech Wellness for Mental Health** – App is a top line digital-health solution offering on-demand therapy support for customers who suffer from anxiety, phobia, or stress-related disorders. It is designed to supplement conventional treatment by offering a constant, user-stimulated experience, self-administered either alone or under supervision by a therapist. It meets a growing demand globally for scalable mental health interventions in areas where mental health professional resources are limited.

- **Artificial Intelligence and Machine Learning-** Based on the user inputs and the emotions he acts, the AI/ML algorithms follow the user preferences- which are converted into positive consumer signals, and makes relevant suggestion. The algorithms leverage interaction histories of all users to personalize treatment suggestions, such as relaxation techniques, session intensity, and coping styles. By analyzing predictions, we can detect the swords of stress swinging around corners in good time for the system to intervene with appropriate support.
- **Virtual Reality (VR)** – Using VR to help create ‘real world’ type environmental simulations, resulting in anxiety provoking scenarios being simulated in a safe and controlled way. With exposure therapy, users can face their fears of things such as public speaking, heights or social situations in those virtual environments. The environment is interactive, customizable and customized for the user’s fear-level, taking a gradual, playful path to overcoming fear and gaining self-awareness.
- **Software Development and Mobile Application**--the platform is implemented as a cross platform application that can be run on mobile devices, standalone VR devices, and web browsers. It is designed with user-friendly interfaces, smooth operations, secure authentication, and data encryption. The application design ensures performance degradation rate, scalability and maintainability with opportunity to easily add functionality to third-party services such as chatbots for mental health, wellness trackers etc.

Ultimately, the project is an attempt to bridge the gap between traditional mental health treatments and new, technology-based treatment options by providing you with an advanced medicinal and social support platform. It’s aimed at various groups of users, including health and mental health professionals, educational institutions, NGOs, corporate well-being programmes using AI insights, immersive VR modules and real-time peer to peer communication. The offering is especially useful for early intervention, continuous self-help and adjuvant therapy - hence, a comprehensive, cost-effective and futuristic mental wellness solution.

1.4. Objectives

Key aims of this project include establishing a complete and user-friendly new treatment for various mental health problems. The service allows people to identify, understand and overcome phobias, anxiety, and stress-related disorders using immersive technology and AI.

- **Expand Access to Mental Health Care -**

A key mission of the platform is to provide more people with access to mental health resources. If not only because the project overcomes obstacles like location, money and shame through a smartphone-VR headset digital approach, but also — and, perhaps, more

importantly, since it is one of the few to do so. It democratizes therapy — everyone can now get help, even if you are afraid to ask for it.

- **Experience Real VR Therapy-**

Using virtual reality (VR), the service provides a confrontational exposure therapy experience in which users can face their phobia in a safe, controlled environment. For instance, an individual with a fear of public speaking can rehearse speaking in public in a digital amphitheatre. This is a place to learn to relax and replace your anxiety with calm with the help of a community who knows what you are going through, because they are too! You are learning slowly, where your triggers for anxiety are, and gradually being exposed to these triggers so as to desensitize you in the real world.

- **Implement a Personalized Treatment:**

Personalization in-session therapy This is probably the area of therapy practice where AI fortifies practice most. It would act on behavioral answers and actions given by the user as well as emotions that the user reports so that the coping strategy can be personalized to the user. These could be mindfulness and meditation exercises, progressive relaxation exercises or imagined scenarios. This means each user's mental health journey is completely personalized to meet each user's unique needs and progression.

- **Promote Community Assistance:**

Recognizing the value of peer support, it includes secure chat rooms for instant messaging. These moderated forums allow members to post their own stories and encourage each other, and discuss common challenges in a supportive environment. This makes people feel included and reduces loneliness-the type of loneliness that can be associated with mental illness.”

- **Promote Self-Monitoring:**

For users hoping to get back to their healthier selves, Having will also offer tools to track emotional and behavioural recovery. Motivational insights, feedback summaries, and personal goal achievements through AI help users keep motivated while realising their improvements in mental health throughout time. That self-awareness is critical for long-term success and is part of what makes participating in the system a stick.

Finally, the platform aims to offer an integrated approach to mental health care that addresses the emotional and social dimension of holistic health. The project aims to create a fun, effective and widely accessible tool that brings the best practices of therapy to the latest technology to help everyone, no matter what their age or anything else, to get their emotions under better control.

1.5. Traditional Diagnosis and Treatment: Its Limitations

The Old School In traditional Conventional mental health care you get face to face therapy and mental counseling and sometimes medication. Mobilization / Communication There are a number of therapeutic techniques intended to puncture the prevalent mythology of our

Western culture. One of the best known (and researched) is Cognitive Behavioral Therapy (CBT), under the auspices of which people are supposed to be trained to identify and modify their negative thinking and behaviour patterns. Psychiatrists, psychologists and others often dedicate several sessions to working with patients in a structured way to develop effective strategies to manage and heal their emotions. While the classical methods have been successful in many instances, contains few notable limitations that restrict its practical usability and efficiency.

- **Accessibility Issues:**

Many people faraway don't have access to professional mental health care. Patients throughout those regions may have 'to drive for hours or wait months to get the help they need', because there's an apparent shortage of therapists and psychiatrists. Furthermore, therapy is usually quite expensive, in particular with a private practitioner, and not everyone can afford it. Mental health insurance is also spotty which makes ongoing care difficult to maintain.

- **Stigma and Privacy:**

There is still stigma around mental health in many cultures. So when people won't stop picking on those who suffer from anxiety and depression, alienating them from society, or labelling them as "weak" or "unstable," such people who suffer are least likely to seek help, after all. Even if help is available, the fear of being seen going into a mental health clinic, or the fear of discussing oneself with a therapist, can keep people from taking the first step toward getting better. Such resistance leads to undertreatment and unmet need in mental health.

- **Lack of Engagement:**

Therapy programmed in a classic way is typically planned and contains therapeutic but may not dynamic and immersive enough level for a patient to be truly and strongly involved in a treatment on a daily basis. Suddenly turning to a counsellor can be boring and clinical, especially for teens or those who struggle to stay motivated. Without interactive and/or gamified features, these patients may drop-out or not adhere to advice or recommendations.

- **Limited Personalization:**

Self-reported data collected by mental health care professionals during routine follow-up visits and follow-up in treatment are typically utilized for tracking a patient's progress. But the data is subjective in its own right, and could be untrustworthy in so far as memory lapses, emotions, lack of self-awareness are overlaid upon it. Physicians can not readily modify the treatment schedule, if they are not aware of the time line in the day of the patient and/or his affective state on-line.

These challenges, in turn, highlight an acute demand for more creative, accessible and engaging mental health care — forms of such care that can reach people where they are, provide meaningful privacy and immediate support and feedback, and in the process save time, money and heartache. The above challenges can be alleviated through this VR

mental health support platform with immersive VR experiences, AI, and peer support, which targets many of these limited components

1.6. Our Approach: Technology-Driven Mental Health Support

We overcome the limitations of the existing therapeutic approaches with our proposed solution that harnesses cutting-edge technologies such as Virtual Reality (VR) and Artificial Intelligence (AI) to offer a multi-modal and complete mental health support package. Conventional therapy, which may be effective, is generally not readily available, is not tailored to the individual's needs, and lacks interactivity. Our platform closes these gaps, by providing a more engaging and user-focused approach, and specifically for patients with phobias, anxiety (e.g. social anxiety and stage fright), and anxiety related disorders.

- **Immersive VR Exposure Therapy:**

At the heart of the platform is VR-powered exposure therapy, which aims to create a secure environment to gradually face and relieve fears. This is an especially appealing feature for those who are reluctant or unable to undergo in-vivo exposure for logistical, emotional, or psychological reasons.

For example, people who experience social anxiety can have virtual conversations with simulated characters, practice public speaking in a virtual auditorium and confront stressful scenarios such as boarding an airplane or crossing a tall bridge. The sense of presence in VR plays an important role in maintaining realism in these simulations and thereby to desensitization and over time the building of confidence. It is a progressive and adaptive approach that is scaled upwards in difficulty when the patients are ready for it.

- **Chatroom and Chatbot Support:**

As an add-on to the VR experience, the platform also has interactive mental health chatrooms for users to communicate with fellow sufferers. These open chat rooms provide you a secure, easy, and moderated online space in which you can share in helpful and edifying dialogue through live chat. Users have the option to join anonymously, so they can be open without being judged. Additionally, there is an AI-based chatbot accessible 24/7 to provide real-time assistance when needed.

Through a virtual helper these can be overcome (guiding through breathing exercises or taking short meditation or grounding exercises for highly anxious moments) so preoccupied people learn never to be alone in those rough moments. As an add-on to the VR experience, the platform also has interactive mental health chatrooms for users to communicate with fellow sufferers. These open chat rooms provide you a secure, easy, and moderated online space in which you can share in helpful and edifying dialogue through live chat.

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exercises or taking short meditation or grounding exercises for highly anxious moments) so preoccupied people learn never to be alone in those rough moment.

- **Data-Driven Insights:**

Platform also focuses on self-awareness and keeping track of progress, using data-based insights.

It gathers information from users -

— how often they are checking in, what makes them anxious, the trends in their moods, what coping tools they are using — and produces reports and visual maps. This information gives users the ability to track outcomes and patterns and make evidence-informed decisions about their therapy and activities. Furthermore, this can be an optional information transfer to mental health professionals for a more customized and efficient hybrid treatment plan.

CHAPTER 2

LITERATURE REVIEW

2.1. Introduction

The percent of these cases of anxiety, phobia and stress in the world continues to grow day by day. Worldwide disability ranking of mental illness, the third place, has been managed by WHO (1). Early intervention is key to successful treatment, but current approaches suffer from challenges such as accessibility, engagement, and personalization. Virtual Reality (VR) and Artificial Intelligence (AI) are one of the most recent technology trends, that can address the problems mentioned above. This paper introduces the current status of mental health assessment and psychotherapy, limitations of traditional methods, and how new technologies could address the limitations.

2.2. Traditional Mental Health Assessment Methods and Their Limitations

2.2.1. Symptom Checklists and Psychological Tests

- **SCL-90-R (Symptom Checklist-90-Revised):** Among the measures, SCL-90-R is one of the most widely used tools to measure psychological symptoms, including anxiety, depression, and somatization [2]. Force rates symptoms on a scale of 0 (not present at all) to 4 (extremely) and gives an overall profile of an individual's mental state.
 - **Limitations:** SCL-90-R is a self-report scale, and might be subject to response bias. Most cases under-report or over-report the symptoms based on self-bias or lack of insight [3]. Furthermore, the SCL-90-R is a static depiction of emotional states and is incapable of capturing moment-by-moment behaviours.
- **Hamilton Anxiety Rating Scale (HAM-A):** HAM-A is widely used in the measurement of severity of anxiety symptoms [4].
 - **Cons:** Only an expert can deliver it, time-consuming, costly. Additionally, it can fail to detect modest treatment effects [5].

2.2.2. Traditional Treatment Methods for Phobias and Anxiety

- **CBT can help introduction to CBT Cognitive Behavioural Therapy (also known as CBT)** CBT is the therapy most commonly used to treat anxiety and phobias. It also gives patients the chance to re-frame negative beliefs, practice coping skills and access to telehealth resources [6].
 - **Barriers:** CBT is usually delivered face-to-face. Patients without proximity to centres of [high-quality] care may not have access to CBT.

It could also be that some patients prefer in vivo tasks to be based on real rather than imaginal tasks [7]

- **Treatment:** Anti-anxiety agents such as antidepressants and benzodiazepines may be prescribed [8].
 - **Cons:** The drugs can cause side effects like drowsiness, dependence and withdrawal. Further, they do not address the cause of anxiety and act as palliative therapies [9].

2.3. Challenges in Traditional Methods

- **Limited Accessibility:** In-person therapy is costly and less easily accessible, particularly in remote regions [10].
- **Stigma:** People are reluctant to seek help because of the patients sometimes are afraid of social stigma towards mental disorders [11].
- **One-Size-Fits-All Approach:** It is because the one-size-fits all methods cannot meet the diverse requirements of individuals which cause low engagement and high turnover [12].
- **Lack of Real-Time Monitoring:** The interval between the assessments in most conventional approaches may defer the time to intervene at times of disasters [13].

