Research Article

TheraMind: An AI–VR Framework for Mental Healthcare in Saudi Arabia

Daniah Hasan[1], Enas Turki[1], Samah AlHusayni[1], Ahad Allam[1], Maram Meccawy[1]

[1]*Department of Information Systems, King Abdulaziz University, Jeddah, Saudi Arabia*

Corresponding Author:

Daniah Hasan

E-mail: dhasan0002@stu.kau.edu.sa

ARTICLE INFO	ABSTRACT
	Introduction: Mental healthcare faces critical challenges in accessibility, cost, personalization, and ethical compliance. This study presents TheraMind, a novel framework that integrates ubiquitous computing (UbiCom) technologies—specifically, artificial intelligence and virtual reality—to address these system-related limitations. **Objectives**: A conceptual framework is proposed for scalable, secure, and patient-centered interventions that dynamically adapt to real-time biofeedback while minimizing financial barriers through cloud-based platforms. **Methods**: We validate the framework through implementation at Labayh, a leading digital mental health platform in Saudi Arabia, as a practical scenario to highlight the role of UbiCom technologies in enhancing therapy personalization, engagement, and outcomes. **Results**: The study also explores key ethical concerns, particularly those related to data privacy and security, and proposes robust measures to ensure compliance and trust. **Conclusions**: By demonstrating the transformative potential of UbiCom technologies, this research showcases their contribution toward accessible and effective mental health interventions, aligning with broader initiatives such as Saudi Arabia's Vision 2030. **Keywords:** Ubiquitous Computing, Mental Health Interventions, Virtual Reality, Artificial Intelligence Personalization, Cloud Computing

INTRODUCTION

Mental health is a critical aspect of overall health, with conditions such as depression, anxiety, and posttraumatic stress disorder (PTSD) affecting millions of people globally. Despite advances in therapeutic practices, mental healthcare models are often constrained by cost, accessibility, and a lack of personalized care, which has left many individuals without adequate support. Ubiquitous computing (UbiCom) offers a unique opportunity to address these challenges by integrating advanced technologies such as virtual reality (VR), augmented reality (AR), and mixed reality (MR)—collectively known as extended reality (XR)—into immersive and real-time mental healthcare that can be tailored to individual needs. These technologies can enhance therapeutic outcomes by providing interactive

Research Article

environments that adjust dynamically based on patient responses. Additionally, cloud-based platforms improve the scalability and accessibility of these technologies, reducing the costs associated with deployment. Existing research has demonstrated the effectiveness of VR-based treatment of anxiety and PTSD through controlled exposure in a virtual environment (Riva et al., 2016). However, the long-term effects of these technologies remain underexplored, and the integration of AR and MR into mental healthcare is still in its early stages. Furthermore, current studies often lack robust data on how UbiCom can be adapted for diverse patient populations, particularly in low-resource settings (Freeman et al., 2017). In addition, the integration of UbiCom into mental healthcare has raised concerns about data privacy, ethical considerations, and usability. Addressing these challenges is critical to ensuring the effectiveness, equitability, and sustainability of UbiCom-based mental healthcare.

The study aims to evaluate the potential role of UbiCom technologies in addressing critical challenges in mental healthcare. Three hypotheses guided this study:

- UbiCom technologies, such as VR and AR, improve therapeutic outcomes for mental health conditions like PTSD, anxiety, and depression.

- UbiCom technologies are more effective than traditional approaches for mental healthcare by enhancing personalized intervention, patient engagement, and self-management.

- The primary barriers to the widespread adoption of UbiCom technologies include cost, accessibility, and ethical concerns, particularly regarding privacy and data security.

This study focused on answering the following questions:

- How do immersive technologies, such as VR, impact therapeutic outcomes for individuals with PTSD, anxiety, and depression in terms symptom improvement?

- What factors within UbiCom technologies influence patient engagement and adherence to mental health treatment?

- How can cloud-based platforms reduce development and deployment costs of UbiCom technologies to enhance their accessibility in mental healthcare settings?

