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A Bibliometric Mapping of mHealth Application in University Mental Health Policy and Practice

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ABSTRACT

Introduction: Mental health issues among university students are becoming increasingly prevalent and have a significant impact on academic performance and overall well-being. In response, mobile health (mHealth) applications and digital psychometric tools have emerged as promising solutions for expanding access to mental health support. However, challenges remain in terms of effectiveness, user engagement, long-term scalability, and integration into institutional frameworks and policy systems.

Methods: This study conducts a comprehensive bibliometric analysis using three established techniques co-citation analysis, bibliographic coupling, and co-word analysis to examine the evolution of digital mental health research in higher education. These complementary methods collectively provide a triangulated understanding of intellectual foundations, thematic development, and conceptual trends. Data were retrieved from the Scopus database, filtered for relevance, and visualized using VOSviewer software to identify key themes, conceptual structures, and research trends.

Results: The analysis identified four major co-citation clusters centered on psychometric tools and digital intervention strategies, three bibliographic coupling clusters highlighting challenges in engagement and implementation, and five Co-word clusters representing emerging research areas such as mindfulness apps, resilience, and digital literacy. Findings reveal growing interdisciplinary collaboration, yet highlight persistent barriers in user adherence, cultural adaptation, and policy development.

Conclusion: The study provides a structured overview of current research on digital mental health interventions in higher education, uncovering gaps in policy integration and long-term effectiveness. It offers practical insights for educators, healthcare professionals, and policymakers seeking to develop sustainable, evidence-based mental health strategies. Moving forward, institutions must focus on inclusive design, ethical data use, and institutional readiness to enhance the impact and scalability of digital mental health tools.

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INTRODUCTION

Mental health in higher education has become an urgent and growing concern due to its significant impact on students' academic performance and overall well-being. Studies have consistently shown that mental health challenges can severely hinder students' academic success and social development, prompting institutions to adopt more comprehensive strategies to address these issues (1–3). For instance, students who experience psychological distress often demonstrate lower academic achievement and increased dropout rates (4,5).

Educational institutions play a vital role in promoting mental well-being by providing access to quality services, fostering supportive environments, and integrating mental health education into the curriculum (6–8). Despite increased awareness, stigma, lack of knowledge, and socio-economic disparities remain major barriers to service utilization (9–11). The complexity of these factors calls for innovative, accessible, and culturally competent solutions.

In recent years, mobile health (mHealth) technologies and digital interventions have emerged as promising tools to enhance the accessibility and effectiveness of mental health support systems in academic settings. Features such as mood tracking, meditation, relaxation techniques, and self-assessment tools have gained popularity among university students for managing stress, anxiety, and depression (12–14). Moreover, several psychometric instruments, such as the PHQ-9 for depression and GAD-7 for anxiety, have been successfully integrated into digital platforms to support remote assessment and intervention (15–17). However, despite widespread interest, evidence regarding their long-term effectiveness, scalability, and integration into institutional policies remains limited.

While previous research has explored the general efficacy of mHealth applications, few studies have focused on their long-term integration within academic institutions and the broader healthcare system (18–20). This suggests a growing need for a systematic examination that extends beyond outcome effectiveness, encompassing organizational, cultural, and infrastructural readiness. Platforms like Cobalt have emerged to provide professional treatment and evidence-based resources, while advancements in artificial intelligence (AI) offer new possibilities for early detection and personalized care strategies (21–23). Nonetheless, concerns remain regarding validation, cultural adaptability, and the contextual suitability of these tools (24–26).

There is a clear gap in the literature concerning the systematic mapping of research on the implementation and policy frameworks of digital mental health tools in higher education (27–30). This study addresses that gap by applying comprehensive bibliometric techniques: co-citation analysis, bibliographic coupling, and co-word analysis, which collectively offer a triangulated methodology that integrates intellectual lineage, conceptual alignment, and thematic emergence. This approach facilitates a comprehensive understanding of the current challenges and opportunities across various disciplines and institutions.

This study is guided by the following research question: How have research trends, implementation challenges, and policy developments evolved in the integration of mHealth applications for mental health services in higher education? Accordingly, the objective of this research is to identify bibliometric patterns, thematic clusters, and critical gaps in the global literature on digital mental health in academic settings, with the aim of informing sustainable, evidence-based strategies for institutional and policy-level integration. By illuminating both conceptual evolution and implementation gaps, the study contributes a structured foundation for institutional policy innovation and cross-sector collaboration.

METHOD

Study Design and Bibliometric Framework

This study employs a structured bibliometric analysis to explore the development, challenges, and policy implications of digital mental health interventions in higher education. Bibliometric analysis is a statistical approach to assessing patterns in academic publications and is widely used to identify influential studies, authorship trends, and research gaps (31,32). The analysis integrates three complementary techniques: co-citation analysis, bibliographic coupling, and co-word analysis. Together, these techniques provide a triangulated methodological framework co-citation reveals foundational intellectual structures, bibliographic coupling maps current conceptual alignments, and co-word analysis uncovers thematic directions, ensuring a robust and multidimensional exploration of the field. The time range for included articles spans from 2000 to 2024, allowing for the inclusion of both seminal and contemporary studies shaping the digital mental health landscape.