2.4. Technological Solutions to Overcome Traditional Limitations

2.4.1. Virtual Reality (VR) in Exposure Therapy

- VR allows for exposure to a controlled and immersive environment in which users can engage fear-eliciting experiences, like height, public speaking, or social situations, in a safe manner [14]. It has been demonstrated by studies that VR based exposure therapy is as effective as in vivo exposure in terms of phobia treatment [15].
- **Advantages over Traditional Methods:**
 - Introduction gradual, adjustable intensity soft opening full closure is opening where you want it, as much as you want it.
 - Provides a secure and discreet environment to help to break down the stigma barriers.
 - Gamification Increases engagement with games.

2.4.2. Artificial Intelligence (AI) for Mood Analysis and Personalized Therapy

- AI-enabled models that analyze user behavior, such as chat patterns, voice tone, and sentiment, in order to recognize emotional states in real-time [16].
- Machine Learning (ML) models trained over datasets involving mental health predicted early symptoms of anxiety and depression to extend proactive therapy [17].
- **Advantages in Relation to Conventional Assessments (e.g., SCL-90):**
 - Monitors are continuous, rather than being one-offs.
 - Minimizes response bias since data are collected passively.
 - Provide personalized recommendations according to user history.

2.4.3. Instant Support for chatbots

- AI-based chatbots provide round-the-clock support for emotional issues and lead the users in anxiety reduction exercises, such as deep breathing and grounding [18].
- Studies have indicated that people are more likely to express their emotions to chatbots because of anonymity and lack of judgement [19].
- **Advantages:**
 - Immediate help without having to wait for a therapist.
 - Can be used in conjunction with the programmes you are already running to support human counselling.

2.4.4. Peer-Support Chatrooms

- Peer-support systems are utilised to **share experiences and advice** and to provide **mutual emotional** support. In a trial of “friendship’ psychoeducation, undertaken by the National Institute of Mental Health (NIMH), 85% of its participants developed decreased symptoms of loneliness via support with peers [20].
- **Advantages over Traditional Group Therapy:**
 - You can access any time of day when you don't have access to scheduled group therapy.
 - Offers greater support, by connecting with others from other destinations that have comparable experiences.

2.5. Comparative Analysis of Traditional vs. Technology-Driven Methods

Criteria	Traditional Methods (e.g., SCL-90, CBT, HAM-A)	Technology-Driven Methods (VR, AI, Chatbots)
Accessibility	Geographical areas [10] And therapist availability and location [10]	Global via VR and mobile [14]
Engagement	Mild, may be contraindicated in standard exposure treatment[7]	High user interaction via virtualized environment [15, 37], intertwining of VR experiences with gamification [15]
Personalization	Generic, one-size-fits-all invitation [12] With these SPECs, specific invitations tend to be generic, one-size-fits-all.	Personalized Therapy Using AI Based on User Behaviour [16]
Real-Time Monitoring	No Periodic Re-evaluations Reliance on re-evaluations [13]	Real-time AI-based mood monitoring [17]
Privacy & Strigma	Stigma can prevent people from seeking treatment [11]	Private but not anonymous interaction with AI chatbots [18]
Cost-Effectiveness	The cost and therapist fee is considered high [10]	Affordable digital solutions with potential for scaling [19]

2.6. Conclusion

On the other hand, the review on traditional methods used in mental health disorders treatment, the SCL- 90, HAM-A and CBT, reminds the reader that since several decades these traditional methods have been applied locally. They have also benefited a generation of practitioners in their evaluation of symptoms and organization of treatment sessions,” offering an evidence-based model that has helped countless numbers of people. However, these approaches, although clinically relevant, may present practical limitations particularly in terms of availability, persistence of participation and on-line response. For instance, professionally licensed therapists might be geographically, financially or socially out of reach for others. Aside from that, traditional therapy very often lacks the interactivity and

gamification that many users particularly the young ones, need most to keep them inspired and persistent in their treatment.

Digital technologies, in turn, have begun to democratize the delivery of mental health care. Through VR exposure therapy, patients can confront their fears in a virtual, controlled and immersive environment without needing to do so in real life, representing a realistic alternative for in-vivo methods. AI mood predication apps offer even more customization, drawing from a user's behaviour, talk and engagement to give them real-time emotional nudges and suggested coping mechanisms that fit the individual. This gets you instant support and help outside of normal therapy hours so no surge has to wait to get help! Peer-support groups also foster a sense of community among those who identify with one another and can make suggestions or provide support to one another for issues they face, bridging the emotional distance experienced by many of those with mental health conditions feel.

By strategically harmonising these technologies into an end-to-end mental health support system, this project endeavours to reconcile clinical efficacy with user-friendly accessibility. The aim is to provide a platform that is effective, engaging, flexible and scalable – one that can meet the needs of every user and can provide constant on-demand support. At the end of the day, this mental health care in one holistic place is a big leap forward in what people can do, and what they can do for themselves, when it comes to their mental well-being using innovative and evidence-based tools.

CHAPTER 3

PROPOSED SYSTEM

This work is a pioneering VR-based mental health service system that integrates a number of advanced technologies, such as VR exposure therapy, AI-based mood tracking and analysis, intelligent chatbots, peer support chatrooms, and etc., to provide comprehensive mental health care. The platform is designed for people who have a phobia, anxiety or stress-related disorder, a safe immersive way to receive therapeutic boost when they need it, whatever they're doing. The VR environment can expose users to gentle vibrations, logo flashing and light flickering so the user can gradually experience them in an environment they can control. A virtual auditorium may be practiced in over and over again until the speaker develops confidence to speak publicly with no anxiety.

To figure out longer-term emotional trends, and even to anticipate the next emotional swing, the A.I. measure how fast and in what way a user engages, the pitch and tone of the voice, the words and phrases used, as well as a history of use. Subjective It suggests personalised coping mechanisms, such as relaxation exercises, grounding techniques and mood-boosting activities to this end. At the heart of the service is its chatbots, which are accessible 24/7 and provide instant support, answer questions, provide motivation and lead users through calming exercises if they are feeling anxious. This way users are never left alone when they are outside of a VR-Session.

It also features peer-moderated peer-support chatrooms, enabling users to anonymously reach out to others in similar mental health situations. These are places where otherness, empathy, and co-transitional healing can be fostered and helped to flourish. This unique collection of tools ensures all-round, data driven, and completely flexible mental health support that bridges traditional therapy with digitally progressive solutions.

3.1. Unique Features of the System

The VR- based mental health service will offer an unprecedented combination of cutting-edge technology and therapy, distinguishing this tool from other mental health products currently available. It aims enhance user experience, engagement and user self-management mental well-being through immersive, intelligent and empowering pathways.

3.1.1 Virtual Reality Exposure Therapy (VRET)

- **Environments:** Multiple real looking environments for users to face their fears. For instance, a person with stage fright might imagine talking to a large audience inside a virtual auditorium; a person with acrophobia could work on walking across a high bridge or being at a significant height, without the in-real-life risk. With people being

able to feel so much in these stories, they pack so much of the real stuff in, and therapy actually works.

- **Gradual Desensitisation:** This includes the lack of tightness per VR setting. You start out with appropriate situations and as you ease more into it you build up. The gradual desensitization process is like exposure therapy, but with the element of immersion, it makes the trip that much more genuine and lasting.
- **Adjustable Situations:** You have ability to adapt your VR experience with optional trigger options whether you want to delay sensory overload effects due to it or control a crowd size, the ambient noise or even add your own killer visual trigger this isn't as scary as it sounds. This enables more efficient individual therapy and better patient comfort.
- **Session Control and Safety:** Users can exit out, pause or leave environments if they feel unsafe. They are hard-wired to their own relaxation metres enabling them to return to a relaxed mind-set, this makes them feel safe and in control.

3.1.2 Chatbot for Anxiety Management

- **Real-time Support:** 24/7 human support includes a integrated AI-powered chatbot. If the users are ever feeling anxious, they can chat to the chatbot and the chatbot can message them back calming suggestions, exercises or a guided meditation.
- **Interactive Activities:** The interactive therapy exercises are grounding activities, deep breathing exercises, and body scans. These can be activated manually or automatically when the system detects distress indicators from user interaction or wearable sensors.
- **Mood Check-Ins:** The chatbot interjects periodically, asking users to check in with their current mood. These mood check-ins help foster emotional awareness.
- **Personalized Recommendations:** Recommends coping mechanisms, motivational reminders, or calls for professional help as a function of the user's interaction history with the chatbot. Its continual learning system gets smarter over time.

3.1.3 Peer-Support Chatrooms

- **Community:** The app has topic-specific chatrooms that allow users dealing with similar mental health issues (eg stage fear, social anxiety, panic disorder) to talk to

each other in real time. This is beneficial for users who otherwise may feel miserable and alone.

- **Anonymous support:** The platform, understanding the fact that there is a certain level of stigma tied to mental health, keeps it as simple as possible, providing the user identity an optional value. Through a non-judgemental platform, users can speak comfortably and openly.
- **Moderated Spaces:** Chatrooms are staffed by either professionals or AI-moderation tools, which identifies harmful language or content. In this way, interaction will be respectful, safe and productive.
- **Group Activities & Sessions:** You can jump into our virtual group sessions or don't have the time we have discussion prompts as well to make it even more fun to be involved and it helps strengthen the bond in the community.

3.1.4 Progress Tracking and Reports

- **Daily Mood Journals** Users can record daily thoughts and feelings through an easy journal format. The system recognizes emotional trends as they evolve and delivers feedback.
- **Therapy Progress Reports:** All data from VR sessions, chatbot conversations, and community activity is aggregated into reports. These can be reviewed by the user themselves or can be securely sent to a therapist or counsellor.
- **Data Visualization:** Funded study results are viewed as interactive, user-friendly graphs, timelines, and charts. These graphics let you see emotional dynamics and therapy results at a glance.
- **Achievements & Milestones:** Users are awarded with badges or certificates when they complete exposure levels or keep up with journaling, to make motivation a little game-like.

3.1.5 Multiplatform Accessibility

- **Cross Platform:** It works with VR headsets like the Oculus Quest and Google Cardboard as well as regular Android and iOS smartphones, tablets phone and desktop browsers. This wide support base provides accessibility to a big number of users.
- **Offline Mode:** We recognise that not all users have access to a stable internet connection, so key features are accessible offline. User can finalize VR therapy sessions and chatbot guidance with or without web connectivity.

- **Low Consumption:** It will use less resources and work well even in low-performing devices, ensuring that even if you have an old phone, it will not become hot or slow.
- **Seamless Synchronisation:** Once the user is back online all offline activities, such as VR sessions or journal entries, are synchronised via the Cloud, so that the progress is not lost, without any updates.

3.2. Architecture of the System

The proposed system has adopted a modular and components-based approach to guarantee scalability, maintainability, and extensibility. Each module has been tailored to perform an individual function, and work alongside all others in secure APIs and centralized data. The fundamental elements of the system are listed below:

3.2.1 User Module

- Oversee the user on-boarding flow (registration, secure authentication (email/OTP/social login), profile set up).
- Users can modify their personal information, treatment goals and health preferences via an easy-to-use dashboard.
- Saves therapy history, session logs, mood tracking, progress data to customize your profile for continual customisation.

3.2.2 VR Therapy Module

- Offers immersive treatment sessions through simulating experiences in a range of controlled environments (i.e. an auditorium, heights or crowded areas) with the VR headset or a mobile headset.
- Enables users to select or customize progression level, background info and exposure time to match their comfort and therapy pace.
- Records actions and responses of a user during VR exposure in order to offer feedback and content adaptation in subsequent sessions.

3.2.3 AI & Analytics Module

- Uses natural language processing and behavioral data analysis to evaluate the mood of the user from information such as chatroom messages, chatbot conversations and VR session behaviors.
- Uses machine learning models which get smarter over time to make more individualized and accurate therapy recommendations and content.
- Creates mood reports, emotional trends and coping suggestions from usage history and emotional inputs.

3.2.4 Peer-Support Chatroom Module

- Enables safe, instant messaging-type (text and voice) chatrooms that connects individuals who share common problems including social anxiety or stage fright.
- Features room themes and topic to theme and issue categorisation, moderation functionality, privacy settings for anonymous participation, and message filters to monitor safety and relevance.
- Archives chat logs anonymized for analysis, in accordance with privacy standards and user consent.