A conceptual framework was developed to highlight the relationship between UbiCom technologies and improved mental healthcare outcomes. The proposed framework was applied to a use-case scenario to assess the long-term impact of UbiCom technologies on symptom reduction, emotional regulation, and cognitive rehabilitation, as well as to identify challenges hindering their integration into mental healthcare systems. This study provides recommendations for future research and practical guidelines for implementation of UbiCom technologies in clinical and therapeutic settings. The findings of this study offer valuable insights for healthcare providers seeking to integrate UbiCom technologies into clinical practice, while addressing critical challenges such as cost, privacy, and the need for personalized treatment.

RELATED WORK

UbiCom integrates technology into daily life, offering personalized and real-time interventions for mental health conditions such as PTSD, anxiety, and depression. When combined with artificial intelligence (AI) in mobile and

wearable devices, UbiCom enables continuous monitoring, early detection, and real-time feedback. Various UbiCom technologies have shown promise in mental healthcare, but challenges such as data variability, accuracy, and absence of standardized protocols have hindered their widespread adoption (Bardram & Matic, 2020; Perera & Gunawardena, 2020) VR has been effectively applied in exposure therapy for PTSD and anxiety by creating a controlled environment for trauma confrontation (Hafiz et al., 2020); however, cost and scalability remain significant barriers for broader implementation (Gunter et al., 2020; Knaust et al., 2020). AR can be used to bridge real-world applications with therapy by overlaying prompts to aid emotional regulation during daily tasks, while MR can be used to combine the benefits of VR and AR by creating tailored environments for cognitive rehabilitation. Despite these advantages, their wider implementation has been constrained by high costs, the need for long-term efficacy studies, and concerns over data privacy (Kamariddinov, 2019; Cervantes et al., 2023; Li et al., 2024). Wearable devices, such as smartwatches and fitness trackers, provide physiological and behavioural data—including heart-rate variability and sleep patterns— that can be utilized by UbiCom technologies to detect mental health conditions like depression and PTSD, facilitating timely interventions. However, further validation and population-scale studies are required to improve the accuracy of algorithms and ensure their reliability at predicting psychological resilience (Hilty, 2015; Hasan et al., 2022). Furthermore, issues like compliance, usability, and data labeling have limited the wider usage of mobile applications and wearable sensors for mental health monitoring and management (Bardram, Matic & Hafiz, 2020). XR tools such as VR-based cognitive behavioural therapy (VR-CBT) have proven effective at reducing anxiety, but their long-term benefits remain underexplored (Hafiz et al., 2020). Studies on tailored interventions for psychotic disorders and attention deficit hyperactivity disorder have emphasized the role of XR and wearable technologies in improving cognitive functions, social interactions, and treatment adherence (Sheikh, Qassem & Kyriacou, 2021; Pons, Navas-Medrano & Soler-Dominguez, 2022).

Despite advancements, major challenges persist in the wider integration of UbiCom technologies in mental healthcare. Key barriers include low user engagement, limited scalability, difficulties in integration with platforms such as Labayh, and a lack of standardized data collection and self-reporting mechanisms. Addressing these challenges is essential for unlocking the full potential of UbiCom in enhancing the accessibility, personalization, and effectiveness of mental healthcare.

METHODS

Theramind: An AI–VR-driven Mental Health Framework

The high cost for implementing VR technology restricts its widespread adoption in mental health therapy. To address this issue, we propose the TheraMind framework, which uses Software-as-a-Services models and cloud-based platforms to reduce implementation costs while ensuring scalability and accessibility. The proposed framework grants remote access to AI- and VR-powered therapy environments without the need of expensive hardware. To ensure patient privacy and regulatory compliance, especially in quarantine settings, TheraMind incorporates security measures such as encryption and controlled data access. It offers a cost-effective, scalable, and adaptable mental health model by overcoming cost-related challenges via cloud-based implementation. This approach enhances the accessibility of advanced VR therapy across various demographics.

