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Exploring Virtual Reality Art Interventions for Mental Health among University Students: A Bibliometric Analysis (2014–2024)

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Abstract

Existing research highlights the effectiveness of virtual reality (VR) and art therapy (ART) in improving mental health. Virtual reality art interventions (VRAI) offer a promising avenue for exploring innovative tools to enhance positive emotions and mental health among university students. However, a significant research gap exists regarding the comprehensive analysis of the intersection between VR, art therapy, and mental health. This study employs first bibliometric analysis using the Web of Science (WOS) database from 2014 to 2024, utilizing VOSviewer 1.6 for statistical visualization and analysis. The research objectives include identifying research hotspots and clusters, trends, and gaps in VRAI for university student mental health. This bibliometric analysis reveals a significant upward trend in scholarly activity at the intersection. This preliminary investigation provides key insights supporting the integration of Virtual Reality Art Interventions (VRAI) into mental health programs, with the aim of aiding university students in regulating emotions. The findings the potential tool of virtual reality art interventions for mental health, particularly virtual painting, with significant contributions from cross-disciplinary studies.

Keywords: Virtual Reality (VR), Art Therapy), Mental Health, University Students, Bibliometric Analysis

Introduction

Although the benefits of Virtual Reality (VR) and Art Therapy (ART) in mental health have been widely recognized, their combined application remains insufficiently explored. The integration of immersive VR environments with artistic engagement represents a novel yet underexamined approach to fostering emotional.

Mental health issues are a significant global concern, particularly among adolescents and young adults(Kusumawati et al., 2023). In Chinese culture, familial and societal pressures to perform academically increase university students' psychological stress(Zhang, 2022).Gao (2020) and Sun (2022) reported a depression prevalence of over 20% among Chinese college students, with depression and anxiety identified as the primary mental health challenges. This demographic is at a critical stage of psychological development, facing pressures related to academics, interpersonal relationships, and self-identity. Consequently, they are highly susceptible to psychological challenges, including depression, anxiety, and social phobias. In China, the mental health index of youth aged 18-24 is notably lower than other age groups, with a depression risk detection rate of 24.1% (Dong et al., 2020). According to Sharma (2022), such challenges not only reduce quality of life but also impair academic performance, social dysfunction, and even extreme behaviors like self-harm or suicide. The World Health Organization (WHO) advocates for the effectiveness of digital interventions in addressing depression among young Chinese adults (Li et al., 2024), supported by 89 studies on digital interventions for depression, anxiety, and psychological well-being among college students(Lattie et al., 2019).To enhance student well-being, a framework of digital mental health interventions (DMHI) has been introduced to university settings, drawing from works by Glasgow, Phillips, & Sanchez (2014), Graham & Fitzsimmons-Craft (2022), Greenhalgh et al. (2017), and Mohr et al. (2017)

Andrews et al. (2015) emphasized the attractiveness of virtual reality (VR) to the younger demographic, highlighting its youthful, vibrant, and informal appeal(Gill et al., 2022). With a focus on university students (NBS, China, 2020), VR interventions are tailored to stimulate engagement, foster interaction, and enhance communication within this age group.

The rise of virtual reality (VR) technology since the 1990s offers a transformative approach to mental health interventions (Lindner, 2021) .Its immersive, interactive, and creative attributes have found applications across diverse fields, from military training(Lobban & Murphy, 2020) to healthcare(Lányi, 2006)(Zuo et al., 2024). In psychological therapy, VR has been employed for the assessment, diagnosis, and treatment of conditions like anxiety(P. Yang, 2024), phobias(Botella et al., 2017), and post-traumatic stress disorder (PTSD)(Wiebe et al., 2022) . By creating controlled virtual environments, individuals can confront fears and process traumatic memories safely.

A growing body of literature links virtual reality art interventions (VRAI) to improvements in physical and mental health as well as emotional well-being.(Hacmun et al., 2021)(Hadjipanayi et al., 2023) (Kaimal et al., 2020).In sum, digital interventions, particularly VR, hold considerable promise in enhancing the well-being of university students by facilitating new forms of engagement and communication.

Art therapy, another effective psychological intervention, supports emotional regulation and fosters self-expression(Lith, 2016). Cheng et al., (2023) and other researchers indicated that drawing art therapy adjust users' emotions , guided generation of deep emotional expression and helpful emotional responses (Fan et al., 2019).

A number of studies have used bibliometric analysis the significant progress of virtual reality (VR) research in areas as diverse as Evolution of Virtual Reality in Medicine(Zuo et al., 2024)

、in Education (Zhao et al., 2023)， Acceptance(Wang et al., 2024)、 Emotions(Biercewicz et al., 2024)(Jingili et al., 2023)； The widespread application of VR depends heavily on user acceptance and emotional responses. Wang et al. (2024) highlighted that factor such as usability, perceived enjoyment, and technical reliability drive acceptance of VR technologies across diverse populations. Meanwhile, Biercewicz et al. (2024) and Jingili et al. (2023) investigated VR's emotional impact, noting its ability to evoke engagement, empathy, and stress relief, making it particularly relevant to mental health interventions. A bibliometric analysis of art therapy revealed consistent research emphasis on its psychological benefits, including stress reduction, emotional regulation, and self-expression(Homavandi et al., 2024) (Liu et al., 2022)

Existing research highlights the efficacy of both virtual reality (VR) and art therapy promoting mental health. The integration of VR and art therapy represents a promising avenue for innovative mental health interventions. Despite this potential, studies combining VR with art-based approaches for mental health remain limited. This study aims to fill this gap through the first application of a decade-long bibliometric analysis, systematically exploring the research hotspots, trends, and gaps in VR art interventions for mental health. The research will provide insights for advancing digital mental health interventions and enhancing their application in non-clinical.

