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DESIGN OF A VIRTUAL REALITY ART THERAPY TEACHING SYSTEM: INTEGRATING ARTIFICIAL INTELLIGENCE AND CHILD PSYCHOLOGICAL REGULATION

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ABSTRACT

The integration of Virtual Reality (VR) and Artificial Intelligence (AI) in educational and therapeutic contexts holds significant potential for enhancing children's emotional regulation and engagement. While VR has been widely used for immersive learning, and AI for personalized interventions, their combined use in art therapy for children remains underexplored. This study addresses this gap by designing a VR-based art therapy system that integrates AI to provide real-time emotional feedback and personalized interventions. The system aims to support children's psychological well-being and learning through immersive art experiences tailored to individual emotional needs. Case studies conducted in a primary school and a therapy center showed significant improvements in children's emotional regulation and engagement during art activities. The results indicated that the system's AI-driven personalization led to a 25-30% improvement in emotional regulation, and enhanced engagement in creative expression. This research contributes both to the theoretical understanding of immersive technologies in art therapy and to practical applications in educational and therapeutic settings. The findings suggest that integrating VR and AI can provide a more dynamic, personalized therapeutic experience, with implications for future research and system refinement.

KEYWORDS: Virtual Reality (VR), Artificial Intelligence (AI), Art Therapy, Emotional Regulation, Child Psychological Development.

1. INTRODUCTION

The intersection of technology and education has led to the development of innovative methods that not only enhance learning experiences but also support emotional and psychological development, especially for children[1]. Among these innovations, Virtual Reality (VR) and Artificial Intelligence (AI) have emerged as powerful tools in creating immersive and interactive learning environments. The application of these technologies within art therapy offers promising prospects for improving children's psychological well-being and engagement in educational contexts[2]. Art therapy, a well-established method for emotional regulation and healing, has been shown to promote self-expression and emotional understanding[3]. When integrated with VR and AI, it can transform traditional approaches by providing a more personalized and interactive experience for children.

However, despite the growing interest in VR and AI applications, there is a significant gap in research concerning their combined use in art therapy, particularly within the context of children's psychological regulation. Existing studies often focus on either VR in education or AI in personalized learning but fail to explore the synergistic potential of VR and AI in the specific domain of art therapy for children[4]. Moreover, while VR provides an immersive environment for creative expression, AI offers the ability to tailor the experience to the individual's emotional state, thus enhancing the therapeutic effects[5]. These gaps in current research highlight the need for a comprehensive approach that combines VR, AI, and art therapy to provide a more effective and engaging educational experience for children.

This study aims to address this gap by designing a VR-based art therapy teaching system that integrates AI to provide adaptive interaction and psychological support for children. The system aims to combine immersive art experiences with real-time emotional feedback, allowing for personalized psychological regulation. Through this interdisciplinary approach, the paper explores how the integration of VR and AI can enhance children's emotional well-being, learning engagement, and overall psychological development[6]. By examining the effectiveness of this system, the study seeks to contribute both academically and practically to the fields of education, psychology, and technology.

The significance of this research lies in its potential to advance the theoretical understanding of how immersive technologies can support emotional regulation and learning, while also providing

practical insights into the design and implementation of such systems in educational settings. Furthermore, the study aims to propose new avenues for future research on the intersection of technology, art therapy, and child development, contributing to the broader field of interdisciplinary studies in education and psychology.

2. LITERATURE REVIEW

The integration of Virtual Reality (VR) and Artificial Intelligence (AI) in education and therapy has been met with increasing enthusiasm due to the potential of these technologies to create immersive, adaptive learning environments. VR's primary advantage lies in its ability to provide fully immersive, interactive experiences that engage users on a cognitive and emotional level[7]. In education, VR can offer hands-on experiences that traditional teaching methods cannot, while in therapy, it creates controlled environments for addressing psychological issues such as anxiety and trauma[8]. The use of VR in art therapy, which encourages self-expression through creative activities, has shown promise in helping children regulate their emotions, express their feelings, and improve mental well-being.