Data Source and Search Strategy

The data were retrieved from the Scopus database, selected for its comprehensive coverage of peer-reviewed journals and robust citation tracking features. Scopus was chosen due to its reliability, global indexing, and relevance for bibliometric research in health sciences (33,34). Although other databases, such as Web of Science, were considered, Scopus was ultimately selected due to its broader coverage of journals in the field of digital health and its greater compatibility with VOSviewer. This choice, however, may limit access to regionally indexed or non-English publications. A keyword search string was developed based on a preliminary literature review and aligned with the research objectives. The final query string was as follows:

Table 1. Search string in Scopus database

Keywords	Justification
"mental health" OR "stress" AND "Higher education*" OR "universit*" OR "college*" OR "HEI*" OR "institution of higher*" OR "IHL*" AND "mobile applications" OR "Mhealth"	To find material on Mhealth, higher education, and mental health

The search was conducted on December 12, 2024, and the results were limited to English-language articles. Exclusion criteria included non-peer-reviewed documents, duplicates, and articles unrelated to the research focus. The search query underwent iterative testing and refinement to reduce ambiguity and false positives. Synonyms and Boolean operators were tested across different configurations to maximize recall and precision. False positives were identified and removed through manual relevance screening of titles and abstracts, ensuring alignment with the study's conceptual focus on digital mental health in higher education.

Data Extraction and Processing

The metadata, comprising titles, abstracts, author keywords, and references, were exported in RIS format for further analysis. This dataset was then processed using VOSviewer, a specialized bibliometric visualization software designed to map bibliographic data. The processing workflow began with a thorough screening and cleaning phase to eliminate duplicate and irrelevant records. Duplicate detection was performed using a combination of automated filtering and manual review. Relevance was assessed by screening abstracts against the inclusion criteria. Subsequently, threshold criteria were applied to citation counts and keyword frequencies to isolate the most impactful publications and concepts. Citation thresholds were determined through iterative trials to strike a balance between network clarity and thematic coverage. For example, a minimum of 23 co-occurrences was selected for co-word analysis to capture meaningful associations while avoiding visual clutter. Finally, the cleaned and filtered data were used to construct visual network maps that revealed thematic clusters and the strength of links between publications, enabling a nuanced interpretation of the intellectual structure of the field.

Types of Bibliometric Analysis

This study applied three bibliometric techniques to examine research trends in the integration of digital mental health within higher education, offering distinct insights into the field's structure and development. Co-citation analysis was used to identify how frequently two publications were cited together in subsequent literature, thus revealing foundational studies and influential theories that underpin this area of research (35–37). This technique addresses the intellectual lineage of the field by clustering works frequently cited together.

This technique allowed for the mapping of the intellectual structure of digital mental health interventions in higher education. In parallel, bibliographic coupling was employed to assess conceptual similarities between documents based on shared references, which helped to highlight emerging research trends and methodological alignments across recent publications (38–40). This method supports identification of current research frontiers and thematic overlaps. Together, the three techniques provide a triangulated framework that integrates structural, conceptual, and semantic relationships, enhancing theoretical rigor and offering a more holistic understanding of the evolving scholarly landscape.

Lastly, co-word analysis focused on identifying frequently co-occurring keywords within the literature, providing insights into the thematic evolution, interdisciplinary linkages, and key conceptual clusters in the field. (38,41) Together, these methods offered a comprehensive and multi-dimensional understanding of how digital mental health is being studied and conceptualized within higher education contexts. This triangulation improves methodological validity and deepens insight by converging structural, conceptual, and linguistic data layers.

Ethical Approval

Bibliometric research analyzes scientific literature using quantitative indicators like publications, citations, and author collaborations to identify research trends, collaboration patterns, and topic impact. Since it uses publicly available data, ethical approval is generally not required. According to Donthu et al. (2021), ethical clearance is typically unnecessary for bibliometric analyses, as they rely on secondary, publicly available sources.

RESULTS

Overview of Publications and Citations

The bibliometric search was conducted on December 12, 2024, using the Scopus database. After applying the inclusion criteria, a refined dataset was obtained comprising peer-reviewed publications on mental health, mHealth applications, and higher education. This dataset encompasses research from multiple disciplines, reflecting the growing scholarly interest in psychology, education, and digital health fields. Figure 1 presents the trend in the number of publications and citations over time, illustrating a steady increase and reflecting the growing academic interest in digital mental health in higher education contexts.