Research Objectives

1. To identify research hotspots and clusters in virtual reality art interventions (VRAI) and mental health using bibliometric analysis.
2. To explore research trends in VRAI interventions for mental health through bibliometric analysis.
3. To examine gaps in research directions for VRAI interventions

Research Questions

1. What are the key research hotspots and clusters in VRAI interventions for mental health?
2. What research trends have shaped the understanding of VRAI interventions over the past decade?
3. What gaps exist in the research directions for future studies on VRAI interventions?

Methods

Research Design

Macro-level research on the role of VR art interventions (VRAI) in supporting mental health remains limited. This study aims to address this gap by conducting a bibliometric analysis of VRAI's contributions to mental health, offering foundational guidance for its applications in the psychological domain. Using bibliometric coupling analysis (BCA) and term co-occurrence analysis (TCA), the study provides a quantitative framework to identify research hotspots, explore trends, and analyze gaps in research directions(Ali et al., 2022)

Identifying Research Hotspots and Clusters

Bibliometric coupling analysis (BCA) was performed using VOSviewer to group publications based on shared bibliographies. This approach facilitated the identification of key research

clusters and themes in VRAI interventions. By analyzing shared references among publications, BCA enabled the delineation of thematic research areas within the field.

Exploring Research Trends

Term co-occurrence analysis (TCA) was conducted using VOSviewer to analyze the frequency and relationships of terms in article titles and abstracts. This method provided valuable insights into the evolution of research trends over the past decade. By visualizing relationships among frequently occurring terms, TCA facilitated the identification of emerging trends and research gaps within the dataset.

VOSviewer Software

Wong (2018) noted that VOSviewer, developed by the Center for Science and Technology Studies at Leiden University, was used to construct and visualize bibliometric networks. Its clustering and graphical representation capabilities provided an intuitive understanding of large bibliographic datasets.

Research Methodology

The research protocol, which comprises Four stages. The study employed a structured methodology to achieve its research objectives.

First, Selection Data Collection, relevant publications were retrieved from the Web of Science Core Collection and organized in Excel.

Second, Bibliometric analyses, including bibliometric coupling and term co-occurrence analyses, were performed using VOSviewer to identify research clusters, hotspots, and trends.

Third, Term Co-occurrence Analysis, a term co-occurrence map was generated and analyzed to examine term frequencies and co-occurrences within article titles and abstracts. These visual data allowed researchers to identify latent patterns and pose new questions for further investigation.

Finally, insights from quantitative analyses provided a comprehensive perspective on the current state and future directions of VRAI research for mental health.

Ethical Considerations

As this study involved secondary data analysis, no direct ethical concerns were identified. All bibliometric data were sourced from publicly accessible databases, ensuring full compliance with ethical and data privacy standards. This methodological approach combined quantitative rigor with qualitative depth, facilitating a comprehensive exploration of the research objectives(Kuc-Czarnecka & Olczyk, 2020).

Article Selection

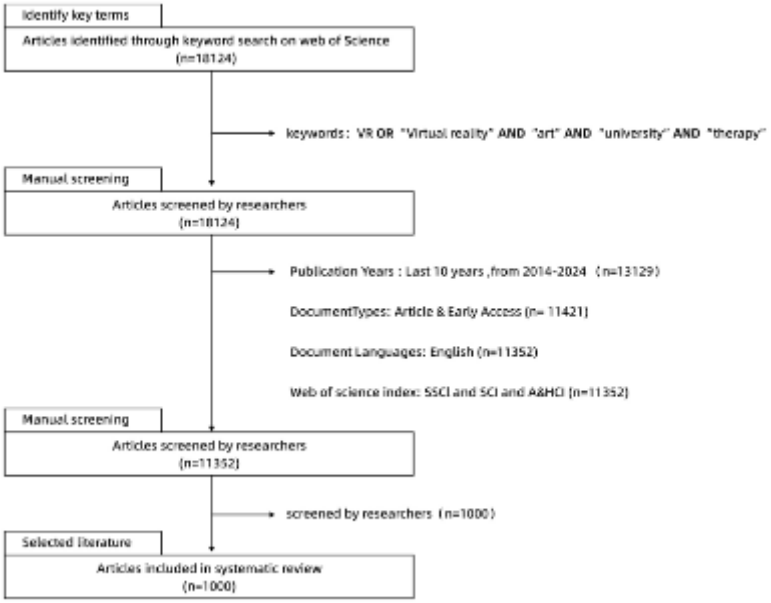

Figure 1. The PRISMA flow diagram illustrates the data collection and inclusion process

This systematic review was conducted following the PRISMA guidelines(Tricco et al., 2018), known for ensuring rigor and transparency. As shown in Figure 1, these guidelines facilitated a comprehensive and systematic research process.

The article selection process for this bibliometric review followed a systematic and rigorous methodology.In selecting high-quality data representations and structures suitable for quantitative bibliometric studies. Initially, 18,124 articles were identified through a keyword search on the Web of Science database using the terms "VR" OR "Virtual reality" AND "art" AND "university" AND "therapy." Articles were then filtered based on predefined inclusion and exclusion criteria. Studies published between 2014 and 2024 were retained, narrowing the selection to 13,129 articles. Further filtering included document types restricted to articles and early-access publications (n=11,421), language limited to English (n=11,352), and indexing within SSCI, SCI, and A&HCI (n=11,352). Subsequently, a manual screening process was conducted to assess the relevance of these articles based on their content, resulting in a final set of 1,000 articles. These studies were selected for systematic review based on their explicit focus on the intersections of virtual reality, art therapy, university settings, and mental health. This methodical approach ensured a high level of precision and relevance, providing a robust foundation for the bibliometric analysis.