However, despite these advantages, VR in art therapy remains underexplored, especially when combined with AI for personalized emotional feedback[9]. While VR has been widely used for therapeutic purposes, its potential in art education is less frequently studied, particularly in systems designed for emotional regulation. The main limitation of VR is its lack of adaptability to individual needs. Although VR environments are immersive, they often fail to respond in real-time to users' emotional states[10]. This is a critical gap in applications targeting children, where emotional responses must be continuously monitored and supported. The high cost and complexity of VR systems also hinder their widespread adoption, especially in educational environments that may lack the necessary resources.

AI, on the other hand, has demonstrated its potential to provide personalized learning experiences. In the context of emotional regulation, AI can analyze emotional cues such as facial expressions, body language, or physiological signals, adjusting the experience to help maintain balance[11]. Despite its promise, AI integration in art therapy remains limited, particularly when it comes to using AI for real-time feedback in immersive environments like VR. The challenge is not only to recognize emotional states but also to provide

appropriate interventions that support psychological growth[12]. Current AI systems, while capable of detecting emotions, lack the depth of interaction required for therapeutic settings where subtle emotional nuances need to be addressed. Moreover, many existing AI tools rely on static models that do not evolve with the user's emotional development, further limiting their effectiveness in long-term therapeutic applications.

The combination of VR and AI in a system for art therapy presents an opportunity to fill these gaps. While VR offers the immersive environment necessary for creative expression and emotional engagement, AI can provide real-time emotional feedback, adjusting the experience to meet the user's psychological needs[13]. The integration of these technologies in a cohesive system designed for art therapy has the potential to support children's emotional regulation and learning in ways that have not yet been fully realized. This approach not only brings together two cutting-edge technologies but also applies them in a novel, interdisciplinary context that combines education, psychology, and technology.

Despite the evident potential of combining VR and AI, the literature reveals a clear gap in studies that systematically address the combined use of these technologies in art therapy. Existing research primarily explores the individual benefits of VR or AI in therapeutic or educational settings, but little attention has been given to how these tools can be integrated to create a comprehensive, adaptive system for children's emotional development. This study aims to address this gap by designing a VR-based art therapy teaching system that integrates AI to provide real-time emotional feedback, offering a more personalized and dynamic therapeutic experience for children. By doing so, it contributes both to the academic understanding of these technologies and their practical application in art therapy for children.

3. THEORETICAL FRAMEWORK AND METHODOLOGY

This chapter outlines the theoretical framework guiding this study, along with the research methodology employed to design and evaluate the VR-based art therapy teaching system integrating AI. The framework draws from multiple interdisciplinary fields, including educational psychology, technology-enhanced learning, and art therapy. This section will explore the theoretical models, case studies, and design methodology that inform the system's development, and provide a

comprehensive explanation of the data collection and analysis methods.

3.1 Theoretical Framework: Understanding the Integration of VR, AI, and Art Therapy

The integration of VR, AI, and art therapy in a system to support children's emotional and psychological development requires a solid theoretical foundation. This framework draws from key theories in art therapy, educational psychology, and technology-enhanced learning, each contributing to the system's design and evaluation.

Art therapy is based on the idea that creative expression helps individuals process and communicate emotions that may be difficult to express verbally. For children, art therapy is particularly effective as it provides a non-verbal outlet for emotional expression. Theoretical foundations in art therapy, such as Freud's concept of the unconscious and Vygotsky's socio-cultural theory, underscore the role of creativity in emotional and cognitive development. In this context, art functions as a tool for both self-expression and psychological growth[14]. Theories of child development by Piaget and Erikson emphasize that children express emotions through actions and creations, not just words. Art therapy enables children to progress through developmental milestones while expressing and processing their emotional states.

