

Mapping the Mobile Health Applications Landscape: A Cluster-Based Systematic Review

Cartographie du paysage des applications de santé mobile: Une revue systématique par analyse de clusters

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ABSTRACT

Introduction-Aim: Mobile health applications (MHAs) have become essential components of modern healthcare systems worldwide. Despite their growing adoption, a comprehensive global synthesis integrating clinical outcomes, adoption factors, and regional distribution of MHA research remains lacking. This review provides a systematic, cluster-based global perspective on MHAs by examining research trends, typologies, and regional disparities across peer-reviewed literature published from 2015 to 2023.

Methods: A systematic literature review was conducted following PRISMA guidelines. Articles were retrieved from Scopus, Web of Science, and PubMed using search terms including "mobile health," "mHealth," and "mobile health applications," restricted to peer-reviewed English-language publications. After screening 1,430 identified records, 229 studies were included in the final synthesis. Thematic cluster analysis was performed using VOSviewer to identify and visualize key research clusters.

Results: Three main thematic clusters were identified: (1) Clinical interventions and outcomes, demonstrating positive effects of MHAs on chronic disease management, patient adherence, and healthcare costs, notably in diabetes, hypertension, and asthma; (2) Psychological and social factors, highlighting the critical role of user-centered design, perceived usefulness (TAM), and social influence (UTAUT) in driving MHA adoption; and (3) Technology and development, addressing interoperability challenges, data security concerns, and device accessibility. MHA typologies span clinical diagnostics, disease management, health promotion, telemedicine, and clinical reference tools. The United States leads in research output, followed by Europe and Asia, while Latin America and Africa remain significantly underrepresented.

Conclusion: MHAs hold significant potential to bridge global healthcare gaps, particularly in resource-limited settings. Standardizing clinical trial protocols, improving user-centered design, strengthening data security, and fostering research in underrepresented regions are critical priorities for researchers, developers, and policymakers advancing equitable healthcare delivery through mobile technologies.

Keywords: mobile health applications, healthcare delivery, chronic disease management, systematic review, technology acceptance, healthcare outcomes.

RÉSUMÉ

Introduction-Objectif : Les applications de santé mobile (ASM) sont devenues des composantes essentielles des systèmes de santé modernes. Malgré leur adoption croissante, une synthèse globale intégrant résultats cliniques, facteurs d'adoption et distribution régionale de la recherche fait défaut. Cette revue offre une perspective mondiale par analyse de clusters sur les tendances, typologies et disparités régionales des ASM (2015–2023).

Méthodes: Une revue systématique a été conduite selon les lignes directrices PRISMA. Les articles ont été extraits de Scopus, Web of Science et PubMed à l'aide des termes « santé mobile », « mHealth » et « applications de santé mobile ». Après filtrage de 1 430 enregistrements, 229 études ont été retenues. Une analyse de clusters a été réalisée avec VOSviewer.

Résultats: Trois clusters ont été identifiés : (1) Interventions cliniques et résultats, effets positifs des ASM sur la gestion des maladies chroniques, l'adhésion thérapeutique et les coûts de santé ; (2) Facteurs psychologiques et sociaux, rôle de la conception centrée sur l'utilisateur, de l'utilité perçue (TAM) et de l'influence sociale (UTAUT) ; (3) Technologie et développement, défis d'interopérabilité, sécurité des données et accessibilité des appareils. Les États-Unis dominent la production scientifique, suivis de l'Europe et de l'Asie ; l'Amérique latine et l'Afrique restent sous-représentées.

Conclusion: Les ASM ont un potentiel considérable pour réduire les inégalités de santé mondiales. Standardiser les protocoles cliniques, renforcer la sécurité des données et promouvoir la recherche dans les régions sous-représentées sont des priorités essentielles pour chercheurs, développeurs et décideurs.

Mots-clés : applications de santé mobile, prestation des soins, maladies chroniques, revue systématique, acceptation des technologies, résultats de santé.

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What is known ?

Mobile health applications (MHAs) are widely used across diverse healthcare settings globally to support disease management, health promotion, telemedicine, and clinical decision-making. Prior reviews have addressed specific dimensions of mHealth, such as clinical outcomes or user acceptance, but without a unified cluster-based synthesis. Established frameworks including the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT) have been applied to explain MHA adoption behavior.