Results

The search identified 1,000 relevant articles from the Web of Science Core Collection, focusing on the intersection of "VR," "art," "university," and "therapy." The review addresses the challenge of the multifaceted nature of "art," often defined as self-expression, by contextualizing it within therapy and healing. This review examines "VR users" as the population, "the creation of visual artworks in immersive VR environments" as the central concept, and "therapy" as the context. The findings highlight growing academic interest in using VR as a tool for artistic and therapeutic applications, particularly in university settings.

The Trend of Publications from 2014-2024

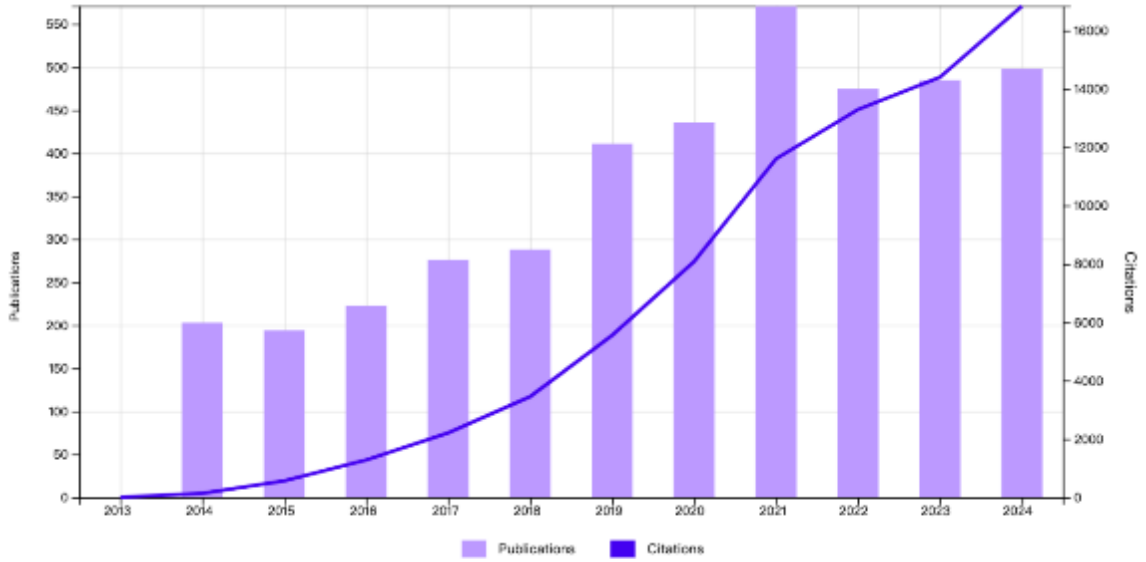

Figure2. A graph illustrating the trend of publications from 2014-2024

Figure 2 illustrates the annual publication and citation trends in the research domain from 2014 to 2024, highlighting significant growth and key developments. Between 2014 and 2019, publication output increased steadily, reflecting growing academic interest and foundational exploration of this interdisciplinary field. A sharp acceleration occurred from 2020 to 2022, peaking in 2021 with over 500 publications annually. This surge corresponds to advancements in virtual reality (VR) technologies and increased global interest in digital mental health solutions during the COVID-19 pandemic. Concurrently, cumulative citations rose substantially, reaching their highest level in 2024, underscoring the growing influence of early foundational works and the impact of recent studies.

After the 2021 peak, publication rates stabilized in 2022 and 2023, indicating a potential transition to a more mature phase of research characterized by incremental advancements rather than exploratory studies. Despite this stabilization, the continued rise in citation counts reflects the enduring relevance of prior contributions. Compared to the modest publication activity in 2014–2016, the recent growth demonstrates the field's rapid evolution and interdisciplinary importance. This trend signifies a shift from foundational research toward consolidation and refinement, emphasizing the need for advanced VR methodologies and expanded mental health applications to sustain momentum and address emerging research gaps.

Research Hotspot

Figure 3 Shown the hotspot research clearly indicates that the focus of the field is mostly on” virtual reality “key word, which can be categorized into aspects:

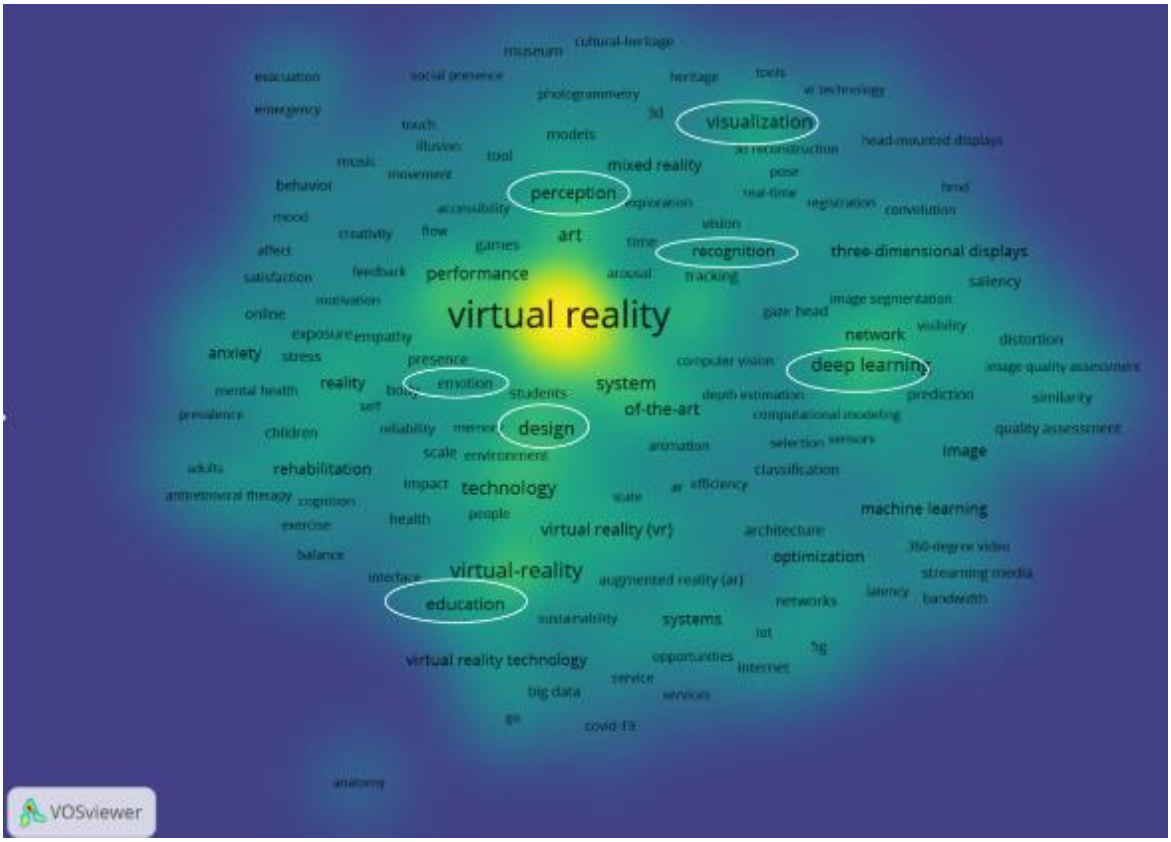

Figure3. Hotspot Research Related to Virtual Reality Art Therapy and Mental Health Among University Students

The bibliometric analysis in Figure 3 highlights the research hotspots and key themes in the field of Virtual Reality (VR) over the past decade. The visualization generated through VOSviewer provides a comprehensive representation of the key themes and relationships within the field of virtual reality (VR) research. Below is a detailed breakdown of the data based on the keywords identified in the visualization: Key Findings:

Central Focus on "Virtual Reality"

The keyword "virtual reality" is the most prominent and central term, indicating it as the core of this research field.

Related clusters emphasize VR's multifaceted applications, including its immersive and interactive potential in mental health and education.

Major Research Themes and Subcategories

The hotspots around "virtual reality" can be categorized into the following aspects:

(a)Visualization and Perception

Keywords: "visualization," "perception," "3D reconstruction," "tracking," "design."

Focus: These terms highlight VR's emphasis on immersive experiences through advanced graphical representation and sensory feedback.

Relevance: Critical in mental health interventions, visual stimulation aids in emotional regulation and therapeutic outcomes.

(b)Recognition and Deep Learning
Keywords: "recognition," "deep learning," "object tracking," "machine learning."
Focus: Integration of AI technologies into VR enables personalized and adaptive user experiences.
Relevance: Particularly beneficial in addressing anxiety and stress among university students through real-time emotional analysis and feedback.

(c)Education and Design
Keywords: "education," "design," "students," "learning."
Focus: VR's application in academic settings enhances both educational outcomes and user-centered therapy designs.
Relevance: Demonstrates VR's dual role as a learning tool and mental health intervention for university students.

(d)Emotion and Rehabilitation
Keywords such as "emotion," "mental health," and "rehabilitation." emphasize VR's use in promoting emotional well-being and recovery from psychological issues.
This aligns with the study's focus on VR as an intervention for university students experiencing mental health as a therapeutic tool.
(e)Technology and Systems

Terms like "system," "technology," "optimization, "and "virtual reality technology" indicate an ongoing emphasis on technological advancements and system optimization.
Such advancements ensure VR's reliability and scalability for broader mental health applications.

These research hotspots demonstrate VR's transformative potential in addressing mental health and educational challenges. The integration of AI, user-centered design, and advanced systems ensures VR's continued relevance and impact across interdisciplinary domains.