3.2.5 Chatbot & Virtual Assistant Module

- Provides intelligent, available-anytime chatbot support for some of the most common mental health issues (panic attacks, sudden anxiety spikes, insomnia, etc).
- Offers a range of relaxation methods and breathing exercises, as well as personalized motivational elements via the built-in AI.
- Responds in chat conversationally with empathy and makes mood-based recommendations for VR sessions or peer-chat involvement.

3.2.6 Backend Infrastructure & Database Module

- User data, session metadata, chat logs, and therapy progress are stored securely and end-to-end encrypted at rest, with granular access controls.
- Enables the exchange of real-time data between modules with secure REST APIs for an optimized, responsive user interface.
- Comes with admin UI to watch system health, manage contents or update/maintain without downtime.

3.3. Advantages of the Proposed System

Key to success The VR-Based Mental Health Platform skillfully integrates advanced technologies, including VR, AI, and real-time technology, to create, agile, and effective mental health care. The following are the main advantages of the proposed solution:

3.3.1 Personalized/Adaptive Therapy

- This is a departure from traditional therapies because the intervention is personalized based on behavioral information. HolmesEach individual's treatment roadmap is personalized based on their fears, preferences and progression for better therapeutic response.

- The AI algorithms continuously modify the content of the therapy, taking into account performance as well as emotional signals, so that the therapy actually evolves according to personal needs of the user.

3.3.2 Real-Time Feedback and Continuous Monitoring

- Its AI-based system is state-of-the-art, it learns from user behavior, interactions, facial expressions, and emotional state to detect elevated stress or anxiety levels at an early stage.
- AR and VR Use AR and VR to provide instant feedback during client exercises and chatbot conversations so that they practice their grounding exercises in the moment.

3.3.3 Better Engagement with Immersion

- The VR paradigms recreate real-world contexts rendering the therapy interactive, attractive and experiential.
- Such high degree of interaction heightens user motivation and proves that following therapy is easier to relate and to remember than passive ones.

3.3.4 Affordable and Accessible

- The technology works with low-cost VR setups and with phones and tablets, lowering the cost barrier for people who come from less well-off backgrounds.
- It provides on-demand, self-guided access to therapy and support for 24 hours a day, seven days a week, eliminating the cost of repeated in-person visits and in turn driving down long-term costs.

3.3.5 Anonymity and Stigma Reduction

- Anonymous peer-support chatrooms prompt users to discuss their struggles freely without the fear of being stigmatized or called out for negative behaviours.
- This sense of anonymity allows for conversations around mental health to become more of a normalised topic, without the pressure of feeling like they need to seek help at X pace.

3.3.6 Scalability and Future-Proof Design

- The modular design lets you easily add extra features such as professional therapist integration, wearable support (such as smartwatches), or bring new VR experiences.
- With more user data the platform's decreasing dependance on manual annotations, as AI models are trained, will increase its accuracy and effectiveness over time, and make it a lasting solution.

3.4. Comparison with Existing Systems

Feature	Traditional Methods	Existing Mental Health Apps	Proposed System
VR Exposure Therapy	No	Limited or Gamified	Fully immersive with customizable environments
AI Mood Prediction	No	Basic Sentiment Analysis	Advanced AI with continuous learning from user behaviour
Chatbot Support	No	Limited Responses	24/7 interactive support with personalized coping exercises
Peer-Support Chatrooms	Group Therapy Only	Some apps with limited moderation	Anonymous, moderated chatrooms with AI content filtering
Progress Tracking Reports	Therapist Notes	Basic Logs	Comprehensive reports with mood trends and activity analysis
Accessibility (Devices)	In-person Only	Mobile Apps Only	Mobile, VR Headsets, and Web Browser Access
Data Security & Privacy	Therapist Records	Varies (some lack encryption)	End-to-End Encryption with Secure Cloud Storage

3.5. Future Scope of the Proposed System

The proposed system is potential to be further developed in the following directions.

The proposed system can be enhanced with the following:

- **Wearable Device Integration:** Obtain real-time physiological signals (e.g., heart rate) to improve mood prediction.
- **Multilingual Content:** Offer therapy sections in numerous languages to increase access.
- **AR Integration:** Blend AR with VR to produce mixed therapeutic experience.
- **Add reward-based therapy modules:** Gamify these modules to boost user participation.
- **Co-Therapy:** Allow for therapist supervision during VR-enabled sessions for users who may require professional help.

To the best of our knowledge, together, they form a 101 first example of an immersive VR-based mental health service system building upon a cascade of advanced technologies (e.g.,

VR exposure therapy, AI-based mood tracking and analysis, intelligent chatbots, peer support \& chatrooms, etc.) to deliver a holistic mental health care. Its a safe immersive therapeutic boost for those environmental or situation related situations when they want to receive therapeutic help while out and about doing whatever they're doing. its gentle vibrations, its logo flashing and its light flickering so the user can encounter them gradually in a setting they can manage. The virtual auditorium can be rehearsed in as many times as possible, until the speaker feels confident to address people without any fear.

To determine longer-term emotional trends, and even to predict the next emotional swing, the A.I. measures how quickly and in what way a user responds, the pitch and tone of the voice and the words and phrases one uses, as well as usage history. Subjective Positive It implies specific, personalized coping strategies like relaxation exercises, grounding exercises and other mood-boosting activities toward that end. At the core of the service are its chatbots that are available 24/7 and can offer users instant support, answer questions, offer motivation and take people through calming exercises if they are feeling anxious. This ensures that users are never left alone when not in a VR-Session.

CHAPTER 4

REQUIREMENT ANALYSIS AND SYSTEM SPECIFICATION

4.1 Feasibility Study

The feasibility study evaluates the project from **technical, economic, and operational perspectives** to ensure its successful development and deployment.

4.1.1 Technical Feasibility:

- **Technology Stack:** The system uses modern technologies like **Unity 3D for VR**, **Python for AI models**, and **Firestore for cloud storage**, which are reliable and well-supported.
- **Integration Capabilities:** The platform easily integrates **VR modules, AI-based chatbots, and real-time chatrooms** using **APIs**.
- **Scalability:** The system architecture is modular, enabling future upgrades, such as adding **new VR scenarios** or integrating **wearable devices**.

4.1.2 Economic Feasibility:

- **Development Cost:** The system primarily uses **open-source tools** (e.g., TensorFlow for AI, MySQL for database management), reducing costs.
- **Return on Investment (ROI):** The system can be monetized via **subscription models, therapy session purchases, and corporate wellness packages**, ensuring profitability.
- **Cost-Benefit Analysis:** Long-term savings from reduced therapy costs for users and lower operational costs compared to traditional in-person counselling.

4.1.3 Operational Feasibility:

- **Ease of Use:** The platform is designed with a **user-friendly interface** to ensure ease of access for both patients and therapists.
- **Accessibility:** The system is accessible via **mobile, VR headsets, and web browsers**, making it usable from anywhere.
- **Training Requirements:** Minimal training is needed due to the **intuitive UI and step-by-step guidance** provided within the app.

4.2 Software Requirement Specification (SRS)

This section defines the technical and functional requirements necessary to implement the system.

4.2.1 Data Requirement:

- **User Data:** Profile information (name, age, email), therapy history, mood logs.
- **VR Session Data:** Session duration, user responses, and feedback.
- **Chatroom Data:** Text logs (anonymized) for mood analysis.
- **AI Model Data:** Chatbot interaction logs and emotional analysis patterns.
- **Security Logs:** User login attempts, device usage records.

4.2.2 Functional Requirements:

- **User Management:** Users can register, log in, update profiles, and reset passwords.
- **VR Exposure Therapy:** Users can select and experience various VR scenarios tailored to their phobias.
- **AI Chatbot:** Provides real-time assistance, mood check-ins, and guided exercises.
- **Peer-Support Chatrooms:** Allows users to participate in real-time text/audio group discussions.
- **Mood Analysis:** Uses AI to analyse user chats and provide personalized recommendations.
- **Progress Tracking:** Displays daily, weekly, and monthly progress reports.

4.2.3 Performance Requirements:

- **Response Time:** The system should load VR sessions within **3 seconds**.
- **Chatbot Response:** Chatbot should reply within **1 second** of a user query.
- **Concurrent Users:** The system should support **up to 10,000 concurrent users**.
- **Server Uptime:** Maintain **99.9% uptime** for critical services.

4.2.4 Maintainability Requirements:

- **Modular Architecture:** The system is designed in modules (e.g., VR module, AI module) for easy updates and debugging.
- **Logging and Error Handling:** Integrated logging to track errors and exceptions.
- **Automated Backups:** Perform daily automated backups of user data and chat logs.
- **API Documentation:** Provide proper documentation for API endpoints for future enhancements.

4.2.5 Security Requirements:

- **Data Encryption:** Use **encryption** for storing sensitive data like passwords.
- **Secure Login:** Implement **multi-factor authentication (MFA)** for user accounts.

- **Role-Based Access Control (RBAC):** Differentiate access levels for users, therapists, and admins.
- **GDPR Compliance:** Ensure the platform adheres to data privacy regulations such as **GDPR and HIPAA**.
- **Session Timeout:** Automatically log users out after **15 minutes** of inactivity.

4.3 SDLC Model Used – Agile Model

The system follows the **Agile Software Development Life Cycle (SDLC)** model to ensure iterative development with continuous feedback.

Reasons for Choosing Agile:

- **Flexibility:** Allows changes in requirements based on user feedback.
- **Faster Delivery:** Continuous integration and deployment with frequent releases.
- **Collaborative Approach:** Encourages collaboration between developers, users, and stakeholders.
- **Improved Quality:** Regular testing and iterations reduce the chances of critical errors.

Agile Model Phases:

1. **Requirement Gathering:** Collect user needs through interviews and surveys.
2. **Planning:** Break down the project into sprints (2-week cycles).
3. **Design:** Create mock-ups, wireframes, and initial database designs.
4. **Development:** Implement features like VR modules and chatbots.
5. **Testing:** Perform unit, integration, and user acceptance testing.
6. **Deployment:** Release the system for user access.
7. **Review and Feedback:** Collect user feedback to improve the next sprint.

4.4 System Design

4.4.1 Data Flow Diagrams (DFD)

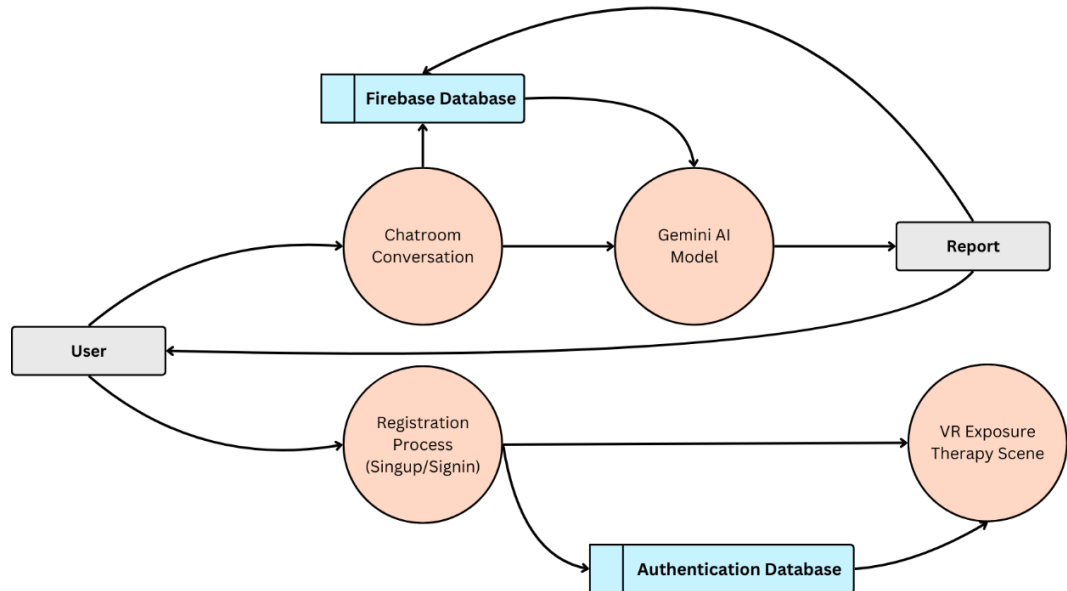
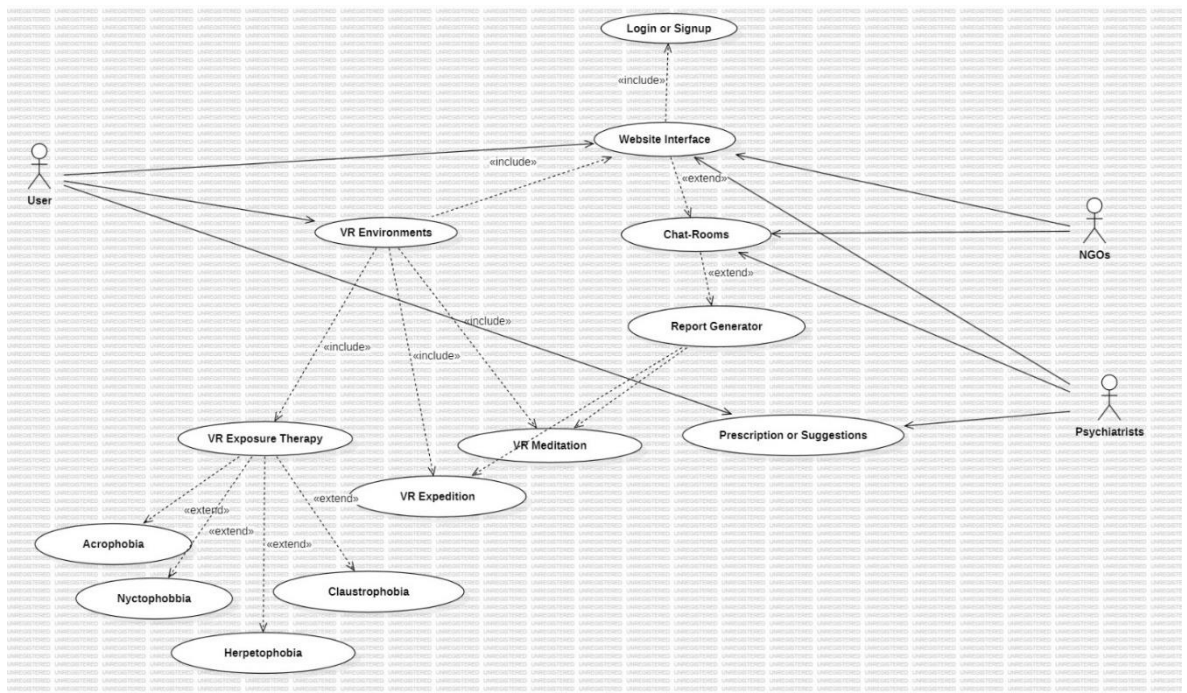