What this article adds ?

This review provides the first comprehensive cluster-based global synthesis of 229 peer-reviewed studies on MHAs (2015–2023), integrating clinical, psychological, and technological perspectives in a single framework. It delivers a typological classification of MHAs and a global map of research contributions, revealing significant research gaps in Africa and Latin America. The findings provide actionable evidence-based recommendations for researchers, developers, and policymakers to guide the equitable design, deployment, and scaling of mobile health solutions worldwide.

INTRODUCTION

In the last decade, mobile health (mHealth), a branch of eHealth, has rapidly evolved into a key component of healthcare systems globally (1). mHealth is broadly defined as the use of mobile computing and communication technologies in healthcare and public health (2). Despite the lack of a standardized definition, mHealth is widely recognized as encompassing medical and (2) public health practices supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants (PDAs), and other wireless technologies (3). According to the Global Observatory for eHealth (GOe), mHealth utilizes basic mobile phone features like voice calls and SMS, as well as advanced capabilities such as global positioning system (GPS), Bluetooth, and third and fourth generation mobile telecommunications (3G/4G) (4).

The proliferation of mobile networks has increased, especially in low- and middle-income countries (1), this rapid expansion, coupled with increasingly affordable and powerful mobile devices, has transformed how health services are accessed, delivered, and managed (5). Mobile health interventions have the potential to offer personalized, citizen-centered healthcare and to improve access to medical services in remote and underserved areas (2).

Research from multiple studies demonstrates that mobile health technologies are effective in providing timely access to healthcare services, improving adherence to treatment, managing patient care, and reducing drug shortages in health facilities. Specifically, SMS-based interventions have been shown to significantly enhance patient adherence to medication schedules and improve attendance rates at healthcare appointments (4).

In developed countries, mHealth is becoming ubiquitous,

particularly in home care surveillance, where it facilitates remote monitoring and timely medical intervention (1,2). Meanwhile, in developing regions, mHealth continues to grow as a viable solution for addressing healthcare disparities (2).

mHealth applications target heterogeneous audiences, including healthcare providers, patients, and even healthy individuals (4). These applications assist with numerous health-related activities, including smoking cessation, weight loss, physical activity, and disease management. Because mobile devices are so widespread, they offer a unique benefit in healthcare delivery, being personal, always connected, and capable of providing smart solutions customized to individual requirements (2).

Despite the promising potential of mHealth, several challenges remain. The lack of regulatory frameworks, concerns about data security and privacy, and user engagement priorities are significant barriers to widespread adoption (2). Nevertheless, the continued evolution of mobile technology and the growing demand for diversified healthcare solutions are expected to drive further advancements in mHealth.

This review aims to provide a comprehensive global perspective on MHAs by exploring research trends, typologies, and regional disparities using a systematic cluster-based approach. By analyzing publications from 2015 to 2023, the review identifies key themes and trends that have influenced the development, acceptance, and implementation of MHAs worldwide.

A systematic review methodology was employed using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement to ensure an unbiased and thorough synthesis of the literature. The literature search was conducted across three complementary databases: Scopus (primary), Web of Science, and PubMed, using a consistent set of search terms to maximize coverage of the peer-reviewed literature on MHAs. Inclusion criteria focused on accessible peer-reviewed English publications from 2015 to 2023 addressing MHAs. Exclusion criteria included non-peer-reviewed works, articles in other languages, inaccessible full-texts, and studies not directly related to MHAs.

By employing a systematic cluster-based approach, the review seeks to uncover critical factors that drive MHA acceptance, effectiveness, and integration into healthcare systems.

The ultimate goal is to offer insights that can guide future research, development, and policy-making, ensuring that MHAs effectively address healthcare disparities, enhance patient engagement, and improve health outcomes globally (4).

Data analysis was conducted using VOS viewer to perform cluster analysis, enabling the identification of thematic clusters and research trends. This approach provided a visual representation of the MHA research landscape, revealing key themes and interconnections in the literature.