Clustering Analysis of Literature and Keyword Grouping

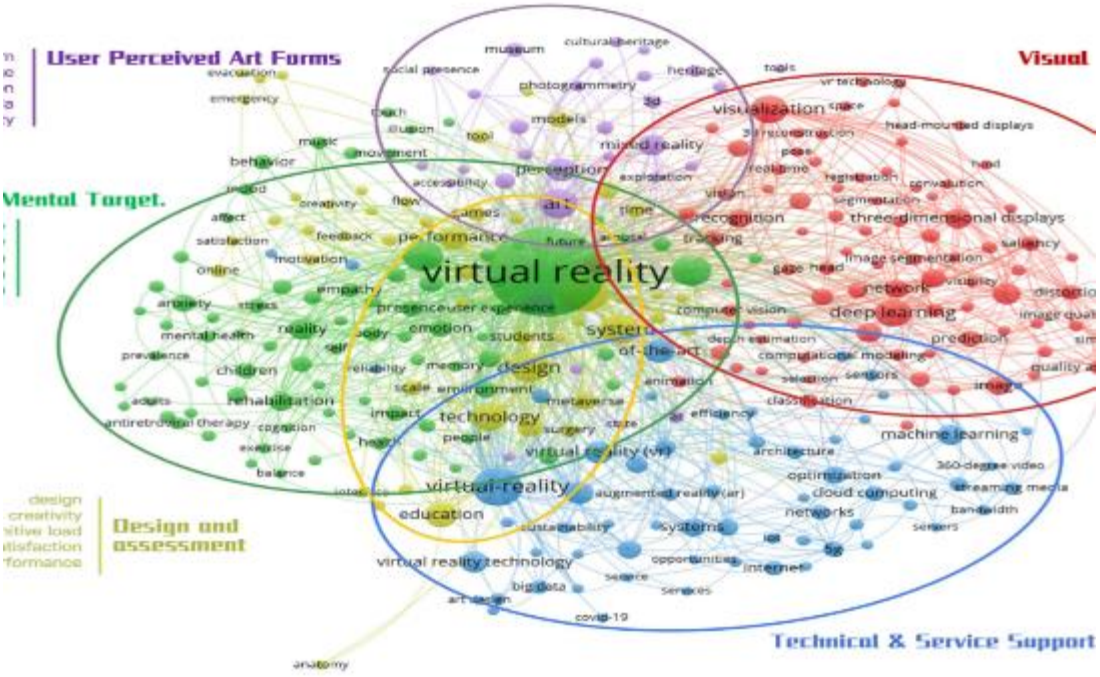

Figure.4 Research Clusters in Virtual Reality Art Interventions for Mental Health

Analysis of Image Content Using Bibliometric Coupling Analysis (BCA) and Term Co-Occurrence Analysis (TCA). A clustering analysis of the literature identified five primary keyword groups, encompassing 310 terms. The university's research on VR in the arts field is organized into three tiers and five dimensions.

Cluster Divisions

(a) User-Perceived Art Forms (Purple)

Keywords: "museum," "cultural heritage," and "accessibility."

This cluster emphasizes the representation of cultural and artistic content and explores user perceptions and immersive media experiences.

(b) Psychological or Physiological Intervention Targets (Green)

Keywords: "mental health," "cognition," and "empathy."

Highlights the application of VR art interventions in psychological therapy and emotional regulation, specifically addressing university students' mental health challenges.

(c) Design and Evaluation (Yellow)

Keywords: "design," "creativity," and "satisfaction."

Reflects the importance of user-centered design and evaluation metrics to optimize the effectiveness of VR in educational and psychological applications.

(d) Visual Design (Red)

Keywords: "visualization," "3D displays," and "image."

Underscores the role of high-quality visual representation in enhancing immersion, particularly in education and mental health interventions.

(e) Technical and Service Support (Blue)

Keywords: "machine learning," "360-degree video," and "networks."

Highlights the critical role of artificial intelligence and robust technological infrastructure in supporting scalable VR intervention systems.

“Virtual Reality” serves as the pivotal term connecting diverse domains, including education, psychological interventions, and artistic experiences. The strong association between education and emotional regulation highlights VR’s dual functionality in learning environments and psychological support. The integration of “Deep Learning” and “Recognition” illustrates a trend toward personalized and adaptive interventions. The convergence of visual design (e.g., “3D displays”) and psychological health interventions (e.g., “rehabilitation”) underscores VR art’s diverse potential in therapeutic contexts.

Figure 4, generated using VOSviewer, identifies five primary keyword clusters associated with VR-based art applications: psychological and physiological factors, design and evaluation, user-perceived art forms, visual design, and technical and service support. These clusters highlight VR's interdisciplinary applications and diverse potential in the arts. Keywords such as “anxiety,” “mental health,” “cognition(Mejia-Puig & Chandrasekera, 2022),” and “immersion(Frost et al., 2022)” highlight VR’s role in addressing psychological health issues, including anxiety reduction, emotional expression, and cognitive regulation. This cluster emphasizes how VR directly influences emotional and mental states, offering new avenues for psychological interventions. Keywords like “creativity(X. Yang, Gebbing, et al., 2023) ,”“cognitive load(X. Yang, Cheng, et al., 2023),” and “satisfaction “stress the importance of user-centric design and evaluation. Effective interaction design and visual optimization are critical for enhancing user engagement and satisfaction. Furthermore, balancing cognitive load with information delivery ensures optimal user experiences. Keywords such as “museum,” “cultural heritage, “and “user perception(Solmaz et al., 2024)” reflect the significance of user experience in presenting artistic content. Immersive VR environments enable innovative art delivery, particularly in educational and cultural contexts. Terms like “3D displays,” “forms,” and “color(Kim et al., 2022) “underline VR’s central role in visual arts. Research demonstrates how visual design significantly impacts users’ aesthetic experiences and engagement levels, expanding VR’s potential in educational and cultural art dissemination. Keywords such as “systems,” “machine learning,” and “service “emphasize the necessity of robust technical infrastructure for VR systems. Advanced technologies like machine learning and optimized network services support scalable and dynamic VR applications.

VR art interventions demonstrate a convergence of psychological intervention, user experience design, and advanced technical systems. The intersection of visual effects (e.g., “3D displays”) with psychological health interventions (e.g., “emotion regulation”(Haeyen & Noorthoorn, 2021)) emerges as a focal area, highlighting VR’s capacity to provide innovative mental health support for university students. Integration of artificial intelligence and visual technologies enhances the adaptability and personalization of VR interventions, further solidifying their application in educational and mental health domains.