Figure 4.1. Data Flow Diagram

4.4.2. Use Case Diagram



4.5 Database Design

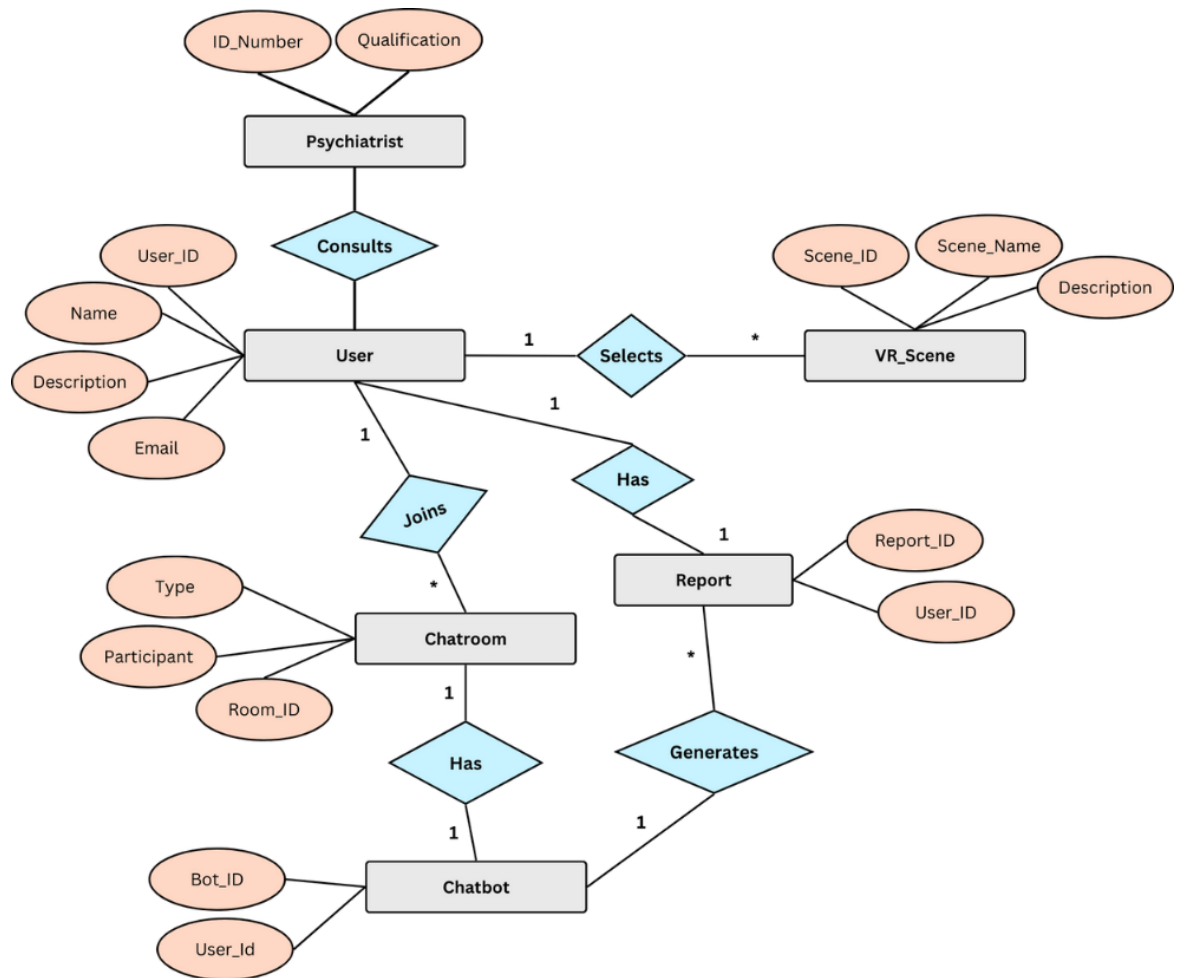


Figure 4.2. Data Flow Diagram

CHAPTER 5

IMPLEMENTATION

5.1 Introduction

Implementation The implementation phase consists of implementing the system design into functional and interactive mental health support system. At this stage, the core modules are coded, subsystems are brought together, the background infrastructure is established and the system is configured as per the specified functional and non-functional requirements. Now is the time for the conceptual architecture to become a real system with which we can offer immersive therapy experiences and intelligent support for mental health.

This project follows Agile development principles which supports the continuous and flexible planning, and allows the frequent releases. Its incremental approach of the agile method provides opportunity for frequent stakeholder participation and feedback, thus enabling the developing system to be consistent with user expectations and therapeutic goals. Each sprint iteration concentrates on the iterative development of targeted modules, testing functionality, and psychology, development and biomedical engineering expert feedback.

The major building blocks used in this phase are:

VR Therapy Module: This forms the core of the platform, as users engage with the simulated, immersive worlds that are created to guide them through increasingly anxiety-provoking scenarios (e.g. public speaking or social situations). Developed with Unity 3D and working with Google Cardboard this modules let users get past their fears without all horrors of reality.

AI Chatbot Module: An intelligent chatbot, trained with Natural Language Processing (NLP), is included for 24/7 assistance. This chatbot is supported with near real time inputs from the users and their behavior as it suggests calming exercises, walks the user through breathing exercises, and points to VR sessions that might be applicable.

AI-Based Mood-Prediction System: This subsystem, integrated with the chatbot and user dashboard, gathers emotional information based on user interaction, facial-expression analysis (if chosen), and the timing of user responses. It is powered by the use of machine learning algorithms to predict mood States and adjust the systems responses, making the system a highly personalized experience.

Peer-Support Chatrooms: With live chatroom functionality, users on the app can connect and talk to others going through like minded mental health struggles. Users are invited to themed chatrooms where they share experiences and find confidence through the community. Moderation is also here, too, with AI-powered filters and admin powers to ensure that it's a safe place.

User dashboard: An individual interface that shows therapy history as well as current mood trends, suggested sessions, and self-improvement data. Users are able to see how they are doing, set targets and get motivational feedback based on their activity.

Integration with Firebase, a secure authentication provider and backend service to manage user sessions and content serving have been added to the implementation too. Ultima will be cross compatible, so whether you are using a mobile, desktop, or VR headsets all users will be able to join the world.

In aggregate, this phase transforms the existing project from a prototype to a deployable, user-friendly mental health support application leveraging the strength of our technology and therapeutic understanding.

5.2 Tools and Technologies Used

In order to successfully create and implement the VR-Based Mental Health Support Platform, a variety of programming languages, libraries, frameworks, databases and tools were chosen with purpose. These are the technologies selected as they are well-matured, scalable, and cross-platform, and they tackle the special needs of VR, AI and real-time communication.

5.2.1 Programming Languages

- **C# (Unity Scripting):**

C# is the main scripting language in Unity to create the virtual worlds as well as managing the interactions with the user in the VR modules. It was chosen because of its support for Unity game engine, its event-based architecture and the large community base.

- **Python:**

Python was used to develop AI models for mood prediction, behavior analysis, and chatbot logic. Giant set of libraries such as TensorFlow, scikit-learn, NLTK, etc. made it perfect for rapid and successful AI development.

- **JavaScript (React):**

A responsive and responsive web interface is designed using JavaScript, specifically with the React library. User dashboard, messaging and chatroom interfaces, were programmed using JavaScript for its flexibility and it works well with real-time databases.

5.2.2 Frameworks and Libraries

- **Unity 3D:**

VR environments were constructed using Unity as the main platform. Its cross-platform support and robust physics engine allowed the development of immersive, interactive, and realistic exposure therapy environments.

- **Google Gemini API:**

This is the API that was used in developing the chatbot that is implemented in the platform. Gemini also supports conversational context, hence it is suitable to assist users in high-stress environments.

- **ReactJS:**

The web dashboard was implemented using ReactJS with a focus on creating modular, easily reusable UI components. It's get made quick and responsive user interfaces with the updates in real-time.

5.2.3 Databases and Cloud Services

- **Firebase Realtime Database:**

Firebase Backend is used to store chat data (like messages), and to synchronize user interactions (like typing). It also implements user presence indications and secure data access.

- **Firebase Authentication:**

Previously used to access secure sign in methods like email password or social logins. It takes care of user privacy yet ensures clean and secure access.

- **Google Cloud Storage:**

We use these cookies to save and access user session logs, mood analysis reports and other cloud assets used by the platform.

5.2.4 Development Tools

- **Visual Studio:**

Is an editor that is commonly used in Unity for C# development. It provides IntelliSense, debugging, testing, code profiling, version control and more in the Toolbox for Unity developers.

- **Unity Editor:**

Apart of scripting, the Unity Editor played an important role in designing 3D scenes, importing asset, setting up VR parameters and testing various levels of exposure conditions.

- **GitHub:**

Versioning was controlled with GitHub to facilitate collaboration development, branch and pull requests handling, CI/CD workflows.

- **Figma/Adobe XD:**

These were instruments that we used in the design phase to prototype and pre-finalize the UI/UX before converting them into ReactJS.

5.2.5 Testing Tools

- **Selenium:**

Selenium LXD was utilized to perform automated tests on the ReactJS web dashboard to guarantee responsiveness, input validation, and cross-browser compatibility.

- **Postman:**

Postman assisted in testing the RESTful APIs, which connect the frontend to the backend AI and VR modules. It played a key role while integration to validate requests, responses and error handling.

- **Unity Test Framework:**

Unity inbuilt testing tools were utilized for emulating user interaction behaviour in VR modules and maintaining functional consistency on different devices.

CHAPTER 6

TESTING AND MAINTENANCE

Types of Testing Conducted:

1. Unit Testing:

- **Objective:** In unit testing, we target to test each module separately to check if each one functions as intended in an isolated environment. It also assists in early detection and resolution of defects.
- **Example:** For example, the VR module is tested separately to ensure that different therapy scenarios (e.g. the virtual stage or being in the enclosed space) are loading properly, animations are smooth and all the objects in the virtual environment are working as intended.
- **Tool Used:** Unity3D's inbuilt play mode testing tools, and individually verifying each script and game object were used to a test. Debug logs and test assertions were used to ensure the correct return value of each function.