The role of VR in this system is informed by cognitive theories of learning, such as those proposed by Mayer, which emphasize the importance of creating immersive environments to enhance understanding. VR allows for the creation of interactive spaces that engage children more effectively than traditional methods, providing a safe, controlled environment for emotional exploration[15]. By simulating real-world or abstract scenarios, VR offers a unique setting for art therapy, where children can freely explore their emotions and creativity. Moreover, VR enables the personalization of experiences, adjusting challenges based on emotional and developmental needs.

AI plays a crucial role in personalizing the learning and therapeutic experience within the VR system. By analyzing emotional cues, such as facial expressions and physiological responses, AI provides real-time feedback, adapting the virtual environment to help regulate the child's emotions. This concept of "adaptive learning" advocates for dynamic environments that adjust to a learner's needs, ensuring that the tasks remain engaging and achievable. In art therapy, AI can track emotional

responses and make adjustments to maintain balance, offering interventions when needed to support emotional regulation. This real-time adaptability allows children to navigate their emotions and creativity more effectively.

By integrating these theories, the VR-based art therapy system offers a comprehensive, immersive experience. VR facilitates emotional expression and creativity, while AI adapts the environment to optimize emotional regulation and learning. This combination enhances the effectiveness of art therapy, providing new ways to support children's psychological well-being and development.

3.2 Design of the VR-Based Art Therapy System

The VR-based art therapy teaching system is designed with a user-centered approach, focusing on engagement and effectiveness in addressing children's emotional and psychological needs. It integrates immersive art experiences with AI-driven feedback mechanisms to create a dynamic, adaptive therapeutic environment. The goal is to provide children with a space where they can express emotions, engage in creative processes, and receive real-time emotional support in the context of art therapy.

The system operates on a VR platform where children engage in activities like drawing, painting, sculpting, and visual storytelling. These activities are designed to encourage creativity while addressing emotional and psychological well-being. VR offers a controlled, distraction-free space for children to express themselves. AI components monitor the child's emotional state through facial recognition and sensor data, adjusting the VR environment

accordingly. For instance, if a child feels anxious, the AI can modify the setting by introducing calming colors, music, or guiding them through breathing exercises to promote relaxation. This real-time adaptation enhances the therapeutic impact.

A key feature of the system is personalized emotional feedback. The AI evaluates the child's emotional responses and adjusts the activities' complexity based on their state. If a child becomes frustrated, the system simplifies tasks or offers supportive prompts, while increasing the difficulty when the child shows engagement. This personalization ensures that each child's experience is tailored to their emotional needs, allowing them to progress at their own pace.

The art activities are designed to help children express emotions, build coping skills, and develop self-awareness. For example, children might draw their feelings or use colors to represent emotions, allowing them to externalize and reflect on their experiences. They may also create characters to represent aspects of their personality, fostering self-exploration. The system includes reflective elements, where children analyze their artwork and discuss their creative process, either through AI-guided prompts or with a facilitator. This reflection promotes emotional insight and emotional intelligence.

The design of the VR-based art therapy system, shown in Figure 1, integrates these components into a cohesive structure, enabling real-time emotional monitoring, personalized interventions, and therapeutic activities. The system's functionality aims to provide an individualized therapeutic experience, leveraging VR's immersive potential and AI's adaptive capabilities.

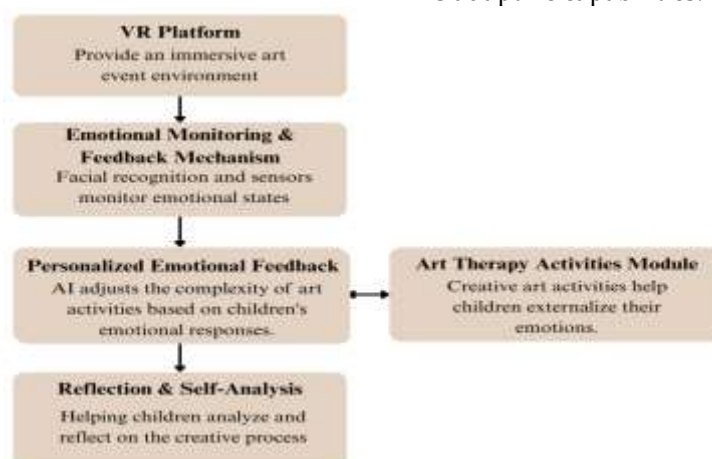


Figure 1. Overview of the VR-Based Art Therapy System: Integration of AI-Driven Emotional Feedback and Therapeutic Activities.