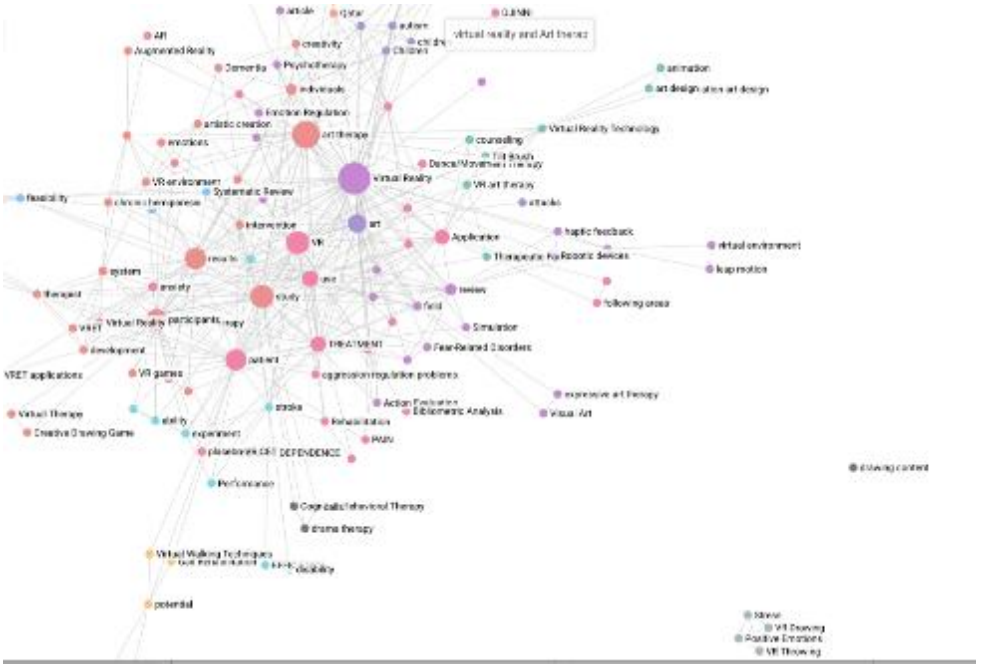

Figure.5 Term Co-Occurrence Network Map of Virtual Reality and Art Therapy Based on TCA Analysis

Figure 5 highlights a significant gap in the research focused on VR painting, despite the extensive scope of VR studies. Key findings include the connections between "VR Painting(Shi et al., 2024)," "VR Throwing," "Stress(Riches et al., 2024)," and "Positive Emotion(Du et al., 2024)," which confirm its potential therapeutic value. However, its weaker integration with broader clusters is evident in its isolation as a node. While "Art Therapy" and "Expressive Art Therapy" are widely recognized, the specific role of VR painting as a medium for self-expression and emotional regulation remains underexplored. Additionally, the lack of strong associations with terms like "Emotion Regulation" or "Stress" highlights its untapped potential in these areas. Similarly, the loose connections between VR painting and evaluation-related terms, such as "Performance" and "Action Evaluation," indicate a lack of research into its impact on user engagement and therapeutic outcomes.

Future research should prioritize investigating VR painting as a therapeutic intervention, focusing on its effects on emotional regulation and creativity. Integrating VR painting into the frameworks of expressive art therapy and positive psychology could offer new insights. Systematic methodologies must be developed to evaluate the therapeutic and educational benefits of VR painting, including metrics for user engagement, emotional outcomes, and cognitive gains. Interdisciplinary approaches that link VR painting to counseling and art education could address gaps in accessibility and participation. Such efforts should emphasize the potential of VR painting as a transformative tool for supporting mental health, particularly among university students.

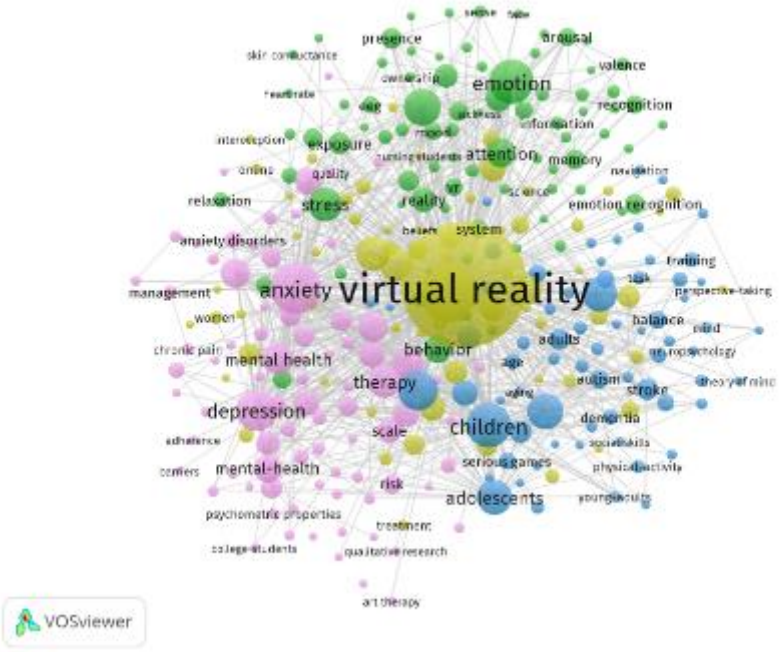

Figure.6 Co-Occurrence Network of Virtual Reality in Mental Health Research

Figure.6 reveals that “Virtual Reality” serves as a core node closely associated with a number of themes, including “Emotion,” “Mental Health(Bell et al., 2024),” “Therapy,” “Anxiety,” and “Stress.” This indicates the extensive evaluation of VR in mental health research, contributing to the development of a multidisciplinary field. However, in terms of the size and distribution of nodes, the research focus remains centered on the following areas: most studies focus on treating disorders such as anxiety, with little attention given to prevention. The integration of art therapy with mental health interventions is poor. For example, existing research tends to explore how symptoms of anxiety or depression can be reduced through VR. Nodes such as “Anxiety,” “Depression,” and “Stress” are prominent, with studies concentrating primarily on the impact of emotional and psychological problems.