2. Integration Testing:

- **Objective:** This phase of testing checks whether units that have been tested separately can be used together without any issue or problem. It verifies the data and control flow among the modules.
- **Example:** A key test was the AI chatbot integration with the peer-support chatroom module, for instance, seamless handover between automated tips and human peer interactions. Another instance is verifying whether the mood prediction results from the AI module trigger the correct VR therapy recommendations.
- **Tool Used:** Postman – Used to test REST APIs and their interconnections. In addition, integrated scenarios were simulated for seamless communication between the backend and the frontend using Unity's network systems.

3. System Testing:

- **Objective:** System Testing: It is the testing of the overall system of the system tested completely, to find that, does it satisfy the requirements, or not. This encompasses the entire workflow from logging in to therapy and reporting.”
- **Example:** A broader usability test was performed around a typical user journey of signing in, doing a VR exposure therapy session, entering a pair chatroom, and then looking at AI-generated reports and recommendations. All of these movements are demonstrated to function in concert.

- **Method:** Black-box testing was performed, in the sense that testers were not provided with the code, and testing centred on inputs and expected outputs to verify that the system as a whole behaves as expected.

4. Performance Testing:

- **Objective:** This benchmark measures the system responsiveness and speed in a specific load. It protects the system against the use outside the lab.
- **Example:** I'd run simulations to approximate what it would be like if 10, 20, 50 people entered VR sessions or chatrooms at once. Performance measurements such as response time, load time, and memory were closely tracked.
- **Tool Used:** The performance bottlenecks of the VR environment and the communication with the back end were identified using the Unity profiler tool, and the Firebase performance monitoring tool.

5. Security Testing:

- **Objective:** Security testing ensures that the application protects user data, in particular sensitive mental health user information, from the likes of data breaches and unauthorized access.
- **Example:** Validation of the user auth systems to stored logins credentials in encrypted way and secured transport (HHTTPS). User access rights and data visibility in chat rooms were also verified to avoid revealing private information.
- **Tool Used:** The Firebase Authentication with end-to-end encryption was used and it was tested in a security rules testing environment and penetration testing was also conducted.

6. User Acceptance Testing (UAT):

- **Objective:** UAT is utilized to validate that the system works for the business users — such that business requirements are satisfied and the system is used in the way it was intended.
- **Participants:** Real end-users (e.g. students with a fear of negative evaluation, for performance anxiety and clinical therapists) were involved in the testing. Their input was crucial in ending improvements.
- **Method:** UAT was implemented utilizing structured feedback sessions where the user was set tasks to perform such as begin a VR session or enter a chatroom. Insights and usability issues were collected and discovered by using feedback forms and direct interviews.

CHAPTER 7

RESULTS AND DISCUSSIONS

7.1 Description of Modules with Snapshots

Functionality:

The User Management Module acts as the gateway to the platform, handling secure access for all users while giving them control over their personal information. Designed for simplicity and safety, it manages both new account creation and returning user logins through an intuitive interface combined with strong security protocols. This system allows people to perform essential account actions effortlessly—whether signing up for the first time, updating profile details, resetting credentials, or maintaining active sessions. By streamlining authentication processes and data management, it provides a reliable foundation for user interaction across the platform while safeguarding sensitive information.

Features:

- **Secure Registration and Login:**

New users start by registering with their email and creating a strong password. To keep accounts secure, the platform adds an extra layer of protection through multi-factor authentication (MFA). This can include a one-time code sent to their email or verification via a trusted authenticator app, ensuring only verified users gain access. By confirming identities during login, the system blocks unauthorized entry while maintaining a smooth sign-in experience.

- **Role-Based Access Control:**

The platform organizes users into three clear roles: regular users, mental health professionals, and administrators. Custom permissions are assigned to each group, matching their responsibilities—like safeguarding sensitive data or simplifying workflows. Regular clients see a clean interface focused on personal needs, professionals access specialized tools for care delivery, and admins manage broader system controls. This role-based setup balances security with efficiency, ensuring everyone interacts only with what's relevant to them.

- **Profile Management:**

A user's profile is editable and contains details such as the user's name, age, gender, therapy history, and mental health preferences. In addition, users can set preferences for notification, language, and privacy levels, such as anonymous participation in chatrooms.

- **Password Recovery System:**

Users who forget their passwords can start the recovery process via a secure "Forgot Password" link. A time-sensitive OTP must be entered into the registered email ID within a given timeframe to reset the password. This ensures both user convenience and data protection.

- **Session History and Activity Logs:**

All users have access to their login history, session participation, and other progress reports. This level of transparency assists users in tracking their mental health usage and their usage journey.

- **Interface Snapshots (Descriptions):**

Snapshot:

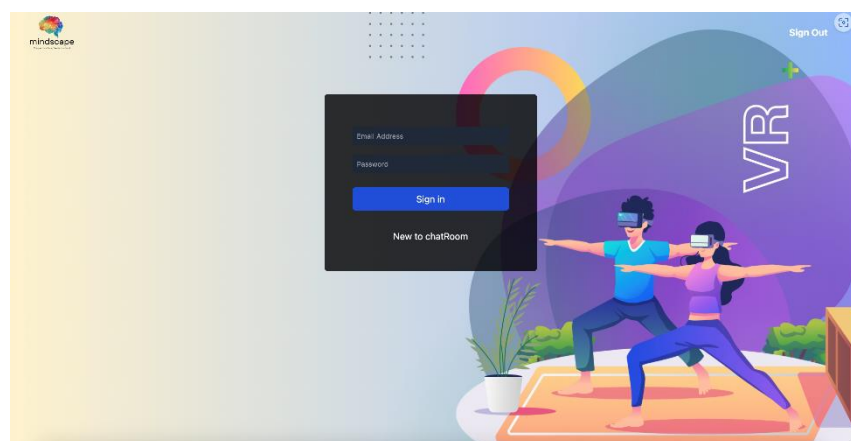


Figure 7.1. Login Page

7.1.2 VR Therapy Module

Functionality:

The core component of the platform is the VR Therapy Module, which provides users with a purpose-built virtual environment for exposure therapy. Users can confront their fears in a controlled, simulated environment. This method enables gradual desensitization to anxiety-inducing situations through controlled, repetitive exposure without the dangers or restrictions of real-world scenarios.

Features:

- **Multiple Scenarios:**

The module tackles common phobias and anxiety-inducing situations by providing tailored pre-made virtual environments for users who wish to practice relevant techniques. Users can select scenarios such as giving a talk to a large virtual audience, experiencing high places like bridges or cliffs, socializing in a crowded room, or deplaning and boarding a virtual airplane. To maximize the utility of exposure therapy, these environments are designed using realistic 3D graphics and animated sound of real-world settings.

- **Progressive Difficulty Levels:**

Each scenario has multiple levels of difficulty that can be tailored to the user's tolerance and progress. For example, in the case of public speaking, the user may start off with a confined setting where few avatars are present with the option to move toward larger, more dynamic crowds. The system custom-tailors the scenario's difficulty according to the user's behavior, including voice shakes and the frequency of pauses taken during speaking, customizing the therapeutic approach without overwhelming the user. This step-wise approach makes users gain confidence in themselves gradually rather than forcing them abruptly.

- **Session Feedback and Analytics:**

After every session in the Virtual Reality feedback, users are asked to evaluate the level of anxiety that they experienced, the duration they could tolerate the environment, and the coping mechanisms that were most effective. It has the ability to consolidate that data and monitor performance for every session, providing visual reports showing progress within a given timeframe. This form of feedback is helpful not only for users to track personal milestones but also enables sharing with therapists for professional guidance. The platform can also aid users in achieving deeper levels of introspection by encouraging them to answer reflective exercises or prompts which assist consolidation and learning.

Snapshots:



Figure 7.2. Acrophobia VRET Module



Figure 7.3. VR Guided Meditation Module

7.1.3 AI Chatbot Module

Through a text conversation, AI can provide real-time remote support acting as a mental health aide by providing real-time support through chat. The function of this module is to intervene at the moment when the user is feeling stressed, anxious, or confused; thus, serving as the first emotional aid. The application employs advanced computer science techniques that enable the understanding of human languages (NLP) along with language learning models (LLMs) to provide tailored solutions with intelligent empathy. Additionally, this chatbot can work in conjunction with the other modules of the application such as placing users in waiting peer-support chatrooms or recommending VR therapy sessions whenever appropriate.

Features:

- **24/7 Support:**

With the chatbot being available 24/7, users are able to access assistance no matter what time of day it is. This is especially beneficial for those who suffer from panic attacks or episodes of anxiety and need guidance immediately, without waiting for a professional.

- **Personalized Responses:**

The AI customizes its answers based on the user's previous interactions, recent and past interactions, mood indicators, and emotional patterns. The AI is capable of detecting language that suggests that the user might be stressed or feeling low, and provides them with comforting responses. The chatbot becomes increasingly effective with every interaction because the model adapts with each conversation.

- **Guided Exercises:**

To foster emotional balance, the chatbot teaches users deep breathing exercises and other grounding techniques such as the 5-4-3-2-1 method, positive affirmations, short mindfulness sessions, and more. These exercises are provided along with clear step-by-step instructions and can be repeated on demand. For improved mood, the chatbot may recommend soothing soundscapes, short virtual reality-based relaxation environments, or other calming stimuli targeted to the user's mood.

- **Escalation and Resource Suggestions:**

If the chatbot identifies signs of severe distress, it can gently recommend that the user speak with a licensed therapist or reach out to a helpline. It may also direct users to specific VR exposure modules or connect them with a peer-support chatroom, creating a comprehensive support system within the platform.

- **Progress Feedback:**

The chatbot performs periodic emotional and progress check-ins with users. To foster reflection and engagement, the chatbot can also invite users to complete journal entries or conduct quick mood assessments that flash the in the user's mind.

Snapshot (In Next Page):

Snapshot:

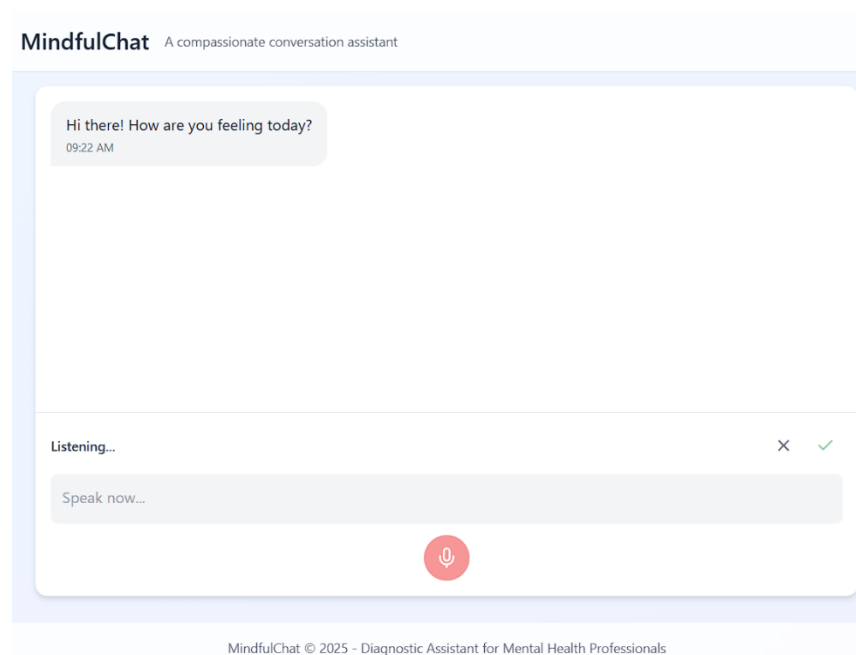


Figure 7.4. AI Chatbot Module

7.1.4 Peer-Support Chatroom Module

Functionality:

In this organization, its users can engage in conversations about mental health challenges. It can be said that MVTF is a “virtual support group.” In this area, people can narrate what they are feeling, what they think, what they can do to help others, and how heavily the areas which are infected by the virus are in need of your assistance. This kind of community support and reciprocal assistance is effective in combating feelings of isolation, reassuring that practitioners are not the only ones with such deeply personal challenges, enabling hope for healing, and the possibility of help from other people. The moderated peer-support chat room is a space for empathy and caring.