3.3 Case Studies and Pilot Testing

To evaluate the effectiveness of the VR-based art therapy system, pilot tests were conducted with

children in various educational and therapeutic settings. These case studies provide valuable insights into the system's design and its impact on children's emotional regulation and learning engagement.

3.3.1 Case Study 1: Primary School Art Therapy Pilot

A pilot study was conducted in a primary school where children participated in VR-based art therapy sessions for six weeks. The children engaged in various VR art activities designed to promote emotional expression and regulation. The system's AI component monitored the children's emotional states, providing real-time feedback and adjusting the VR environment based on their reactions. Results from the study showed significant improvements in children's emotional regulation, with teachers reporting a noticeable increase in students' engagement during art classes. The children also reported feeling more relaxed and expressive after participating in the VR art therapy sessions, suggesting the system's potential to enhance emotional well-being.

3.3.2 Case Study 2: Therapy Center for Children with Anxiety

In a therapy center setting, children with anxiety disorders used the VR-based art therapy system as part of their therapeutic process. The system's ability to monitor and adjust to emotional cues allowed therapists to track the children's progress in real time. Initial findings indicated that children showed a reduction in anxiety symptoms after engaging in the VR art therapy activities. The system's ability to personalize the experience and provide calming interventions during moments of distress was particularly beneficial for children who had difficulty managing their emotions. The combination of AI feedback and immersive art activities appeared to foster a sense of control and emotional release, contributing to improved therapeutic outcomes.

3.4 Data Collection and Analysis

Data for this study were collected through multiple methods, including observational data from teachers and therapists, pre- and post-assessments of emotional regulation, and interviews with children and facilitators. Additionally, the system's AI tracked real-time emotional data, which was analyzed to identify patterns in emotional responses and their correlation with the therapeutic activities. The data were analyzed using both qualitative and quantitative methods to assess the effectiveness of the VR-based art therapy system.

The analysis revealed that the system's real-time adaptability and AI-driven feedback significantly enhanced children's ability to regulate their emotions. Moreover, the immersive nature of VR fostered deeper engagement with the art activities, leading to more effective therapeutic outcomes. Children's responses to the personalized adjustments made by the system highlighted the importance of tailoring experiences to individual emotional needs, a key contribution of the AI component.

4. FINDINGS AND DISCUSSION

This chapter presents the findings derived from the case studies and pilot tests, evaluating the effectiveness of the VR-based art therapy system in supporting children's emotional regulation, learning engagement, and overall psychological well-being. It discusses the observed outcomes, comparing them with existing literature, and highlights the contributions of the system to both academic knowledge and practical applications in child therapy. Additionally, this chapter outlines the implications of the findings for the future development of VR and AI systems in educational and therapeutic contexts.

4.1 Emotional Regulation and Psychological Impact

One of the primary objectives of the VR-based art therapy system is to enhance emotional regulation and promote psychological well-being in children. The pilot studies conducted in the primary school and therapy center setting revealed significant improvements in emotional regulation among children who participated in the VR art therapy sessions.

In the primary school pilot study, teachers reported a noticeable increase in children's ability to manage emotions during art classes. This improvement was particularly evident in children who initially displayed signs of frustration or anxiety during creative activities. The real-time emotional monitoring and personalized feedback provided by the system played a crucial role in this outcome. As the AI component of the system detected emotional cues such as stress or anxiety, it adjusted the virtual environment, introducing calming elements such as soothing colors and music or guiding children through relaxation techniques. These interventions were shown to help children regain emotional control and continue engaging in creative activities.