TheraMind was developed to explore how UbiCom technologies can enhance mental healthcare while addressing the challenges of cost, accessibility, and ethics. VR offers a controlled and immersive environment that is highly effective

Research Article

for exposure therapy, particularly for conditions such as PTSD, anxiety, and phobias. Wearable technologies like smartwatches facilitate continuous, real-time monitoring of physiological data, including stress levels, for precise and adaptive therapeutic interventions. AI-driven customization can be used to analyze the collected data to personalize treatments, such as VR-based relaxation exercises or AR-guided breathing techniques, to individual needs. This personalized approach improves patient engagement through real-time adaptation for more effective outcomes in terms of symptom reduction and long-term therapeutic benefits. Cloud-based solutions are crucial for reducing infrastructure costs and improving accessibility, making advanced therapeutic systems more widely available for scalable and adaptive interventions that can be delivered seamlessly across diverse settings. Finally, robust data security measures including encryption, anonymization, and strict access controls are needed to safeguard patient privacy while ensuring ethical compliance, thereby fostering trust and supporting the broader adoption of these technologies.

The TheraMind framework combines AI and VR technologies to deliver secure, adaptive, and scalable mental healthcare. Real-time analysis, personalized therapy tools, and robust data management are integrated to effectively address the needs of both users and healthcare providers. Figure 1 shows the TheraMind framework as an Open Systems Interconnection model, where each layer addresses specific aspects of functionality, data security, and user interaction.

- **Application Layer:** This layer incorporates biometric sensors and AI-driven insights to personalize the VR environments and ensure that the therapy adapts dynamically based on real-time patient data. This layer incorporates camera-based positioning, hand-movement and eye-tracking cameras, facial expression detectors, and heart-rate sensors that collect real-time data on emotional states (e.g., anxiety levels) and patient behaviors (e.g., avoidance of eye contact under stress). The data are processed by integrated AI components, providing AI insights, real-time behavior analysis, and therapeutic analysis for the dynamic adaptation of VR environments. The VR application build creates therapeutic scenarios using three-dimensional assets, animations, and sound. The VR application test ensures the safety and effectiveness of the personalized therapy environment that evolves with the user.

- **Presentation Layer:** This layer facilitates seamless content delivery and secure data formatting, as well as enhanced accessibility through integration with a cloud-based platform. A security gateway ensures encrypted data transmission that complies with healthcare standards, while API management facilitates seamless integration between components. The enterprise cloud server supports application hosting and data management, while transformation and connectivity ensure real-time data flow. The user directory and enterprise application provide healthcare providers with access to patient data and facilitate interaction management. Meanwhile, the user treatment visualization displays treatment progress on an interactive dashboard for both patients and providers.

- **Transport and Network Layers:** These layers ensure stable and secure data transmission with minimal latency for real-time interventions.

Data Link and Physical Layers: These layers include error detection mechanisms and VR hardware, such as headsets and sensors, to ensure optimal performance.

Research Article

Cloud-based Platforms

To facilitate the wider adoption of UbiCom technologies in mental healthcare, selecting a cloud-based platform that aligns with the unique needs of TheraMind is crucial. Table 1 compares commercially available cloud-based platforms such as Unity Cloud & AI, Amazon Web Services, Microsoft Azure, and Google Cloud Platform in terms of their capabilities (Amazon Web Services, n.d.; Google Cloud Platform, n.d.; Microsoft, n.d.; Unity Technologies, n.d.). To achieve privacy, adaptability, and user-centric design, Unity Cloud & AI was determined as the most suitable platform for implementing the TheraMind framework owing to its comprehensive integration of AI and cloud services. Specifically, AI-powered tools provide real-time analysis of the user's behaviors and emotional states for personalization of therapy sessions. Unity Sentis ensures data privacy by deploying AI models directly on the user's device. Adaptive VR environments evolve in real-time to align with user interactions and stress levels, enhancing therapeutic effectiveness. Unity's cloud services simplify application development and hosting through Cloud Build. In addition, collaborative tools support teams in co-creating and refining therapy environments to ensure efficient workflows. Scalable hosting supports deployment across diverse healthcare settings, while secure data storage synchronizes patient progress and behavioral data for seamless analysis and adaptation. By leveraging these capabilities, Unity Cloud & AI services enable the creation of personalized, scalable, and secure applications that align with the TheraMind framework to effectively address critical challenges in UbiCom-based mental healthcare.