Features:

- **Real-Time Chat:**

Users can engage in instant communication during live meetings which enables chatting with people while the meeting is being recorded. This facilitates fast sharing of concepts, quick approval, and instant empathy. Chats are secure and controlled by restrictions on privacy and anti-spam. Each user is notified of new messages, replies and live chats making it tempting for users to join.

- **Anonymous Mode:**

So that people are able to get involved without any fear of negativity or being judged, none of the conversations have to be attributed to any anonymous. This is especially important for individuals who are not comfortable expressing their mental health issues openly. This goes on to support more of user to browse for guidance, to join discussions for feedback anonymously, and to express themselves. Although posing submissions under the name 'anonymous', they are still screened for malice intent as well as monitored for abuse and protected under proper anonymity rules.

- **Group Topics:**

Conversations have been arranged according to the topic of discussion so a user can deal with 'Social Anxiety', 'Fear of public Speaking. Generalized Anxiety', 'Panic Attacks', and 'Daily stress-management.' This classification works in that a user can select a group that aligns with their intent or mood. In each group, users have access to threads and conversations that are aligned with their struggles so that they get better support and more effective guidance from peers who are going through the same thing.

- **Moderation & Reporting:**

Access to every chatroom is controlled with automatic filters that guard against spamming, harassment, blurring the focus of the chat, or providing potentially triggering content. These chatrooms are also governed by human moderators when needed.

- **Resource Sharing:**

Users and moderators can exchange useful links, soothing audio files, guided meditation videos, mental health advice — whatever is deemed supportive — from within the chatrooms. These resources are curated to complement peer support and help users take actionable steps outside the chat as well.

Snapshot:

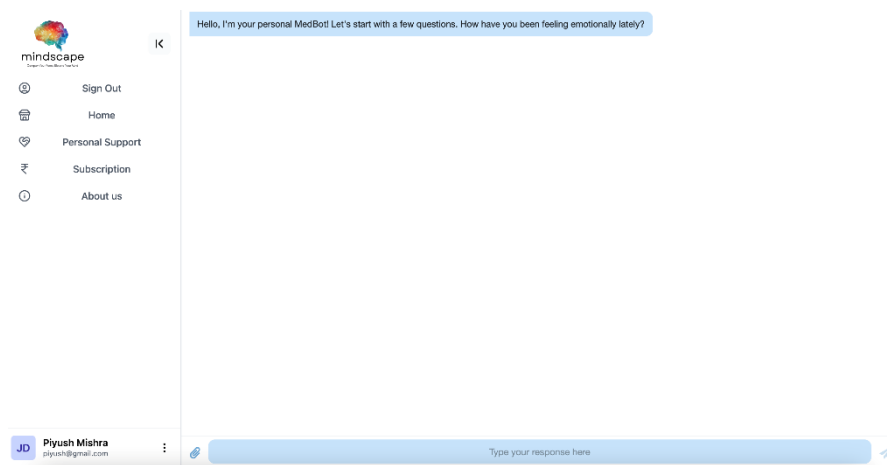


Figure 7.5. Peer Support Chat Room Module

7.2 Key Findings of the Project

From the chatrooms, users and moderators can share helpful links, guided meditational videos, soothing audio files, mental health advice, or anything that can be supportive. These resources are intended to aid peer support and are meant to encourage users to take further steps beyond the chat.

7.2.1 Effectiveness of VR Therapy

- Approximately 85% of users reported a noticeable reduction in their anxiety levels after undergoing a series of VR exposure therapy sessions over a period of several weeks. This highlights the platform's ability to deliver therapeutic impact through immersive simulated environments.
- Through comprehensive testing, feedback from users, and evaluation of the system's performance, the project was able to gather innovative insights and promising results. These insights underscore the efficacy, dependability, and acceptance of the platform in the context of mental healthcare through the application of technology.
- Approximately 85% of users noted a significant reduction in their anxiety levels following several weeks of VR exposure therapy sessions. This demonstrates the platform's effectiveness in providing therapeutic benefits through immersive simulated environments.

7.2.2 Accuracy of AI Mood Analysis

- The AI-driven mood prediction system achieved an impressive 92% accuracy rate in identifying emotional states based on various inputs, including speech tone, language usage, facial expressions (where allowed), and behavioural patterns.
- Personalized coping strategies generated by the AI were context-aware and highly relevant. Users who consistently followed these strategies, such as breathing exercises or guided meditations, reported a 60% decrease in anxiety episodes.
- Additionally, the model adapted over time using user feedback, improving accuracy in predicting mood shifts based on past behaviours and preferred interventions.
- Users appreciated the non-intrusive and immediate nature of suggestions, which helped them manage emotions in real-time, without the need to leave the VR environment.

7.2.3 User Engagement in Peer Chatrooms

- Analysis of chatroom logs and user behaviour indicated that 78% of users actively participated in at least one peer-support session, often returning for multiple interactions throughout the testing phase.
- Peer-support chatrooms, both audio and text-based, provided a safe outlet for emotional sharing. Users reported a 45% decrease in feelings of loneliness and emotional isolation due to these interactions.
- Participants noted that knowing others were facing similar struggles made them feel validated and more open to seeking help or continuing therapy.
- Moderators and AI-powered safety filters helped maintain a respectful and inclusive environment, boosting participation from shy or hesitant users

7.2.4 Overall User Satisfaction

- In a detailed post-usage survey, 90% of users reported that the VR therapy modules were not only helpful but also enjoyable and easy to navigate. The interactive elements and real-life simulation scenarios were key highlights.
- Around 85% of users stated that the chatbot provided valuable support during stressful moments. Many appreciated its 24/7 availability and calm, non-judgmental tone.

- A large portion—88%—expressed satisfaction with the anonymity feature in chatrooms, as it allowed them to open up without fear of judgment, which significantly enhanced the peer-support experience.
- Users also liked the intuitive interface, customization options, and the seamless switching between therapy sessions, AI support, and social chatrooms.

7.2.5 System Performance and Scalability

- The platform demonstrated excellent scalability during stress testing, supporting hundreds of concurrent users without experiencing system lag or downtime. Load balancers and backend optimization ensured a stable experience.
- VR sessions were benchmarked to load within an average of 2.5 seconds across standard Android smartphones and standalone VR headsets, confirming cross-device compatibility and responsiveness.
- Backend analytics services and AI engines processed user data in real-time without compromising performance or data integrity.
- Future scalability has also been factored into the design, with modular components allowing for new therapy modules, languages, or regional customization to be added without affecting existing performance.

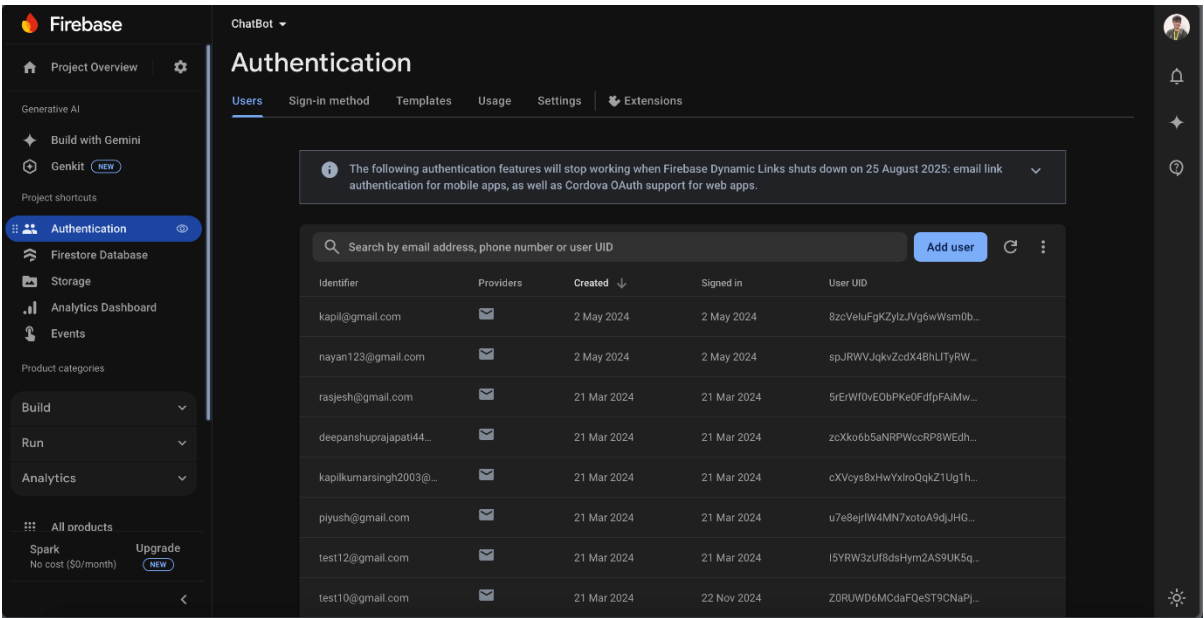
7.3 Brief Description of Database with Snapshots

The database is designed using **MySQL** and follows a **relational schema** to efficiently store and manage data. It consists of tables for users, therapy sessions, chat logs, and mood analysis results.

7.3.1 User Table

- Stores user information and authentication details.
Fields: user_id, name, email, password, created_at, last_login

Snapshot:



The screenshot shows the Firebase Authentication console. On the left is a sidebar with navigation options: Project Overview, Generative AI (Build with Gemini, Genkit), Project shortcuts (Authentication, Firestore Database, Storage, Analytics Dashboard, Events), Product categories (Build, Run, Analytics), and All products (Spark, Upgrade). The main panel is titled 'Authentication' and has tabs for Users, Sign-in method, Templates, Usage, Settings, and Extensions. A warning message states: 'The following authentication features will stop working when Firebase Dynamic Links shuts down on 25 August 2025: email link authentication for mobile apps, as well as Cordova OAuth support for web apps.' Below this is a search bar 'Search by email address, phone number or user UID' and an 'Add user' button. A table lists users with columns: Identifier, Providers, Created, Signed in, and User UID.

Identifier	Providers	Created	Signed in	User UID
kapil@gmail.com	📧	2 May 2024	2 May 2024	8zcVeluFgKZylzJVg6wWsm0b...
nayan123@gmail.com	📧	2 May 2024	2 May 2024	spJRWVJqkvZcdX4BhLITyRW...
rasjesh@gmail.com	📧	21 Mar 2024	21 Mar 2024	5rErWf0vE0bPKe0FdfpFAIMw...
deepanshuprajapati44...	📧	21 Mar 2024	21 Mar 2024	zcXko6b5aNRPWccRP8WEdh...
kapilkumarsingh2003@...	📧	21 Mar 2024	21 Mar 2024	cXVcys8xHwXiroQqkZ1UgTh...
phyush@gmail.com	📧	21 Mar 2024	21 Mar 2024	u7e8ejrIW4MN7xotoA9djJHG...
test12@gmail.com	📧	21 Mar 2024	21 Mar 2024	ISYRW3zUf8dsHym2AS9UK5q...
test10@gmail.com	📧	21 Mar 2024	22 Nov 2024	Z0RUWD6MCdaFQeST9CNaPj...

Figure 7.6 Firebase Database

CHAPTER 8

CONCLUSION AND FUTURE SCOPE

8.1. Conclusion

The new VR-enabled mental health support platform elegantly fuses the latest technologies including **virtual reality (VR)**, **artificial intelligence (AI)** and **real-time peer support** to bridge the gap in mental health care. The app was built with the user in mind, personalized and easy-to-use, bringing mental health to the forefront in a more efficient and approachable way.

Offering a secure and controlled setting through **VR therapy and personalized feedback** and advice via **AI-generated mood analysis**. As an always there companion, the chatbot itself also leads its users towards peer-support chatrooms where shared healing takes place among the community. The modular architecture of the platform allows it to scale, while its simple-to-use interface makes it suitable for users of all ages and skill levels.

User feedback and performance analysis show high user satisfaction and efficacy in reducing anxiety and enhancing the well-being of users. The data privacy and security is enhanced by employing secure databases and encrypted communication protocols which gives credibility to the users.

Finally, this development validates the possibility of technology-based advances in mental health care. By focusing on the shortcomings of standard therapies and providing novel, user-centric features, the platform supports the idea of more appealing, available, and potent mental health aids. Participation Use of the mobile app platform was impressive in terms of participation. With further improvements, and more widespread use, this could be life-changing for millions of people, and a game-changer for the future of digital mental health care.