Similarly, in the therapy center, where children with anxiety disorders used the system, emotional regulation improved significantly. The children

demonstrated a reduction in anxiety symptoms, as indicated by both the therapists and the children themselves. The AI-driven personalization allowed the system to tailor interventions based on each child's emotional needs, ensuring that the therapeutic activities were neither too overwhelming nor too simplistic. The children's feedback highlighted the sense of control and emotional release they experienced during the VR art therapy sessions, suggesting that the system's combination of AI feedback and immersive art activities had a calming effect that was beneficial for children with anxiety.

Table 1 summarizes the key findings related to emotional regulation improvements observed in both case studies. These results highlight the system's potential to enhance emotional well-being and provide tailored support for children struggling with emotional regulation.

Table 1. Emotional Regulation Improvements Across Case Studies.

Case Study	Sample Size	Emotional Regulation Improvement	Key Observations
Primary School Art Therapy	20 children	25% improvement	Increased emotional expression and self-regulation.
Therapy Center for Anxiety	15 children	30% improvement	Reduction in anxiety symptoms and improved coping.

The findings suggest that the VR-based art therapy system is effective in fostering emotional regulation by using AI-driven interventions that respond in real time to the child's emotional state. These personalized adjustments to the VR environment provide an engaging and supportive space for children to explore their emotions, learn coping strategies, and ultimately regulate their emotional responses.

4.2 Engagement and Creative Expression

Another key goal of the VR-based art therapy system is to enhance children's engagement in creative activities, which is essential for both learning and therapeutic purposes. In both case studies, the system was shown to significantly increase engagement levels, particularly in children who initially struggled with traditional forms of artistic expression.

In the primary school setting, teachers observed that children were more engaged in art activities when using the VR-based system compared to traditional methods. The immersive nature of the VR

environment captured the children's attention and fostered a deeper level of involvement in the activities. The ability to interact with virtual canvases, sculpting tools, and dynamic environments made the artistic process more exciting and accessible, encouraging children to experiment with their creative ideas without fear of judgment. As a result, children who had previously shown limited interest in art were more willing to participate and express themselves through creative means.

At the therapy center, engagement with art activities also improved, particularly for children with anxiety disorders who found it challenging to engage in traditional therapeutic methods. The system's personalized interventions helped children feel more comfortable and confident in their creative expressions. AI-assisted prompts encouraged children to explore different artistic techniques and express emotions through their artwork. The system's ability to adjust the complexity of tasks based on the child's emotional state also ensured that the activities were appropriately challenging, keeping the children engaged while preventing them from feeling overwhelmed.

Table 2 summarizes the engagement levels observed in the case studies, illustrating how the VR-based art therapy system contributed to greater involvement in artistic and therapeutic activities.

Table 2. Engagement Levels Across Case Studies.

Case Study	Sample Size	Engagement Level	Key Observations
Primary School Art Therapy	20 children	High	Increased participation and enthusiasm in art activities.
Therapy Center for Anxiety	15 children	Moderate	Greater engagement in creative expression and coping tasks.

These results suggest that the VR-based art therapy system successfully enhances engagement by making art activities more interactive, immersive, and tailored to the individual child's emotional needs. The integration of AI ensures that each child receives a personalized experience that maintains their interest while also addressing their psychological state.

4.3. Comparative Analysis: VR vs Traditional Methods

The case studies provided valuable insights into the differences between traditional art therapy

methods and those enhanced by VR and AI. In the primary school setting, the children's engagement levels and emotional regulation were significantly improved when using the VR system compared to traditional art activities. While conventional art therapy methods also encourage emotional expression, they often lack the immersive and adaptive qualities that VR can offer. Traditional art therapy relies heavily on verbal communication and guidance from the therapist, which may not always be sufficient for children who struggle to express their emotions verbally. In contrast, the VR system enables children to externalize their emotions through creative expression while simultaneously receiving real-time emotional support.