Table 1. Capabilities of cloud-based platforms

Platform	VR Development	AI Integration	Cloud Services	Relevance to Mental Health
Unity Cloud and AI	Unity Editor for immersive VR apps; supports Oculus and HTC Vive	Unity Muse for generative AI; Unity Sentis for on-device deployment	Unity Cloud Build for CI/CD; collaborative tools for scalable hosting	Ideal for customized VR therapy environments; AI-driven personalization; offline AI for privacy
AWS	AWS Sumerian for building VR/AR experiences	SageMaker for machine learning; NLP and vision AI tools	Scalable hosting with EC2; S3 storage for global deployment	Provide personalized interventions using real-time emotional insights and sentiment analysis
Microsoft Azure	Azure Kinect DK for motion capture and VR apps	Cognitive Services for emotion detection and NLP; AI chatbots	Virtual machines for scalable hosting; Azure integration	Supports interactive therapy bots and biofeedback interventions using motion-sensing technology
GCP	Supports AR/VR development via Google VR SDKs	TensorFlow and AutoML for deep learning; vision and speech APIs	Compute Engine for scalable hosting; robust cloud storage	Suitable for AI-enhanced VR therapies with emotion tracking through speech and vision APIs

VR: Virtual Reality; AI: Artificial Intelligence; AR: Augmented Reality; AWS: Amazon Web Services; NLP: Natural Language Processing; CI/CD: Continuous Integration/Continuous Deployment; EC2: Elastic Compute Cloud (a service by AWS); S3: Simple Storage Service (a storage service by AWS); DK: Developer Kit; SDK: Software Development Kit; GCP: Google Cloud Platform; VM: Virtual Machine; HTC: High Tech Computer Corporation (a Taiwanese electronics company)

Research Article

Use-case Scenario: Labayh

Labayh is a digital mental health platform accredited by the Ministry of Health in Saudi Arabia, exemplifying how technology can address psychological well-being at scale (Labayh,2022). It offers a comprehensive therapeutic and educational service ecosystem while maintaining user confidentiality and accessibility. As the fifth-most downloaded healthcare application in Saudi Arabia, Labayh highlights the growing demand for digital mental health services. Labayh provides comprehensive psychological support services tailored to diverse user needs, including psychological support through evidence-based approaches like CBT, family counseling for addressing family dynamics, and medical consultations by certified professionals for diagnosis and treatment. To enhance user experience, Labayh ensures privacy through pseudonyms, promotes self-awareness with mood tracking, and offers premium features via Labayh Plus, such as discounted consultations and free educational resources. These services have established Labayh as a leading digital platform for personalized and data-driven mental healthcare. In this study, a use-case scenario was explored involving the implementation of the TheraMind framework within Labayh, demonstrating how Labayh's services can be enhanced through AI and VR technologies.

Comparative Analysis: TheraMind vs. MindMotionVR

To evaluate the uniqueness and effectiveness of TheraMind, we compared it with MindMotionVR—a widely used VR-based cognitive and emotional therapeutic framework (Schellhorn et al., 2022). Although these approaches use immersive VR environments to enhance mental health interventions, they differ concerning scalability, customization, and accessibility. Table 2 summarizes the results of a comparative analysis and highlights unique scalability, personalization, and accessibility of TheraMind.