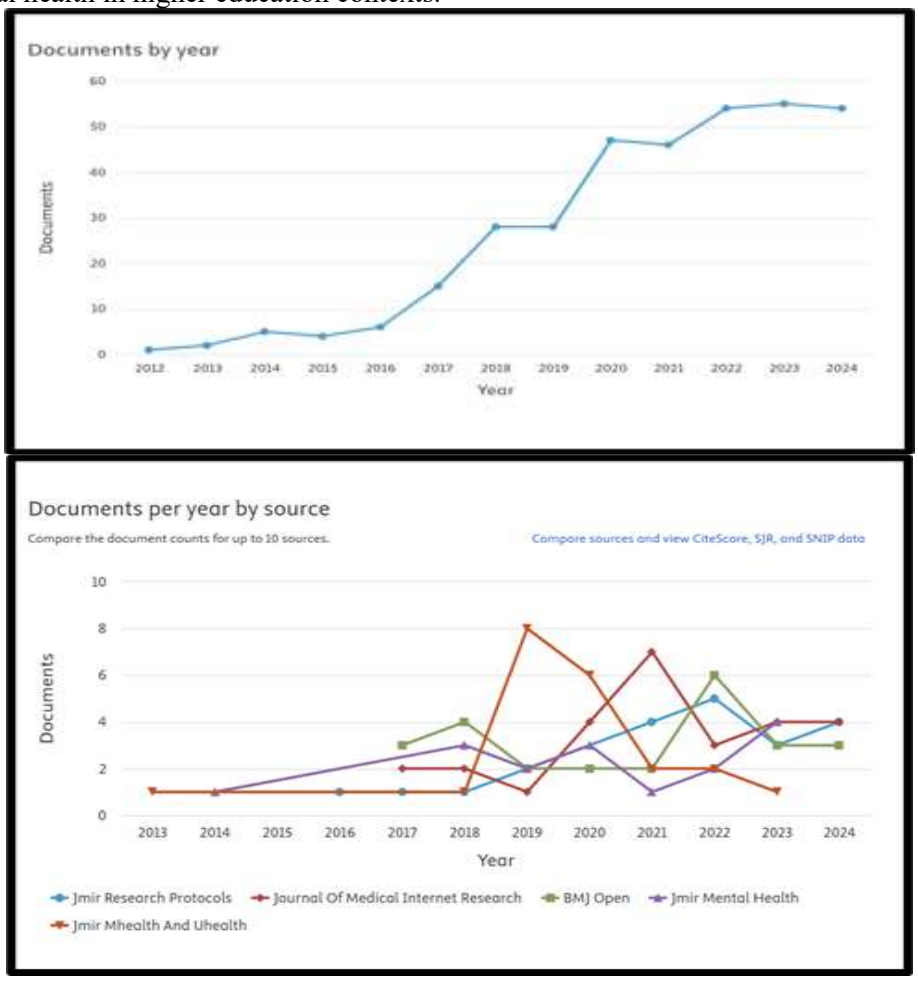

Figure 1. Number of publications and citations on Mental health in Higher education (source: Scopus)

Co-citation analysis

The co-citation analysis identified 26 highly cited documents from a total of 16,226 references, based on a citation threshold determined through several iterations to balance clarity and comprehensiveness. The threshold was calibrated to include documents with a minimum of 6 co-citations and high total link strength (TLS), ensuring relevance and analytical clarity. A high threshold risked omitting relevant sources, while a low threshold led to cluttered visualizations. Among the most co-cited papers were (42) with nine citations, followed by (43) with eight, (44) with seven, and (45) and (46) with six. Table 2 presents the top 10 documents with the highest co-citation counts and link strength across the four identified clusters.

Table 2. Presents the Top 10 Documents with the Highest Co-citation and Total Link Strength in Cluster 1 until Cluster 4

No	Author	Title	Citations	Links
1	Firth et al. (2017)	Can smartphone mental health interventions reduce symptoms of anxiety? A meta-analysis of randomized controlled trials.	9	20
2	Firth et al. (2017)	The efficacy of smartphone-based mental health interventions for depressive symptoms: A meta-analysis of randomized controlled trials.	6	17
3	Kroenke et al. (2001)	The PHQ-9: Validity of a Brief Depression Severity Measure.	6	16
4	Cohen et al. (1983)	A Global Measure of Perceived Stress.	7	13
5	Tourus et al. (2018)	Clinical Review of User Engagement with Mental Health Smartphone Apps: Evidence, Theory and Improvements.	8	13
6	Buysse et al. (1989)	The Pittsburgh Sleep Quality Index: A New Instrument for Psychiatric Practice and Research.	6	12
7	Kroenke et al. (2002)	The PHQ-9: A New Depression Diagnostic and Severity Measure.	5	9
8	Lattie EG et al. (2019)	Digital Mental Health Interventions for Depression, Anxiety, and Enhancement of Psychological Well-Being Among College Students: Systematic Review.	6	8
9	Chandrasekar et al. (2018)	Do Mental Health Mobile Apps Work: Evidence and Recommendations for Designing High-Efficacy Mental Health Mobile Apps.	6	6
10	Spitzer et al. (2006)	a brief measure for assessing generalized anxiety disorder: the gad-7,	7	6

Cluster 1: "Psychometric Tools in Health Research," This cluster includes pioneering research that laid the foundation for the development and validation of psychometric tools widely adopted in mental health studies and clinical evaluations. These studies form the foundational intellectual structure frequently cited in digital intervention literature, emphasizing the clinical rigor embedded in digital health assessments. Buysse et al., (1989) introduced the Pittsburgh Sleep Quality Index (PSQI), a key instrument designed to measure sleep quality and disorders, particularly relevant in psychiatric evaluations (47). Similarly, Cohen et al., (1983) developed the Perceived Stress Scale (PSS), which remains a prominent global standard for assessing the extent to which individuals perceive their life situations as stressful, thus influencing both physical and mental health outcomes (48). Kroenke et al., (2001) contributed significantly by validating the Patient Health Questionnaire-9 (PHQ-9), a concise and effective screening tool for identifying the severity of depression symptoms, widely applicable in both general and psychiatric medical contexts (46). These tools have been instrumental in facilitating accurate diagnoses, enabling large-scale public health research, and enhancing the application of evidence-based approaches in mental health services.

Cluster 2: "Digital Interventions in Mental Health" This cluster highlights significant contributions to the study of smartphone-based mental health interventions targeting anxiety, depression, and general psychological well-

being. Firth, Torous, Nicholas, Carney, Rosenbaum, et al., (2017) conducted a meta-analysis demonstrating the effectiveness of smartphone tools in reducing anxiety symptoms, while another study by the same authors evaluated their impact on depressive symptoms (42). Torous et al., 2018provided a clinical review emphasizing the importance of user engagement strategies (43). Lattie et al., (2019) reviewed digital interventions targeting college students and confirmed their growing relevance as scalable, evidence-based mental health solutions, while calling for enhanced design and engagement mechanisms (49).