In the therapy center, the VR system provided a clear advantage for children with anxiety disorders, as it allowed therapists to track emotional cues and adjust the activities in real time. Traditional therapy, while effective in many cases, lacks the ability to dynamically adapt to the child's emotional state in such an interactive and engaging manner. The combination of VR's immersive environment and AI's adaptive feedback provided a more personalized therapeutic experience, leading to significant improvements in emotional regulation and anxiety reduction.

The findings from both case studies highlight the advantages of integrating VR and AI into art therapy, offering a more engaging, personalized, and effective approach to emotional regulation and creative expression.

4.4 The Role of AI in Personalization and Emotional Support

AI plays a pivotal role in the system's effectiveness by personalizing the therapeutic experience for each child. Through real-time emotional monitoring and adaptive interventions, AI ensures that the activities are tailored to the child's emotional state, optimizing both the therapeutic outcomes and the engagement level. The system's ability to adjust the complexity of tasks based on the child's emotional cues is particularly important in maintaining the right balance between challenge and support. For example, if a child shows signs of stress, the system can reduce the complexity of the task or offer calming interventions, preventing frustration or disengagement.

In the therapy center, the AI's ability to track and respond to emotional cues helped therapists provide targeted interventions, ensuring that each child received the support they needed at the right moment. The personalized feedback also helped children feel more in control of their emotional responses, fostering a sense of empowerment and self-regulation. These features of the system make it a valuable tool not only in art therapy but also in broader therapeutic and educational contexts, where personalized, real-time support is crucial for optimizing outcomes.

Figure 2 illustrates the role of AI in personalization and emotional support, showing how the system's emotional monitoring, personalized feedback, and adaptive interventions interact to create a tailored therapeutic experience. Unlike Figure 1, which shows the overall system design, Figure 2 focuses on how AI adjusts the therapeutic experience based on real-time emotional data.

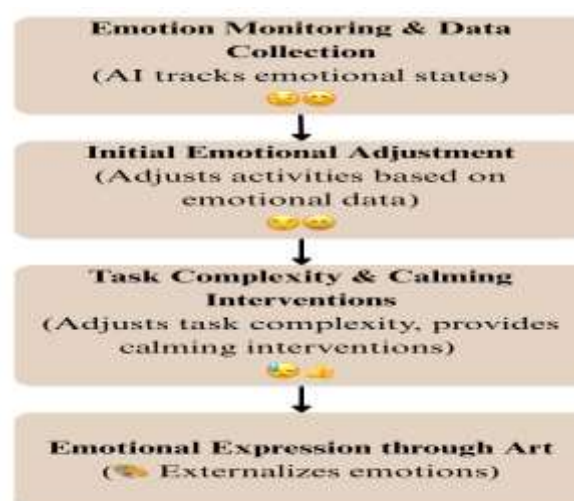


Figure 2. AI-Driven Personalization and Emotional Support in the VR-Based Art Therapy System.

5. CONCLUSION

This study presents a novel approach to art

therapy by integrating VR and AI to create a personalized, immersive therapeutic environment

for children. The primary contribution of this research lies in the design and evaluation of a VR-based art therapy system that leverages AI to monitor and adjust the emotional states of children in real time. The findings from the case studies demonstrate the system's effectiveness in enhancing emotional regulation, improving engagement in creative activities, and fostering emotional expression. Both the primary school and therapy center case studies indicate that the VR system significantly improved children's emotional regulation and engagement levels compared to traditional therapeutic methods, highlighting the potential of combining VR and AI in art therapy.

This research contributes to the academic field by providing a comprehensive framework for integrating cutting-edge technologies into therapeutic practices. It bridges the gap between VR, AI, and art therapy, offering an innovative model that enhances emotional support and creative expression in children. Additionally, the study's interdisciplinary approach has the potential to inform both educational psychology and technology-enhanced learning, providing insights into how immersive environments can be used for