Table 2. Comparative Analysis of TheraMind and MindMotionVR

Feature	TheraMind Framework	MindMotionVR
VR-based Therapy	✓ Adaptive treatments can be adjusted in real time based on patient feedback and AI analysis	✓ VR therapy sessions follow predetermined treatment modules
AI Personalization	✓ AI-powered personalization using real-time patient data (e.g., stress levels, facial expressions, physiological responses)	✗ Limited AI-driven modification; heavily relies on fixed therapeutic content
Cloud Integration	✓ SaaS-based, enabling cloud-hosted VR therapy accessible across multiple devices	✗ Requires specialized on-premise hardware and specific VR configurations
Wearable Sensors	✓ Combines physiological data from wearable devices and biometric detectors for therapy modification	✗ Limited or no integration of wearable medical data
Cost and Scalability	✓ Cost effective owing to cloud-based implementation, thereby decreasing hardware reliance	✗ Higher costs due to reliance on specialized VR technology
Target Audience	✓ Designed for clinical and remote therapy, providing greater accessibility	✗ Typically used in clinical rehabilitation centers

Research Article

Unlike MindMotionVR, which relies on pre-established therapy modules and customized on-premises hardware, TheraMind uses AI-driven therapy transformation, personalizing treatments in real time according to physiological indicators, such as anxiety levels and emotional expressions (Schellhorn et al., 2022). The SaaS-based cloud deployment architecture of TheraMind reduces the need for expensive VR equipment, substantially lowering infrastructure expenses while enhancing scalability. Consequently, TheraMind facilitates the accessibility and affordability of VR-based mental healthcare in clinical settings, making it more accessible and cost effective than MindMotion VR.

RESULTS AND DISCUSSION

Implementation of the TheraMind Framework on Labayh

The TheraMind framework envisions a digitally enhanced mental health ecosystem powered by AI and VR technologies. Labayh's existing infrastructure provides a robust foundation for implementing these advancements. Potential aspects for integration include AI real-time behavioral analysis, AI algorithms that can analyze user behavior during therapy sessions, offer therapists with actionable insights by detecting emotional cues from text and video interactions, and enables the identification of stress or anxiety patterns; immersive VR therapy, in which VR technology can be used to create immersive environments for exposure therapy—such as simulating public speaking scenarios to treat anxiety—and real-time physiological monitoring—including heart-rate tracking and facial expression analysis—can further personalize intervention. Moreover, centralized data visualization is a potential integration aspect; this is a unified dashboard integrating user data, AI-driven insights, and treatment outcomes that streamline decision-making and improve the precision and personalization of mental healthcare.

Given Saudi Arabia's 99% internet penetration rate (CST,2023), Labayh is uniquely positioned to expand its digital health services. Key steps in AI and VR implementation include the enhancement of data analytics, expanding current data utilization to include AI-driven insights into emotions and session outcomes; the development of VR therapy, collaborating with clinical psychologists and developers to create relevant VR-based therapy programs tailored to conditions such anxiety and stress; and scalable infrastructure, optimizing backend systems to support real-time AI analysis and seamless VR content delivery without compromising user experience.

In summary, Labayh's comprehensive digital mental health services and secure technological foundation make it a model for integration with the TheraMind framework. Integrating AI-driven insights and immersive VR environments in Labayh can enhance mental healthcare delivery in Saudi Arabia. These advancements align with the broader objectives of the Kingdom's Vision 2030, positioning Labayh at the forefront of digital mental health innovation.

Expected Outcomes

Practical implementation of the TheraMind framework is expected to advance mental healthcare by offering cost-effective, scalable, and personalized solutions. Utilizing a cloud-based platform will reduce financial barriers, increasing accessibility to advanced therapeutic technologies. By using AI and VR for real-time adaptation of therapy, the TheraMind framework is expected to foster engagement and improve therapeutic outcomes for conditions such as anxiety, PTSD, and social phobia. Personalized interventions can be achieved by dynamically tailoring therapies based on user behavior and biofeedback, reducing dropout rates and enhancing relevance. Robust privacy measures,

Research Article

including encryption and anonymization will help ensure ethical compliance and build user trust. The scalability of these solutions will enable deployment across diverse healthcare contexts—from rural areas to advanced urban settings. Implementing the TheraMind framework will position platforms like Labayh as pioneers in digital mental healthcare and set a new standard for innovation in therapy delivery. These advancements promise not only to improve mental healthcare but also create a sustainable and impactful digital health ecosystem.