Cluster 3: "Mental Health Apps: Usage, Effectiveness, and Challenges". This cluster explores both the practical use and the limitations of mental health applications. It reflects a transition from theoretical validation to applied evaluation, showing divergence from Cluster 1 in scope but overlap with Cluster 2 in delivery methods. Kroenke & Spitzer, (2002) reaffirmed the utility of the PHQ-9 as a core diagnostic instrument in digital apps (50). Torous et al., (2018) underscored the persistent issue of low user retention, as evidenced by high dropout rates in clinical app trials (43). Kern et al., (2018) studied student attitudes and acceptance of mobile mental health apps, revealing both potential and resistance within this population (51). Chandrashekar, (2018) examined app design elements contributing to efficacy, highlighting key usability and engagement barriers (52).

Cluster 4: "Psychometric Tools and Mindfulness-Based Apps" This cluster integrates validated assessment tools with mindfulness-based applications. This cluster demonstrates interdisciplinary convergence by merging structured diagnostic tools with behaviorally oriented wellness apps, contributing to personalized care frameworks. Kroenke et al., (2001) and Spitzer et al., (2006) contributed with the PHQ-9 and GAD-7, respectively, both pivotal in diagnosing depression and anxiety (44,46). Cohen et al., (1983) introduced the PSS as a reliable tool for stress evaluation (48). Mani et al., (2015) reviewed the usability of mindfulness apps, particularly those available on iPhone platforms, noting both their promise and current limitations (53). This cluster emphasizes the synergy between validated psychometric instruments and technology-driven interventions, advocating for evidence-based and user-centered mental health care models.

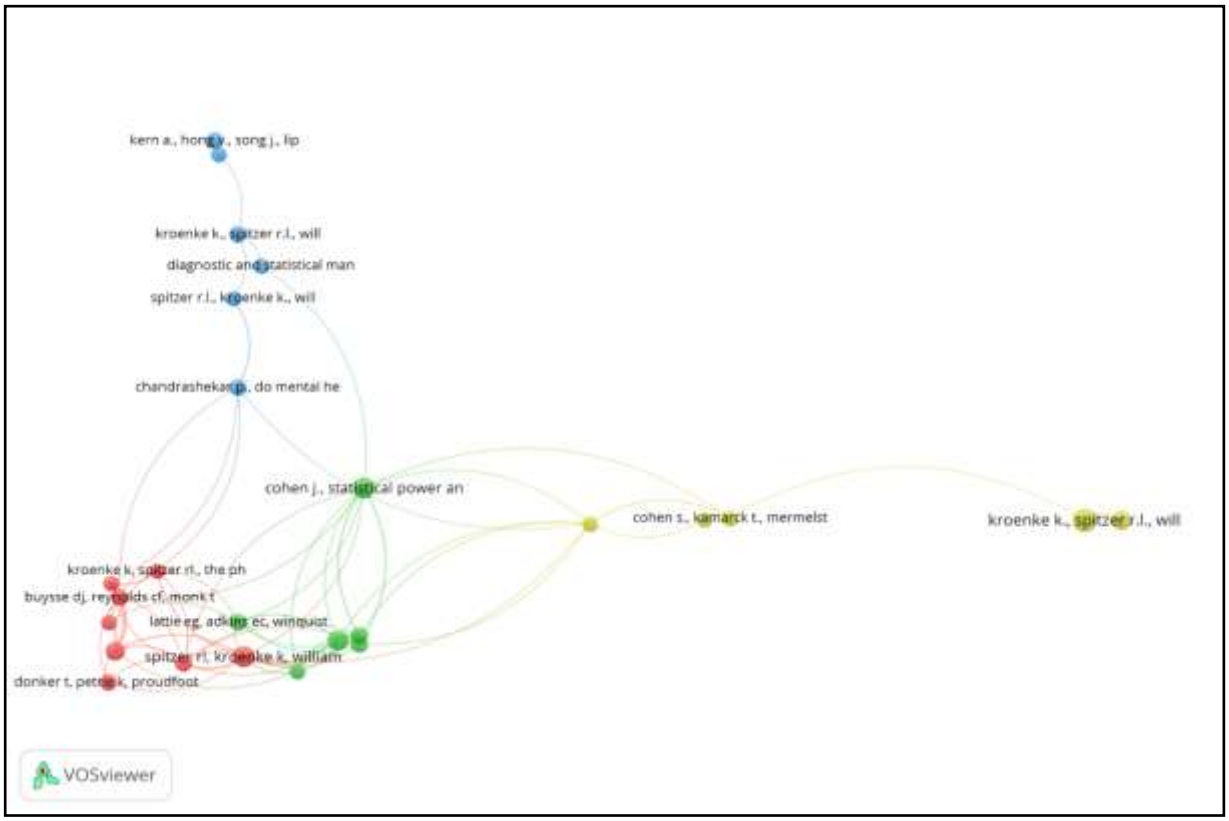

Figure 2. Co-citation analysis of The Complexity of Using Digital Applications and Interventions to Support Mental Health

Table 3. Co-citation analysis on The Complexity of Using Digital Applications and Interventions to Support Mental Health

Cluster No and colour	Cluster label	Number of publications	Representative publication
1 (red)	Psychometric Tools in Health Research	6	Buysse et al., 1989; Cohen et al., 1983; Kroenke et al., 2001
2 (green)	Digital Interventions in Mental Health	3	Firth et al., 2017; Torous et al., 2018; Lattie et al., 2019
3 (blue)	Mental Health Apps: Usage, Effectiveness, and Challenges	4	Kroenke & Spitzer, 2002; Torous et al., 2018; Kern et al., (2018); Chandrashekar, 2018
4 (yellow)	Psychometric Tools and Mindfulness-Based Apps	3	Spitzer et al., 2006; Cohen et al., 1983; Mani et al., 2015

Bibliographic coupling

The bibliographic coupling analysis revealed that thirty-five of the 345 papers had at least 45 citations. Among these, three distinct clusters were formed, indicating thematic groupings based on shared references. This analysis complements co-citation results by linking more recent publications that reference similar foundational work. According to total link strength (TLS), the top three documents were authored by Lattie et al. (2019) with a TLS of 16, .(54) with a TLS of 15, and (55) with a TLS of 12.