While considerable efforts target existing mental health problems, terms like “Mood” and “Mental Health” exhibit weak connections to preventive or wellness-focused interventions, particularly for non-clinical populations. “Emotion Recognition” is a key topic, but its application is not closely tied to specific demographic groups, such as college students. The strong links among “Emotion,” “Emotion Recognition,” and “Mental Health” highlight the potential of VRAI to address psychological challenges by regulating and analyzing emotional states. However, the peripheral position of “College Students” in the visualization reflects a clear gap in research, despite their vulnerability to stress and mental health challenges, including academic stress and social anxiety. This highlights the insufficient emphasis on using VRAI to regulate emotions among university populations.

The increased number of nodes highlighting “Children(Erdős & Horváth, 2023),” “Adolescents(Owens & Bunce, 2023),” and “Young Adults(Riches et al., 2024)” “Older Adults(Wang et al., 2024)” suggests that these populations have received focused attention in research. However, the relatively small number of nodes for “College Students(Browning et al., 2023)” and the marginalization of this group suggest that the impact of virtual reality on their mental health has not been adequately explored. The challenges they face, such as

academic pressures, career planning, and life adjustments, underscore the psychological needs of this population.

The “Art Therapy” node reflects a niche but growing field. However, compared to other modalities, such as music(Yang, 2024) and movement(McAnally & Wallis, 2023), virtual reality art-based interventions (e.g., painting and drawing) are underrepresented in existing studies. Current research often emphasizes the technical aspects of VR technology, such as the shape, color, and flow of visual indicators, while focusing less on its mental health efficacy. Research on the psychological regulatory effects of visual art forms remains largely unknown. These applications often emphasize self-expression and emotion regulation but lack alignment with emotion-centered user needs in VR.
These gaps and challenges indicate that current research has shortcomings in terms of target groups, emotional range, and the diversity of intervention methods, limiting the full application of virtual reality technology in mental health.