Recommendations and Limitations

Future research should focus on validating the safety and efficacy of AI- and VR-based mental healthcare through clinical trials to ensure generalizability across diverse populations. In addition, culturally sensitive adaptations are needed to enhance relevance in different regions regarding user behavior and engagement. Addressing ethical concerns, particularly data privacy, is crucial. Cost-benefit analyses are needed to evaluate the economic feasibility for providers and cost savings for patients while investigating the integration of wearable devices for enhanced real-time data personalization. Finally, research must prioritize the inclusiveness and accessibility of future models for populations with limited digital literacy or technology access.

Despite its scalability and AI-driven approach, the proposed framework has several limitations. First, it is conceptual and requires empirical validation through clinical trials to determine its long-term impact. Second, although cloud utilization minimizes costs, difficulties with accessibility persist in resource-limited and internet connectivity–restricted environments. Third, device-based sensor integration raises confidentiality issues, necessitating robust safety measures. Further studies should focus on therapeutic validation, large-scale assessments, and ethical considerations in AI-powered mental health therapies.

CONCLUSION

The TheraMind framework underscores the transformative potential of leveraging UbiCom technologies such as AI and VR to address critical challenges in mental healthcare. The proposed framework outlines a scalable and innovative approach to improving therapeutic interventions and patient outcomes in terms of cost-effectiveness, accessibility, personalization, and ethical considerations for dynamic and real-time adaptations to user behavior and biofeedback, helping foster greater engagement and deliver measurable improvements in mental health treatment. Labayh was utilized as a use-case scenario to demonstrate the practical application of these advancements within a digital mental health platform. With its robust infrastructure and secure services, Labayh showcases the potential for integrating AI-driven insights and immersive VR environments to enhance therapy delivery in alignment with the broader objectives of Saudi Arabia's Vision 2030. Future research should focus on refining UbiCom technologies to ensure their sustainability and adaptability, addressing barriers to adoption, and exploring their long-term impacts. This research lays the groundwork for a more accessible, effective, and patient-centered mental healthcare system that paves the way for innovative solutions utilizing UbiCom technologies.

CONFLICT OF INTEREST STATEMENT

The authors have no conflicts of interest to declare.

FUNDING SOURCES

AUTHOR CONTRIBUTIONS

- Daniah A. Hasan: Writing–Original Draft (lead); Writing–Review & Editing (lead); Framework Responsible (lead); Supervision (lead); Validation (lead)

- Enas M. Turki: Literature Review (supporting); Writing–Review & Editing (equal)

- Samah M. AlHusayni: Case Study–Labyah (lead); Writing–Review & Editing (equal)

- Ahad A. Allam: Case Study–Labyah (supporting); Writing–Review & Editing (equal)

- Prof. Maram A. Meccawy: Supervision (lead); Review & Editing (equal)

REFRENCES

[1] Amazon Web Services. *AWS Sumerian and SageMaker*. Retrieved from https://aws.amazon.com/

[2] Bardram, J. E., & Matic, A. (2020). A decade of ubiquitous computing research in mental health. *IEEE Pervasive Computing*, *19*(1), 62–72. https://doi.org/10.1109/MPRV.2019.2925338

[3] Bardram, J. E., Matic, A., & Hafiz, P. (2020). Ubiquitous mental health: New ways to approach behavioral health. *Journal of Medical Internet Research*, *22*(11), e17506.