Table 3 presents the top 10 documents in the bibliographic coupling analysis, ranked by citation count and TLS. A network visualization (Figure 3) further illustrates the intellectual structure and thematic divisions across the clusters. These clusters provide insights into present and future challenges in using digital applications for mental health assistance. Notably, they underscore the shift from exploratory feasibility to questions of long-term adoption and scalability, which are central to implementation science.

Table 4. Top 10 documents in bibliographic coupling analysis

Rank	Publication	Citation	Total link strength
1.	Lattie E.G.; Adkins E.C.; Winquist N.; Stiles-Shields C.; Wafford Q.E.; Graham A.K. (2019)	385	16
2.	Harrer M.; Adam S.H.; Fleischmann R.J.; Baumeister H.; Auerbach R.; Bruffaerts R.; Cuijpers P.; Kessler R.C.; Berking M.; Lehr D.; Ebert D.D. (2018)	138	15
3.	Ponzo S.; Morelli D.; Kawadler J.M.; Hemmings N.R.; Bird G.; Plans D. (2020)	51	12
4.	Mccloud T.; Jones R.; Lewis G.; Bell V.; Tsakanikos E. (2020)	54	7
5.	Lyzwinski L.N.; Caffery L.; Bambling M.; Edirippulige S. (2019)	56	4
6.	Stawarz K.; Preist C.; Coyle D. (2019)	65	3
7.	Graham A.K.; Greene C.J.; Kwasny M.J.; Kaiser S.M.; Lieponis P.; Powell T.; Mohr D.C. (2020)	84	3
8.	Montagni I.; Cariou T.; Feuillet T.; Langlois E.; Tzourio C. (2018)	64	3
9.	Peng C.; He M.; Cutrona S.L.; Kiefe C.I.; Liu F.; Wang Z. (2020)	54	2
10.	Chen I.-H.; Pakpour A.H.; Leung H.; Potenza M.N.; Su J.-A.; Lin C.-Y.; Griffiths M.D. (2020)	128	2

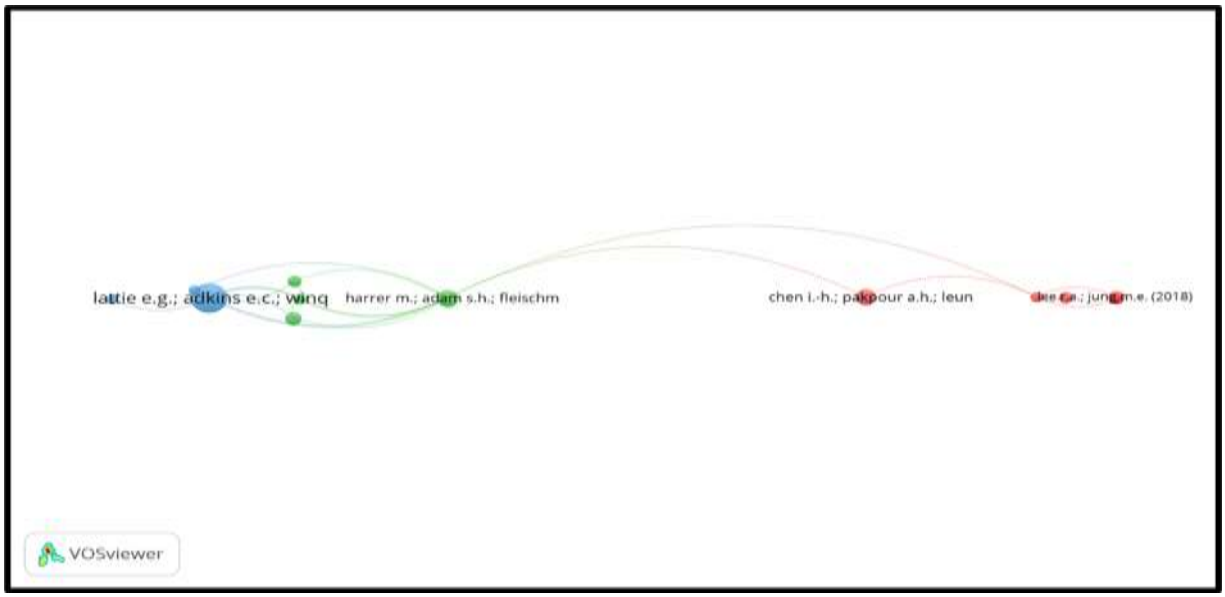

Figure 3. Bibliographic coupling of The Complexity of Using Digital Applications and Interventions to Support Mental Health

Cluster 1 (red) focuses on *the Role and Challenges of Mobile Health Apps in Supporting Mental Wellbeing*. This cluster intersects with co-word Cluster 1 and co-citation Cluster 2, triangulating evidence that app design, user trust, and perceived credibility remain persistent obstacles. This theme investigates how mobile applications contribute to mental health management, assessing their effectiveness, user engagement, perceived benefits, and limitations. Studies such as Lee and Jung (2018) demonstrated that the use of DeStressify significantly improved overall health, energy, and emotional wellbeing (56). However, the app did not substantially affect stress, anxiety, or functional outcomes. Stawarz et al., (2019) found that while 78% of participants used smartphone apps, many viewed them as insufficient replacements for in-person therapy due to lingering distrust (57). The Feel Stress Free app, evaluated by McCloud (57,58), showed moderate success in reducing depression and anxiety, though the impact diminished over time. Peng et al., (2020) analyzed 2,802 studies on mobile health apps from 2000 to 2019, revealing five major research themes, including mental health and telemedicine (59). In a related study, Chen et al., (2020) found that generalized and specific problematic technology use was positively associated with psychological distress (60).