Record Counts by Publication

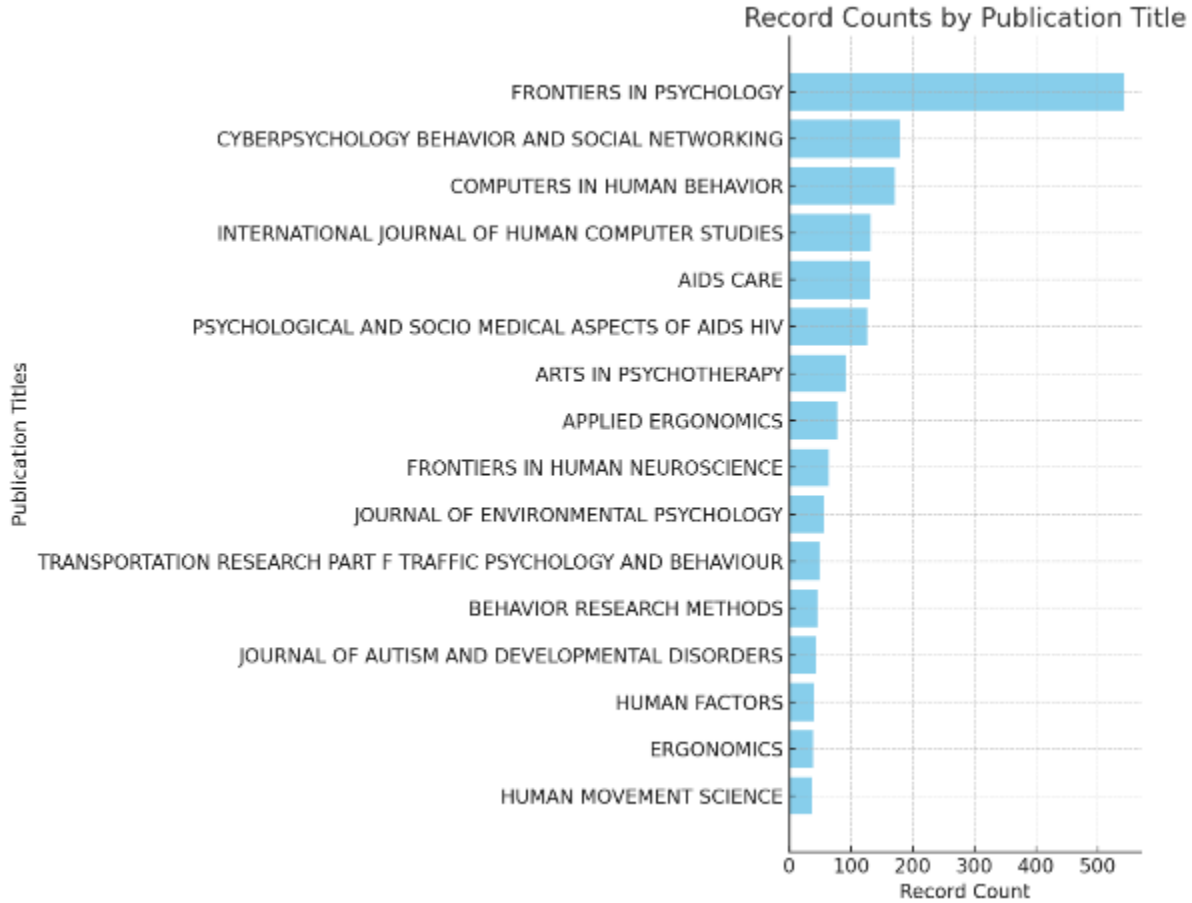

Figure.7 Record Counts by Publication Title in Virtual Reality and Art Therapy Research
Figure.7 reveals the distribution of publication records across various journals, highlighting 'Frontiers in Psychology' as the leading source with the highest record count, followed by 'Cyberpsychology Behavior and Social Networking' and 'Computers in Human Behavior.' This indicates the interdisciplinary nature of Virtual Reality and Art Therapy research, spanning psychology, human behavior, and ergonomics. The analysis of publication titles reveals that *Frontiers in Psychology* dominates VR-related research with 13.374% of the total publications, emphasizing the centrality of psychology in VR applications, particularly for mental health,

emotional regulation, and cognitive interventions. Supporting journals such as *Cyberpsychology, Behavior, and Social Networking* (4.409%) and *Computers in Human Behavior* (4.212%) highlight VR's integration with human behavior and social interactions, while niche journals like *AIDS Care* (3.202%) and *Psychological and Socio-Medical Aspects of AIDS/HIV* (3.128%) indicate its relevance in healthcare settings. The table also underscores VR's multidisciplinary reach, with contributions from ergonomics (*Applied Ergonomics*, 2.266%) and environmental studies (*Environmental Psychology*, 1.404%), reflecting its application in workspace optimization and environmental contexts. The collaborative dominance of the University of Washington, with strong partnerships across the USA and Europe, mirrors this interdisciplinary approach. European institutions like University College London and University of Barcelona contribute significantly to healthcare and behavioral studies, aligning with the diverse themes represented in the journals. Underrepresented areas such as developmental disorders (*Journal of Autism and Developmental Disorders*, 1.108%) and physical rehabilitation suggest emerging opportunities for VR research. These findings highlight VR's transformative potential across fields, with future growth expected in niche areas like movement therapy, cognitive interventions, and environmental applications.

Future Directions

This study highlights VR's transformative role in mental health interventions, particularly its potential to support university students through a blend of artistic design and technological innovation. Future research should explore the integration of psychological frameworks with multimodal technologies, focusing on visual arts and advanced systems to optimize therapeutic outcomes. Systematic evaluations of user experiences and short- and long-term outcomes are needed to establish intervention effectiveness. Experimental methodologies for assessing interventions should also be developed. VR art interventions present significant potential in education and non-clinical mental health therapy, especially for university students in resource-limited contexts. These interventions offer scalable, practical solutions for addressing psychological needs through innovative means. This analysis demonstrates VR art interventions' potential as a transformative tool for advancing educational and psychological outcomes. Further research should aim to refine their functionality and expand their accessibility to diverse populations.

Limitations

This study acknowledges two primary limitations. First, it exclusively examines literature published between 2014 and 2024. Although studies from 2025 are available, they were excluded from the analysis, potentially limiting the study's temporal scope. Second, the study relies solely on the Web of Science (WOS) database, a widely utilized academic resource. The inclusion of citations from other databases, such as Scopus or Taylor & Francis, might yield differing results and provide a broader perspective.

Conclusion

The visualization highlights key hotspots in VR research, focusing on emotions, mental health, and intervention strategies. Although the field is advancing toward integrating emotion recognition and validation into VR interventions, there is an urgent need to expand research into preventive applications and develop tailored solutions for underserved populations. Future studies should aim to bridge these gaps by examining the intersection of VR, emotional well-being, and the unique challenges faced by specific populations. This study emphasizes

the potential of VR combined with art to support preventive roles in mental health interventions for university students.

Future research should explore the integration of psychological frameworks with multimodal technologies, prioritizing visual arts and system modeling to optimize therapeutic outcomes. Assessments of user experiences and outcomes are necessary to determine the effectiveness of interventions. Experimental methods should also be developed to evaluate these interventions comprehensively. This analysis underscores the transformative potential of VR art interventions (VRAI) as tools for promoting educational and psychological outcomes. Further studies should aim to confirm the accessibility of VRAI as a preventive mental health tool targeted at university populations.

This study represents the first bibliometric analysis of Virtual Reality Art Interventions (VRAI) addressing university students' mental health, examining the field's growing accessibility. Existing research predominantly focuses on intervention applications rather than therapeutic uses, with limited attention to the specific needs of university populations. While progress has been made in integrating emotion recognition and validation into VR interventions, expanding research into preventive applications remains a critical priority. Among the leading journals in this field, Frontiers in Psychology stands out as particularly influential.

Future investigations should explore the mechanisms and efficacy of VR-based artistic painting interventions in emotional regulation. Researchers are encouraged to develop personalized VRAI methods tailored to the mental health needs of university students, emphasizing emotional regulation. The combination of virtual reality with complementary therapies, such as art therapy, offers significant potential to enhance therapeutic outcomes. The integration of VR, art, and mental health reflects an increasingly interdisciplinary shift, combining technology, creativity, and psychological treatment.

These findings provide a foundation for developing evidence-based VR interventions in mental health. By tracing the evolution of VR-based art interventions, this study identifies key trends and applications, offering a framework for their integration into university counseling and Digital Mental Health Intervention （DMHI） programs. The results highlight the potential of VRAI to support emotional regulation , positioning it as a valuable tool in mental health.

Data Availability

The datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request.

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