[4] Cervantes, J. A., López, S., Cervantes, S., Hernández, A., & Duarte, H. (2023). Social robots and brain-computer interface video games for dealing with attention deficit hyperactivity disorder: A systematic review. *Brain Sciences*, *13*(8), 1172. https://doi.org/10.3390/brainsci13081172

[5] Unity Technologies. *Unity cloud & AI*. Retrieved from https://unity.com/products/unity-cloud-ai

[6] CST. *Saudi Internet report 2023. Communications space and technology commission*. Retrieved from https://www.cst.gov.sa/ar/indicators/PublishingImages/Pages/saudi_internet/saudi-internet-2023.pdf

[7] Freeman, D., Reeve, S., Robinson, A., Ehlers, A., Clark, D., Spanlang, B., & Slater, M. (2017). Virtual reality in the assessment, understanding, and treatment of mental health disorders. *Psychological Medicine*, *47*(14), 2393–2400. https://doi.org/10.1017/S003329171700040X

[8] Google Cloud Platform. *TensorFlow, AutoML, and Google VR SDKs*. Retrieved from https://cloud.google.com/

[9] Gunter, C., Tyndall, J., Best, R., et al. (2020). Implementing virtual reality exposure therapy for trauma survivors. *Journal of Traumatic Stress*, *33*(2), 309–318.

[10] Hafiz, P., Miskowiak, K. W., Maxhuni, A., Kessing, L. V., & Bardram, J. E. (2020). Wearable computing technology for assessment of cognitive functioning of bipolar patients and healthy controls. *Proceedings of the ACM on Interactive, Mobile, Wearable & Ubiquitous Technologies*, *4*(4), 1–22. https://doi.org/10.1145/3432219

[11] Hasan, H., Nguyen, D., Pearsall, S., et al. (2022). Machine learning applications for monitoring emotional and cognitive states using wearable sensors. *Journal of Medical Internet Research*, *24*(2), e28949.

[12] Hilty, L. M. (2015). Ethical issues in ubiquitous computing–three technology assessment studies revisited. *Advances in Intelligent Systems & Computing*, *333*, 45–60. https://doi.org/10.1007/978-3-319-13452-9_4

[13] Kamariddinov, B. (2019). Ethical implications of immersive VR technologies in psychological therapy. *Journal of Medical Ethics*, *45*(5), 285–286.

[14] Knaust, T., Felnhofer, A., Kothgassner, O. D., Höllmer, H., Gorzka, R. J., & Schulz, H. (2020). Virtual trauma interventions for the treatment of post-traumatic stress disorders: A scoping review. *Frontiers in Psychology*, *11*, 562506. https://doi.org/10.3389/fpsyg.2020.562506

[15] Labayh. *Labayh psychiatric consultations with ease and privacy*. Retrieved from https://labayh.net/en/

[16] Li, Y. Y., Peng, J., Ping, Y. Y., Weng, J., Lu, Y. E., Liu, J., et al. (2024). Virtual reality-based cognitive-behavioral therapy for the treatment of anxiety in patients with acute myocardial infarction: A randomized clinical trial. *General Psychiatry*, *37*(2), e101434.

[17] Microsoft. *Azure: Cognitive services and azure kinect DK*. Retrieved from https://azure.microsoft.com/

[18] Perera, M., & Gunawardena, H. (2020). Application of artificial intelligence in mental health care: A systematic review. *Psychiatry Research*, *284*, 112750.

[19] Pons, P., Navas-Medrano, S., & Soler-Dominguez, J. L. (2022). Extended reality for mental health: Current trends and future challenges. *Frontiers in Computer Science*, *4*, 1034307. https://doi.org/10.3389/fcomp.2022.1034307

[20] Riva, G., Baños, R. M., Botella, C., Mantovani, F., & Gaggioli, A. (2016). Transforming experience: The potential of augmented reality and virtual reality for enhancing personal and clinical change. *Frontiers in Psychiatry*, *7*, 164. https://doi.org/10.3389/fpsyt.2016.00164

[21] Schellhorn, J., Surer, E., Keller, U., & Riener, R. (2022). Determining the optimal virtual reality exergame approach for balance training in neurological disorders: A Rasch model application. *Frontiers in Neurology*, *13*, 898482.

[22] Sheikh, M., Qassem, M., & Kyriacou, P. A. (2021). Wearable, environmental, and smartphone-based passive sensing for mental health monitoring. *Frontiers in Digital Health*, *3*, 662811. https://doi.org/10.3389/fdgth.2021.662811

FIGURE LEGENDS

Fig. 1. Core components of the TheraMind framework