Cluster 2 (green) examines the *Effectiveness and Perception of Digital Interventions for Mental Health*. Graham et al., (2020) conducted a study among individuals diagnosed with anxiety and depression, reporting that digital interventions led to significantly higher recovery rates compared to waitlist controls, with sustained effects over time (61). Harrer et al., (2018) observed strong positive impacts on stress, anxiety, and depression after a seven-week intervention, with benefits persisting at three-month follow-up (54). Montagni et al., (2018) noted that although most students used digital tools to seek health information, many remained skeptical about replacing traditional services (62). Ponzo et al., (2020) evaluated a four-week BioBase program, finding that it substantially reduced anxiety and depression while enhancing overall well-being (55).

Cluster 3 (blue): highlights the *Limited Effectiveness and Implementation Challenges of Digital Interventions for Mental and Behavioral Health.* Findings from this cluster align with those from Co-word Cluster 5, suggesting a need for resilience-building frameworks tailored to academic populations. Levin et al., (2020) reported recruitment difficulties and underpowered experimental results despite moderate app usage and participant satisfaction (63). Lattie et al., (2019) found that while many studies employed online cognitive behavioral therapy and showed promise, most lacked usability data and robust implementation strategies (49). Lattie et al., (2019) found no significant differences between e-diary and mindfulness app groups regarding weight loss, though emotional eating and stress were somewhat reduced in the mindfulness group. Despite high user satisfaction, overall adherence remained low, indicating the need for more engaging and scalable intervention designs (49).

Table 5 summarizes the bibliographic coupling analysis, listing the cluster color and label, the number of included publications, and representative studies within each group.

Table 5. Bibliographic coupling analysis on The Complexity of Using Digital Applications and Interventions to Support Mental Health

Cluster No and colour	Cluster label	Number of publications	Representative publication
1 (red)	The Role and Challenges of Mobile Health Apps in Supporting Mental Wellbeing	5	Lee & Jung, 2018., McCloud et al., 2020., Stawarz et al., 2019
2 (green)	Effectiveness and Perception of Digital Interventions for Mental Health	4	Graham et al., 2020., Ponzo et al., 2020., Harrer et al., 2018., Montagni et al., 2018
3 (blue)	Limited Effectiveness and Implementation Challenges of Digital Interventions for Mental and Behavioral Health	3	Levin et al., 2022., Lattie et al., 2019

Co-word analysis

Using the same dataset as the previous analyses, the co-word analysis identified five thematic clusters, derived from 57 out of 2,658 keywords that met the inclusion threshold of 23 co-occurrences. These clusters represent thematic convergence across both structural and conceptual axes, offering an interpretive lens that is distinct from citation-based approaches. Table 6 lists the top 15 keywords based on their frequency and total link strength, with terms such as "female," "mobile application," and "mental health" ranking highest in connectivity and relevance to the field.

Table 6. Top 15 keywords in the co-occurrence of keywords analysis

Rank	Keyword	Occurrences	Total link strength
1	Female	183	1547
2	Male	164	1457
3	Mobile application	179	1371
4	Mental health	176	1245
5	Mobile applications	154	1170
6	Depression	98	861
7	Young adult	88	852
8	Mhealth	118	698
9	Psychology	78	698
10	Anxiety	63	573
11	Smartphone	65	505
12	Adolescent	50	484
13	Telemedicine	45	389
14	Quality of life	38	368
15	Physical activity	35	320