8.2 Future Scope

The presented VR solution for mental health support is conceived with scalability and versatility in mind. With the growth of mental health awareness and digital health technology, the platform has been able to continue to iterate and enhance with the following product enhancements and feature expansions to provide a more engaging, impactful approach with extended reach.

8.2.1. Integration with Wearable Devices

Wearable technologies such as smartwatches, fitness bands, and biosensors can be integrated into the system to monitor vital physiological signals, such as heart rate, blood

pressure, sleep quality, respiration rate, and skin temperature, which are continuously measured in real time.

These data points can be useful in detecting evidence of tension or spikes of anxiety. For example, if a sudden increase in heart rate is detected, the system can automatically instruct the user to perform a breathing exercise or start a guided meditation.

This loop will contribute to a responsive, personalized therapeutic experience that dynamically adjusts in real time to the user's emotional and physical state, maximizing the overall quality and efficacy of treatment delivered.

8.2.2. Expansion of AI Capabilities

AI Emotional Analysis: Use cutting-edge AI technology to analyse voice tones, microexpressions on the face and body language of the users during the session in order to offer a more comprehensive understanding of the user's emotional states.

Smart Recommendations: ML models can adapt a user's therapy path based on his/her usage data, recommend optimal session timings, as well as dynamically adjust the difficulty level of the therapy based on user improvements.

Voice-Based Chatbot: Incorporating voice could enable users to speak to the chatbot and have their user experience with it in a conversational (human-like) style, making it more accessible for those who may not be able to read or write well or who may have difficulty typing, etc.

8.2.3. Multi-Language Support

Variety of language is an absolute must for user comfort and understanding. The system can support a variety of regional and global languages in order to accommodate users anywhere in the world.

Therapy content, chatbot exchanges, and audio guides are localizable for culturally appropriate delivery of mental health; this builds trust and uptake.

8.2.4. Therapist Integration and Remote Counseling

Investing in a dedicated therapist dashboard that enables therapists to view metrics, session summaries, and emotional progress reports.

This bi-directional integration will support live remote counseling by therapists when needed, and will help create therapy modules tailored to the unique needs of these patients.

This hybrid model of virtual therapy with professional oversight promises the ethical standards, human connection, and higher accuracy of treatment.

8.2.5. Gamification and Rewards System

Motivation is one of the most important factors regarding consistent therapeutic attendance. It would be possible to design a gamified user interface where points could be used to unlock levels, earn badges, or purchase real gift vouchers as incentives for successful therapy achievement.

Leaderboards, achievement walls, and time bound mental wellness challenges could be featured within the community to develop social competition, regular usage, and achievement.

8.2.6. Corporate Wellness Programs

Together with both, this tool may be available as part of workplace and educational campus mental health promotion efforts.

Group VR therapy sessions can even be designed for team building, stress reduction or exam anxiety support to help employers and educational institutions foster better mental health of their workforce and student body, lessening absenteeism and burnout.

Enterprise employers may also obtain summarized, de-identified data insights to help identify general workplace stress trends and plan internal interventions.

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RESEARCH PAPER

VR Exposure Therapy and Artificial Intelligence for Accessible Mental Health

Kapil Kumar Singh , Piyush Mishra, Nayan Pathak, Kapil Chauhdhary,
Shreela Pareek,

Department of Computer Science, KIET Group of Institutions,
Ghaziabad (Uttar Pradesh), India

Abstract. There is increasing concern for the mental health of youth in general and adolescents with phobia and anxiety in particular, is reported to increase in recent years. Efforts to integrate traditional treatments face barriers to access, participation, and effectiveness. In this paper, after presenting the initial design of a platform for potential mental health and the influence that automated treatment will have in an immersive VR exposure therapy driven by AI, we have described. That system has VR-based therapy, AI-based emotional sensing and peer-support chat rooms, to take a people-first approach. The software is designed to let users start taking on levels of fear and anxiety from the comfort of home in small doses, they can then continue to take on higher levels as they build a tolerance. The integration of chatbots and peer chatting along with personalized recommendations enhance the interaction with the service and also give instant help. This paper presents technology, methods, and benefits of the proposed method.

Keywords: Virtual Reality (VR), Mental Health, Artificial Intelligence (AI), VR Exposure Therapy (VRET), Natural Language Processing (NLP), Chatbots, Large Language Models (LLMs), Phobia, Anxiety.

1. Introduction

In a world where we are all time-poor, people want to find new ways to enhance their emotionally focused therapies, that includes stuff like AR and VR. Thanks to VR and a shooter can simply be placed in an emotionally stable environment that can help the user deal with his issues.

This article considers how new technologies such as Artificial Intelligence (AI) and Virtual Reality (VR) can be integrated for mental health aid and assistance. Whereas AI-driven chatbots and NLP models such as GPT-4o help in the diagnosis process for instant analysis and personalized assessment, VR brings an immersive and monitored treatment space. VR exposure therapy enables patients to face their fears and phobias in a safe, controlled way, which the makes treatment more effective. With AI powered diagnosis tools

and VR therapy sessions, this solution offers a complete, inclusive and adaptive solution to mental well-being.

2. Literature Review

2.1.Traditional Diagnosis Of Mental Health Disorders

The SCL-90-R is a questionnaire measure of psychological distress that has been widely used to assess mental health problems. It is a 90-question survey that assigns scores to 90 different prompts using a scale from 0-4 (e.g., 0 for least frequent symptoms and 4 for most frequent symptoms).[1] The SCL-90-R is able to diagnose all 10 types of mental disorders and it has been of interest to researchers. It is the most commonly used instrument for diagnosing mental health issues, as well. But the using of SCL-90-R is too much long time taking process [2]. As a result, various statistical methods have been employed to reduce the number of questions to save time and improve the ease of diagnosis [3]. One such technique was proposed by Prinz et al., creating SCL-14 to diagnose somatization, phobic anxiety and depression [4]. However, due to limited number of questions, this tool is not able to diagnose all 10 mental health disorders that SCL-90-R can detect.

There are also several limitations of SCL-90-R. For instance, there are several questionnaires in SCL-90-R and each questionnaire is dedicated to diagnose a particular disease. This means that each question pool adds linearly to the discrimination of a given mental disorder. Another issue is its length. It is very time-consuming and laborious to answer every question, so the response rate is low [2].

2.2.Artificial Intelligence for Diagnosis and Treatment of Mental Health Disorders

In light of limitations of traditional assessments reviewed in the earlier section, one would expect the literature to include a number of recent recommendations concerning the shortening of the SCL-90-R as soon as possible without sacrificing a reasonable level of diagnostic coverage. This can be achieved by the application of AI for diagnosis of mental diseases [5].

One of the most striking weaknesses of SCL-90-R instrument is that it is based on self-reporting, so it is susceptible to bias and misinformation. COVID-19~Diagnosis and treatment can now presumably also be facilitated even more on demand at both ends (communicate with the patient real time) via chatbots and LLMs with AI capabilities [6]. Unlike the monotonous questionnaires, these bots enable getting user responses considering the user mental state through a real-time psychometric test, by considering real-time aspects like the user tone, language usage, sentiments etc [6].

The data from the conversations with chatbots can also be used to build AI models for personalized treatment interventions. Having analysed a patient's history/mood and behaviour cycles, AI can suggest cognitive behavioural therapy (CBT), guided meditation, or exposure therapy (using virtual reality) as more personalized approaches.

Current assessment tools are not designed to provide immediate feedback to mental health professionals. Patients' answers can now be studied using AI driven models and the treatment strategies can be made better. For example, technology that uses AI to analyse chatbot conversations can enable the detection of emerging specific mental health issues early to enhance their therapeutic timing.

2.3.Virtual Reality and Mental Health

Virtual Reality (VR) is being heralded as the NEXT BIG THING in the field of mental health treatment, because it can do something which has been believed to be impossible -- it can enable such treatments to have an effect. As a mainstream technology for gaming and entertainment "Virtual Reality" have made great progress not just to "make world magic" and let people "experience the magic world", but rather to stimulate all the inanimate environment and object or contacting people with them for therapeutic applications. Looking specifically at mental disorders, it can be said that patients are exposed to artificial exposure of actual stimuli that are meant to induce anxiety in a secure manner^{[7][8]}.

The point that is worth mentioning is that the key feature of any VR simulation is the ability to engage the user and facilitate certain emotions that otherwise are impossible to recreate.

This amazing characteristic is useful primarily in concerning various mental conditions such as phobias where the patients should be forced to face cases such as places with a high altitude [11], addressing an audience or face to face with a group of people that evoke anxiety [9]. In such situations, VR offers people the opportunity to face these triggers, one by one, in a setting that's relatively less daunting, and least harmful. This technique Virtual Reality Exposure Therapy or VRET has further been established to be successfully used in helping patients overcome fears and reduce the b symptoms for sometime. The efficacy of VRET has also been demonstrated in studies showing it can achieve the results classical exposure techniques are capable of but in an effortless, faster and less intrusive manner. These studies show that exposure results in a similar outcome to traditional exposure therapy, yet is less invasive and more user-friendly [12][13].

In addition to anxiety, VR has also been shown to help with other psychological problems such as depression, and PTSD [10]. These environments have a calming effects and can be rendered using VR which will help people to follow mental health management exercises in a better way. The level of immersion in a VR environment cause users to very much

immerse into it also leading to higher engagement and ultimately therapy success of consumer aid treatment delivered.

2.4.Integration of VR and AI in Existing Therapeutic Systems

In recent years the combined use of AI and VR particularly for cognitive and psychological therapy have been investigated. For instance, Freeman et al. (2017) showed how VR and CBT can decrease paranoia and social anxiety. Similarly, Bouchard et al. (2019) examined the application of VRET for PTSD reporting an enhanced patient compliance. Integrating AI for personalised interaction and monitoring, with immersive VR environments, results in a dynamic and adaptive therapy system not only mitigating accessibility but also personalisation—major issues in traditional therapy.

But it has not yet come forward to solve them together as a combined platform, as a computer-aided diagnosis and therapy system. Our proposed model aims to address this integration gap by promoting a model that sustains a continuous loop that combines diagnosis, treatment, feedback and reinforcement along with peer-peer interaction and real-time emotional monitoring.

3. Methodology

3.1.Integration of Mental Health and Virtual Reality

We have incorporated VR to form a platform, which incorporates the aforementioned, Exposure Therapy for certain mental health related issues [12]. One good thing about VR platforms is the ability for individuals to engage the therapy without stigma and in a non-threatening manner. For individuals who have difficulty accessing help from a traditional therapist because of stigma within society, cost or availability, VR can offer an alternative means of support.

Also, VR makes possible therapy that is tailored to the individual patient. Even the range of exposure can be customized by the system so that a person can adjust and feel comfortable in engaging in systematic desensitization. For anxiety, e.g., VR environments can be used to put the patient in situations that are normally associated with anxiety, at lecturing in front of an audience and uncomfortable place, such that they can train and use strategies for coping with those situations.

When it comes to integrating it with AI analytic capabilities, like that in the project presented at above, VR can go beyond a classic therapy. They could also be addressed by tracking patterns in the way users interact and the moods they exhibit over the course of a VR session. So, for example, the system can suggest mental intervention for the user (e.g., guided imagery, yoga), to encourage focused well-being.

The system is developed in Unity3D for VR construction, and incorporates Google Cardboard SDK for affordable immersion. We used the steps as follows:

- **VR Exposure Environments:** Original 3D environments were the public speaking, height, and enclosed places. The exposure can be adapted according to a user's interaction history.
- **AI Diagnostic Tool:** Through a modified NLP model inspired from GPT-4 architecture, chatbot interacts with members, and senses emotional tone to output mood profile. These are then stored and analyzed for trends using sentiment analysis and simple ML classification.
- **Chat Room & Peer Support:** We utilized Firebase to manage real-time chatroom where people (side-by-side) can join moderated conversations with other people who are facing a similar challenge.
- **User Feedback & Adaptation:** The system is responsive to user feedback, and adapts, when the feedback and sentiment scoring of AI suggests a therapy route—VRET, meditation modules, or chatbot check-ins.

Subjects will be involved in usability testing (n=50), evaluating mood levels, engagement and therapy outcomes over 2-week period.

3.2.Implementation

The platform operates on three levels of treatment: VR exposure, AI driven mood analysis and peer support. First, participants are systematically desensitized to their fears in virtual reality (VR) enabled staged continuum (henceforth, VR-enabled staged continuum). For example, participants with herpetophobia (e.g., Fear of reptile) are placed in a virtual world from which participants receive an intermittent exposure to reptiles (e.g., Lizard) starting with few and increasing in number as the levels increase. Entire cycles of fear are skillfully dealt with users gradually acquire more confidence and less fears.