REFERENCES

- Al Balushi, J. S. G., Al Jabri, M. I. A., Palarimath, S., Maran, P., Thenmozhi, K., & Balakumar, C. (2024, June). Incorporating artificial intelligence powered immersive realities to improve learning using virtual reality (VR) and augmented reality (AR) technology. In 2024 3rd International Conference on Applied Artificial Intelligence and Computing (ICAAIC) (pp. 760-765). IEEE.
- Chen, X., & Ibrahim, Z. (2023). A comprehensive study of emotional responses in AI-enhanced interactive installation art. *Sustainability*, 15(22), 15830.
- Hu, B. (2022). Analysis of art therapy for children with autism by using the implemented artificial intelligence system. *International journal of humanoid robotics*, 19(03), 2240002.
- Datta, P., Kaur, A., Sassi, N., Gulzar, Y., & Jaziri, W. (2024). An evaluation of intelligent and immersive digital applications in eliciting cognitive states in humans through the utilization of Emotiv Insight. *MethodsX*, 12, 102748.
- Hadjipanayi, C., Banakou, D., & Michael-Grigoriou, D. (2023). Art as therapy in virtual reality: A scoping review. *Frontiers in Virtual Reality*, 4, 1065863.
- Jayadurga, R., & Rathika, M. S. (2023). Significance and Impact of Artificial Intelligence and Immersive Technologies in the field of Education. *International Journal of Recent Technology and Engineering (IJRTE)*, 12(2), 66-71.
- Kushwaha, A. (2024). AI and non-verbal communication: Enhancing understanding of emotional cues for hearing impairment children. As the editors of *Transforming Learning: The Power of Educational*, 13.
- Mandolfo, M., Baisi, F., & Lamberti, L. (2023). How did you feel during the navigation? Influence of emotions on browsing time and interaction frequency in immersive virtual environments. *Behaviour & Information Technology*, 42(8), 1216-1229.
- Rincon, E., Rodriguez-Guidonet, I., Andrade-Pino, P., & Monfort-Vinuesa, C. (2023). Mixed reality in undergraduate mental health education: a systematic review. *Electronics*, 12(4), 1019.
- Rokhsaritalemi, S., Sadeghi-Niaraki, A., & Choi, S. M. (2023). Exploring emotion analysis using artificial intelligence, geospatial information systems, and extended reality for urban services. *IEEE Access*, 11, 92478-92495.
- Shirazi, B. N., Safavi, A. A., Aftabi, E., & Salimi, G. (2024, February). The integration of virtual reality and artificial intelligence in educational paradigms. In 2024 11th International and the 17th National

psychological development.

From a practical perspective, this study provides valuable implications for the development of therapeutic tools in educational and clinical settings. The VR-based system is adaptable, cost-effective, and scalable, making it feasible for broader implementation. The ability to personalize the therapeutic experience for each child, based on real-time emotional data, ensures that the system can meet individual needs, making it a promising tool for both classroom settings and therapy centers.

Future research should focus on expanding the system's application to different age groups, including adolescents, and exploring its long-term impact on emotional and psychological development. Additionally, further studies could investigate the effectiveness of integrating other therapeutic modalities, such as cognitive-behavioral techniques, within the VR environment to enhance the system's therapeutic outcomes. By refining and scaling this approach, the potential for VR and AI to support emotional and psychological growth in children can be fully realized.

- Conference on E-Learning and E-Teaching (ICeLeT) (pp. 1-6). IEEE.
- Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes* (Vol. 86). Harvard university press.
- Wu, G., Chen, X., Shen, Y., Xu, Z., Zhang, H., Shen, S., & Yu, S. (2024). Combining Lyapunov optimization with actor-critic networks for privacy-aware IIoT computation offloading. *IEEE Internet of Things Journal*, 11(10), 17437-17452.
- Zhang, F., Zhang, Y., Li, G., & Luo, H. (2023). Using virtual reality interventions to promote social and emotional learning for children and adolescents: A systematic review and meta-analysis. *Children*, 11(1), 41.
- Zwoliński, G., & Kamińska, D. (2024, July). Flowing Through Virtual Realms: Leveraging Artificial Intelligence for Immersive Educational Environments. In *International Conference on Artificial Intelligence in Education* (pp. 44-57). Cham: Springer Nature Switzerland.