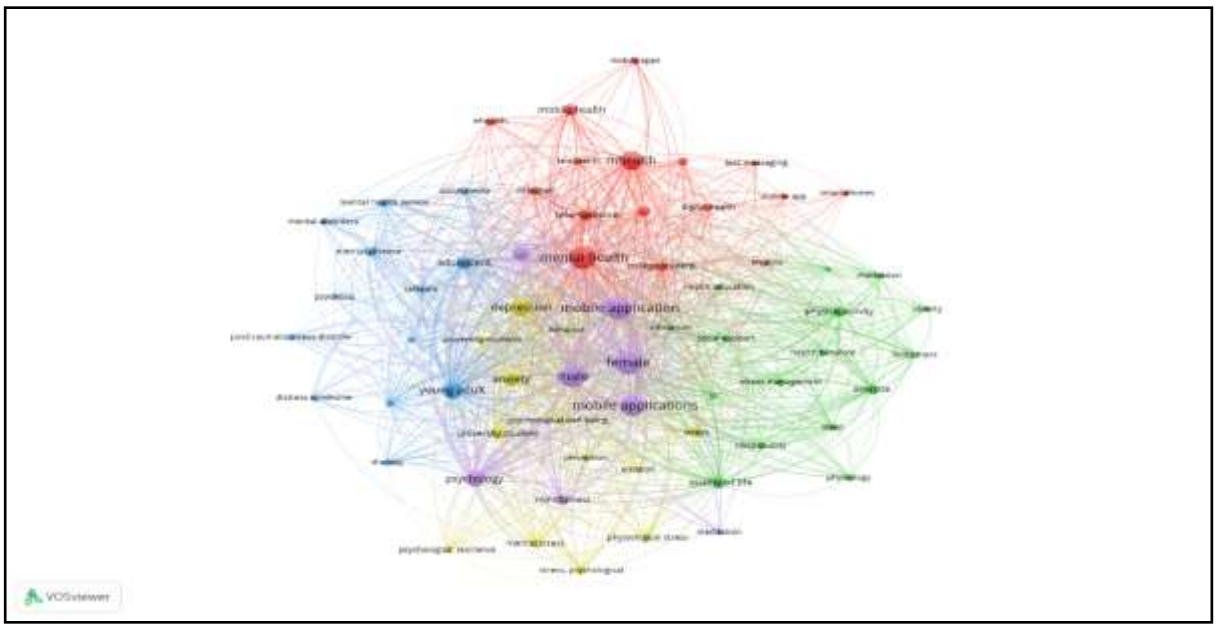

Figure 4. Co-word analysis of The Complexity of Using Digital Applications and Interventions to Support Mental Health

Figure 4 presents a network visualization showing the co-word clusters, each representing distinct thematic orientations in digital mental health research. Each cluster complements prior analyses, adding thematic richness and confirming the interdisciplinary nature of research trajectories.

Cluster 1 (red) focuses on advancements in digital mental health technologies and their implementation in clinical settings. Studies Connolly et al., (2021) and Graham et al., (2020) emphasize the integration of mobile apps like MindLogger into clinical practice and research, particularly for children's mental health (61,64). Other works examine the long-term effects of digital interventions on anxiety and depression, the role of machine learning in mental health diagnostics, and the readiness of dynamic predictive models for integration into internet-based cognitive behavioral therapy (65,66).

Cluster 2 (green) represents holistic approaches to mental health and well-being across different populations. Alsubaie et al., (2019) highlight the role of social support in reducing depression among students (67), while Felder et al., (2022) demonstrate the superior outcomes of digital CBT for insomnia over conventional therapy in postpartum women (68). Other studies examine risk identification apps tailored to occupational characteristics (69), the efficacy of yoga interventions in PTSD (70) and mental health interventions during pregnancy (71).

Cluster 3 (blue) examines the impact of psychosocial factors on mental and physical health. Christiansen et al., (2021) and Jones et al., (2021) show how loneliness, social isolation, and frequent exposure to news are linked to mental health issues such as depression and anxiety (72,73). Walsh et al., (2022) focus on identity-related stress among Black women (74), while research by Yıldırım & Çelik Tanrıverdi, (2020) links mindfulness, chronotypes, and social support to psychological well-being (75).

Cluster 4 (purple) centers on the impact of mindfulness and meditation apps on mental health and addiction treatment. Studies indicate that mindfulness-based interventions can significantly reduce depression, anxiety, and addiction-related behaviors (76–78). Huberty et al., (2020) show that improvements in pre-sleep arousal mediate reductions in depression and anxiety (70), while Caponnetto & Casu, (2022) identify gaps in addiction-related app coverage, especially for substances like heroin and cocaine (79).

Cluster 5 (yelow) explores resilience and support in academic well-being. This aligns closely with Bibliographic Coupling Cluster 3 and emphasizes student-centered priorities for institutional planning. Research in this group emphasizes the role of self-esteem, social support, and resilience in shaping psychological outcomes for university students. Studies include analyses of chronic bullying (80), the moderating effects of self-efficacy (81), and validation of resilience scales linking social support with life satisfaction (75,82).

Table 7 summarizes the co-word analysis, detailing each cluster's number, label, keyword count, and representative keywords used to describe thematic foci in mental health research.

Table 7. Summary of Co-word Analysis on Mental Health Research Themes in SMEs

Cluster No and color	Cluster label	Number of keywords	Representative Keywords
1 (red)	Mental health care application	16	Mental health, mhealth, mobile health, telemidicine, mobile phone, digital health
2 (green)	Holistic Approach to Well-being mental health	16	Quality of life, physical activity, exercise, sleep quality, stress management, motivation, social support
3 (blue)	Mental health in young adult	13	Young adult, mental desorders, psycosis, adolescent, anxiety disorders, distress syndrome, mental diseases
4 (purple)	Psychology and Meditation Aplications	13	Mobile apliactions, psychology, mindfulness, meditations, smartphone
5 (yelow)	Psychological Well-Being and Resilience Among University Students	13	Anxiety, depressions, mental stress, psychology resillience, psychology well-being, university student

DISCUSSION

Principal Findings and Theoretical implications

This study presents a comprehensive bibliometric analysis of digital mental health interventions within higher education, focusing on research trends, thematic evolution, and implementation barriers. By combining co-citation, bibliographic coupling, and co-word analysis, the study offers a triangulated lens through which to interpret the conceptual, structural, and thematic evolution of the field. The findings reinforce the increasing complexity and interdisciplinary nature of mHealth applications for student mental health, as evidenced by the convergence of clinical psychology, health informatics, and education policy across the co-citation, bibliographic coupling, and co-word analyses.