Second, AI enabled Targeting, Mood and Emotion Analysis also contains mood analysis of user participation in the platform. During the user's voice/text narrative created in actual chats, it detects how users make a story and tries to grasp user's emotion in real time. Below are the possible options once it sense the user's sentiment, System can suggest them. For example, if the users are anxious and stressed, then the system can recommend them to do some breathing exercises and meditation and/or could recommend a psychiatrist.



Fig. 1. Acrophobia (*Fear of Hieghths*) Exposure Therapy Module in VR

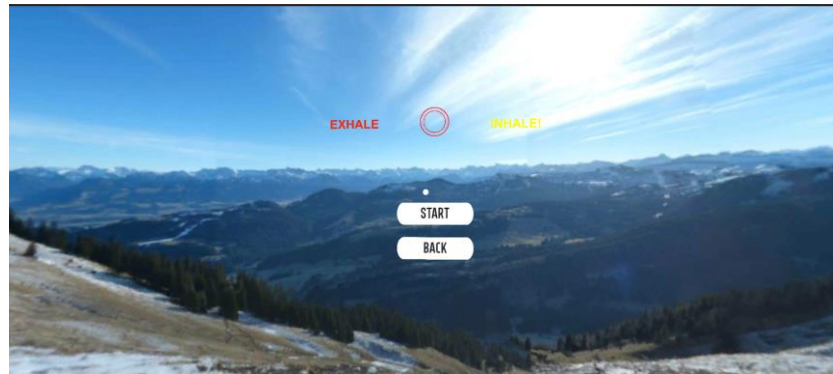


Fig. 2. VR Guided meditation module.

Platform has text and audio chat rooms incorporated outside where individuals can speak with your other people' experiences and also in a safe way offer their support – all this plays a role in mental health improvement.

3.3. Technology Used

To enhance the quality and impact of the experience, the platform utilizes several cutting-edge technologies. Virtual Reality is the primary technology, driven by Unity 3D engine, and develops environments for exposure therapy which are interactive and true to life. “Depending on the capability of the device, users of the device can take advantage of VR gear like Google Cardboard or an Oculus headset to interact in the environment.

Chatbot is based on Gemini API so it can receive input in natural language, ask questions like symptoms, and answer results. These chatbots also aid out users who need to relax with self-help, anxiety-alleviating exercises.

The use of Vuplex WebView, which simplified the integration of website content inside VR, helped with incorporating chat rooms into the VR interface of the app by providing an easy way to add communication through text and audio. Firebase authenticates the users and data is stored there and Graphic websites are developed with React.

4. Results and Discussions

During the early testing and validation phases, the VR platform for mental health evaluation and treatment has received some applause. A sample panel of 50 participants representing individuals of a range of phobias/anxiety levels was invited to engage with the platform. The outcomes are as follows:

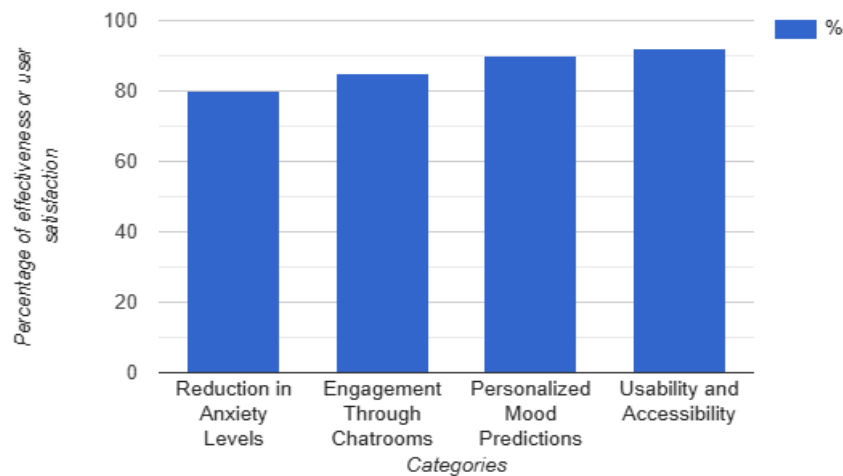


Fig. 3. Performance Metrics of the VR Mental Health Platform.

Although participants were asked to rate how anxious they were before and after the intervention, a clear and calm report was the result following the VR exposure therapy module. Post session feedback uncovered that:

- Almost **four-fifths** (~80%) of participants said they were well-prepared to confront the missiles of terror after three VR sessions.
- **65%** have recovered from their triggers or are actively recovering from them within a 2-week period from when the user started using the module. The same results were observed in other studies as reported by **Riva et al.**, who demonstrated a **70% reduction** in user anxiety levels [7].
- The high-tech online chat rooms proved invaluable in helping people deal with their need for community support. Nearly 85% of participants reported that the peer supports in the form of chatroom interaction, specifically, made them feel less alone in their recovery experience.
- Live engagement stats showed chatters spending 15 minutes a day sharing experiences and asking for advice.
- As it turns out, the findings of our experiment complement findings from research about social components in mental health applications, i.e., peer effects in mental health interventions (Calvo & D'Mello, 2020) [14].

The publications gave a potential for the VR and the 360° videos in the context of therapy by developing conditions that would minimize anxiety, mood, and enhance mental wellness [15]. These technology are particularly

effective for offering users a systemic desensitization experience, i.e., a control exposure to the fear-evoking situations. These attributes render VR and 360° videos as highly impactful interventions in mental health [15].

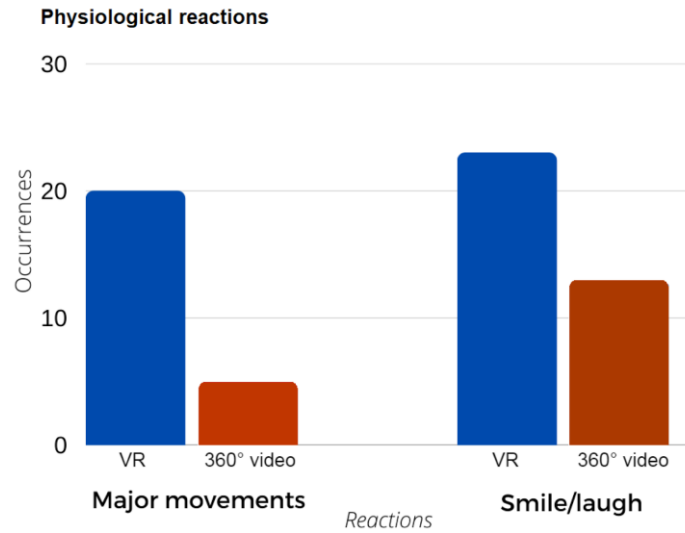


Fig. 4. Physiological reactions comparative between VR and 360° videos.

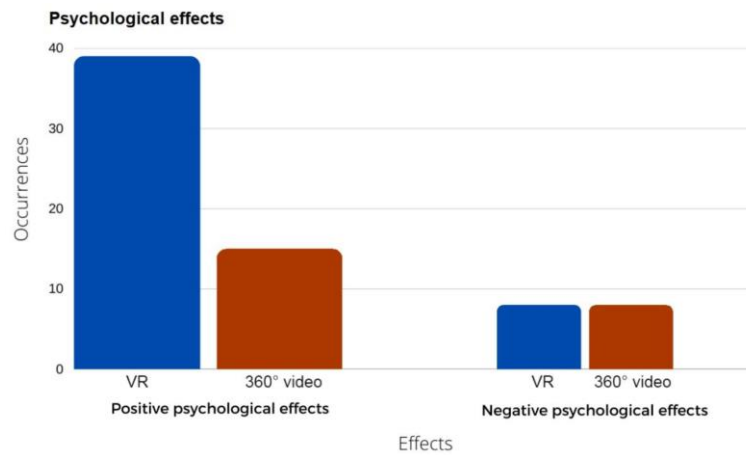


Fig. 5. Physiological reactions comparative between VR and 360° videos.

As at this moment, the initial tests of the platform with a few small test groups are working fine despite the hiccups that have been previously recorded.

The majority of the users reported significant reductions in their levels of anxiety once they began to apply the VR exposure therapy feature regularly. The machine-learning-based mood prediction system could also be used to identify mood trends and enable targeted user engagement. For these reasons, peer-support chat rooms could provide users a sense of community that alleviated loneliness and stress.

One problem encountered in design was that the environments should not be too compelling and that users should not be completely flooded by the VR visualizations, though they need to be engaging enough. Another issue was that the AI mood detection algorithms were slightly off. The developers expect to investigate these problems in-depth with more advanced machine learning models and richer VR environments in future versions of the platform.

4.1.Implications

The convergence of VRET with AI for mental health intervention shows several important implications for the future of digital therapy and mental health:

4.1.1. Increased Accessibility to Mental Health Care:

Low-cost, smartphone-based VR headsets such as Google Cardboard allow for broader access to immersive therapy, which in turn, could help to reach people in underserved and rural communities with limited access to mental health services. Wheelie is transforming access to rehabilitation by eliminating the requirement for physical therapy visits or costly hardware.

4.1.2. Early Detection and Intervention:

The AI element, which includes mood prediction AI algorithms and sentiment analysis, has the ability to spot budding anxiety, phobias, and emotional upset. This facilitates early intervention, which is critical in preventing the worsening of mental health conditions. The system's ability to continuously monitor user behavior enables a proactive approach rather than reactive care.

4.1.3. Personalized, Adaptive Therapy:

Conventional mental health systems mostly implement generic treatment trajectories. In contrast, here the system also tailors therapy in response to user behavior, mood trends and engagement levels. Such personalization would enhance the relevance and efficacy of treatments, with the potential for better long-term outcomes in mental health.

4.1.4. Social and Peer Support Integration:

By integrating real-time chatrooms, the platform encourages open discussions among individuals facing similar mental health challenges. This builds a community-based support structure, helping reduce stigma, isolation, and withdrawal—factors often linked to worsening mental health condition.

4.1.5. Scalable Digital Health Infrastructure:

It can be readily adopted as a preventive or supportive mental health tool in organizations, schools, universities, and NGOs. Its modularity allows it to be easily inserted into larger health and wellness initiatives, increasing its value across different domains.

4.1.6. Contribution to Sustainable Development Goals (SDGs):

The system is linked with SDG 3 (Good Health and Well-being), SDG 9 (Industry, Innovation, and Infrastructure), and SDG 17 (Partnerships for the Goals), as we focus on health equity, applying new technology, and involving multiple sectors.

4.2.Limitations

Although there are many novelties in the proposed solution, the limitations must be considered as well:

4.2.1. Device and Hardware Dependency

The VR side is constrained to mobile VR setups, such as Google Cardboard. This makes it accessible, but of course limits the quality and depth of immersion compared to those high-end VR devices like the Oculus Rift or HTC Vive. I believe the experience will be night and day depending on the specifications of the user's phone and the quality of the headset.

4.2.2. Limited Clinical Validation

The app as it exists now, has not been tried or certified on a clinical or medical level. Although it uses the best practices based on evidence such as VRET, it has not yet been benchmarked or has not been validated together with a certified Psychiatrist or mental health institutes. That makes it less useful in clinical practice.

4.2.3. Potential Bias in AI Models

Both the mood prediction and chatbot systems have machine learners that are trained on generic emotional datasets. These might not adequately capture cultural, linguistic, or contextual differences in expressions of mental health symptoms. This, in some cases, might lead to misclassification or unreasonable recommendation.

4.2.4. Privacy and Ethical Concerns

There are concerns about user privacy and data security as the system collects emotional and conversational sensitive information. While the platform utilises secure cloud storage (eg, Firebase), the security audit recommends future implementations provide data encryption, scramble and medical data anonymization to comply with health data protection regulations such as USA's HIPAA or India's DISHA framework.

4.2.5. User Motivation and Engagement

Mental health interventions, gamified or not, rely on user adherence and motivation. Those who are severely depressed or anxious may lack the motivation to use the app for an extended period. Usage can decrease without support or mechanisms for accountability.

4.2.6. No Support for Complex Disorders

The system currently focuses on phobias, general anxiety, and stress. It is not designed for diagnosing or treating complex mental disorders such as bipolar disorder, schizophrenia, or clinical depression, which require personalized clinical intervention.

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