The co-citation clusters illustrate how foundational psychometric tools such as PHQ-9, GAD-7, and PSS have been integrated into digital platforms, enhancing the remote assessment of mental disorders. Simultaneously, the rise of mindfulness and meditation-based apps reflects a paradigm shift toward user-driven, self-managed care. This transition aligns with hybrid care models and emerging theories in digital behavioral health, including stepped-care frameworks and self-determination theory (83,84). These frameworks conceptualize digital interventions as layered components within a continuum of care that accommodates both primary prevention and acute treatment. The rise of digital self-monitoring tools also reinforces a shift toward user agency and personalization in mental health care, a trend accentuated by pandemic-driven innovation and publication surges (85,86). These developments expand traditional models of mental health delivery, suggesting new theoretical frameworks that integrate digital self-monitoring and hybrid care pathways (42,44).

Moreover, the bibliographic coupling results underscore the practical tension between technological promise and real-world usability. Studies within Cluster 3 highlight critical limitations including low adherence, limited scalability, and inadequate user retention strategies, supporting the need for refined behavioral models that account for motivational dynamics and digital fatigue (49,87). Integration with behavioral change frameworks such as COM-B and UTAUT may provide insights into overcoming these persistent barriers. Human-centered design, personalization, and trust remain central to user engagement theories in digital mental health.

Managerial and Policy Implications

From a policy perspective, the uneven implementation of mHealth tools across educational institutions reveals persistent gaps in digital infrastructure, workforce training, and institutional buy-in. Despite positive outcomes in symptom reduction, the lack of standardized evaluation frameworks and insufficient integration with existing mental health services hinder widespread adoption (59,61). These findings suggest the need for differentiated strategies that account for the varying capacities of low-resource and high-resource institutions.

Administrators and healthcare leaders should prioritize hybrid models that combine app-based self-help with professional oversight, particularly through coaching or stepped-care approaches. Investing in digital literacy programs, cross-sector partnerships, and evidence-based app validation is essential for ensuring ethical, equitable, and sustainable use. Policy-makers must also address data privacy and culturally adaptive implementation to foster trust and accessibility across diverse student populations. Illustrative policy models from successful implementations such as university-AI health pilots should be examined and adapted.

Limitations

This study has several limitations. First, the exclusive reliance on the Scopus database may lead to the omission of regionally significant or non-English publications, potentially skewing the global representativeness of results. Second, bibliometric analysis captures co-occurrence and citation patterns but does not assess the quality or empirical robustness of the included studies. Finally, thematic interpretations based on visual mapping may involve subjective judgment, although multiple validation steps were used. Future research may benefit from triangulating bibliometric results with expert validation, content analysis, or qualitative coding to enhance interpretive reliability.

Recommendations for Future Research

Future research should examine the longitudinal effects of mHealth interventions on both psychological well-being and academic outcomes in university populations. There is also a pressing need to explore institutional readiness for digital mental health integration, including leadership support, policy formulation, and implementation science frameworks. Additional inquiry into the role of artificial intelligence, ethical standards for data use, and culturally tailored interventions will further advance the field. Mapping research gaps revealed in bibliometric clusters to targeted research questions such as app engagement for marginalized populations or AI use in personalized therapy can sharpen research focus. This study encourages the development of multidisciplinary research agendas that bridge public health, education, and technology policy to create scalable, equitable mental health solutions for higher education environments.

CONCLUSION

This study provides a systematic bibliometric exploration of digital mental health interventions in higher education, focusing on implementation, effectiveness, and policy frameworks. Through the combined use of co-citation, bibliographic coupling, and co-word analyses, the research identifies dominant themes, conceptual relationships, and knowledge gaps within the evolving digital mental health landscape. Key findings emphasize the increasing role of mobile health (mHealth) applications, psychometric tools, and mindfulness-based technologies in supporting mental health among university students. These digital tools have demonstrated potential in addressing anxiety, depression, and stress; however, challenges such as user engagement, technological trust, cultural adaptability, and integration with institutional systems remain significant obstacles to widespread adoption. The analysis also reveals a lack of unified policy approaches and limited long-term evaluation mechanisms, which hinders the sustainability of digital mental health initiatives. To address these gaps, stakeholders including policy-makers, academic leaders, healthcare providers, and developers must collaborate to establish evidence-based, culturally sensitive, and ethically responsible frameworks for implementing and scaling mHealth solutions.

This study contributes to the academic discourse by offering a multi-dimensional understanding of how digital technologies intersect with mental health support in higher education. It urges the development of robust implementation policies, investment in digital infrastructure, and targeted interventions that reflect the diverse needs of student populations. This includes strategies tailored to low-resource institutions, multilingual and culturally inclusive app design, and training models to enhance stakeholder adoption. Future efforts should aim to bridge the gap between innovation and practice by aligning digital tools with institutional capacities and student readiness, while also ensuring that ethical standards and inclusivity guide their use. By doing so, universities and health systems can build more resilient and responsive environments that foster mental well-being and academic success. This conclusion underscores the significance of bibliometric triangulation as a novel framework for informing future mental health policy and practice in academic settings.

AUTHOR'S CONTRIBUTION STATEMENT

Each author contributed distinctly to this study. Author 1 conceptualized the research and coordinated the team. Author 2 was responsible for data collection and management. Author 3 conducted the data analysis and validation. Author 4 drafted the manuscript, while Author 5 edited the manuscript and managed the journal submission and revisions.

CONFLICTS OF INTEREST

The author hereby certifies that this research is free from conflicts of interest. The author has no financial or personal affiliations with any organizations that would compromise the integrity and objectivity of this study. This statement is intended to ensure that the results of the study are based on valid data and unbiased analysis, thereby enhancing the article's credibility and trustworthiness.

DECLARATION OF GENERATIVE AI AND AI-ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

During the preparation of this work the authors used ChatGPT in order to assist in generating preliminary drafts of writing and refining the clarity of the text. After using this tool/service, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

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