METHODS

Search Strategy and Selection Criteria

To ensure a comprehensive and unbiased synthesis of the literature on MHAs (Figure 1), a systematic review was conducted following the PRISMA guidelines (6). The literature search was primarily conducted using the Scopus database, chosen for its extensive and multidisciplinary coverage of peer-reviewed journals in health sciences, computer science, and social sciences, all relevant to the mHealth field. To strengthen the comprehensiveness of the search and minimize the risk of missing eligible studies, complementary searches were also performed in Web of Science (WoS) and PubMed using the same keywords and filters. After deduplication, 235 additional records were identified from WoS and PubMed and screened against the same inclusion and exclusion criteria; 27 met eligibility requirements and were incorporated into the final synthesis.

Search Strategy

Keywords and Phrases: The search strategy included a combination of keywords and phrases such as "mobile health," "mHealth," and "mobile health applications".

Search Filters: Consistent filters were applied across all three databases (Scopus, Web of Science, and PubMed) to include only peer-reviewed articles published in English from 2015 to 2023.

The databases were searched using the queries listed below,

- Scopus: TITLE-ABS-KEY ("mhealth" OR "mobile health" OR "mobile health applications") AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (LANGUAGE , "English")) AND PUBYEAR > 2014 AND PUBYEAR < 2022
- Web of Science: TS=("mhealth" OR "mobile health" OR "mobile health applications"). The search was restricted to English-language articles published between 2015 and 2021 using the database filtering options.
- PubMed: ("mhealth"[All Fields] OR "mobile health"[All Fields] OR "mobile health applications"[All Fields]) AND ((ft[Filter]) AND (english[Filter]) AND (2015:2023[pdat]))

Selection Criteria

- Inclusion Criteria:
 - o Peer-reviewed articles published in English
 - o Studies focusing on the development, implementation, acceptance, and impact of MHAs
 - o Research providing insights into regional disparities and typologies of MHAs
- Exclusion Criteria:
 - o Non-peer-reviewed works (e.g., conference papers, theses)
 - o Articles published in languages other than English
 - o Studies not directly related to MHAs
 - o Inaccessible full-text articles

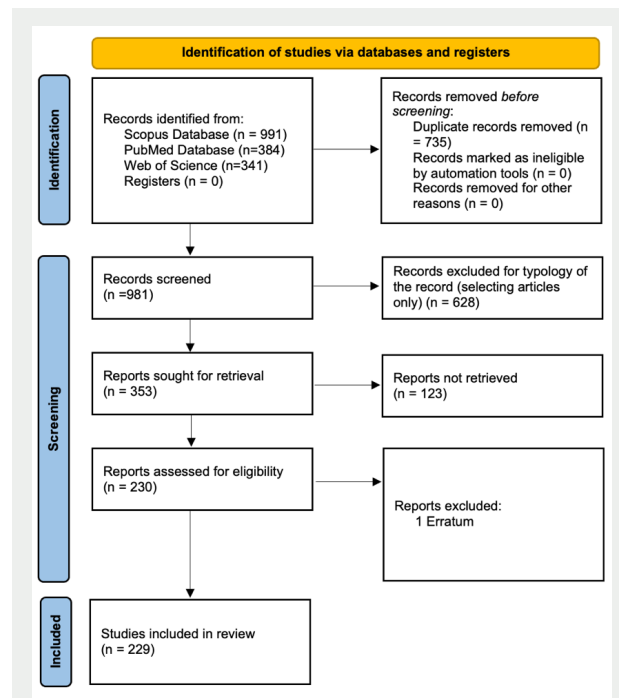


Figure 1. Identification of Studies Related to Mobile Health Applications via Scopus, Web of Science, and PubMed Databases.

Data Extraction and Analysis

The initial step involved a thorough screening of the titles and abstracts of the identified articles to ensure that they met the inclusion criteria. Following this, the full-text articles were reviewed to confirm their eligibility for inclusion in the study.

For data extraction, a standardized form was used to collect relevant information from each study. This included details such as the authors, year of publication, study design, and geographic location. The focus of each study, including its context, objectives, and the problematics it addressed, as well as the types of MHAs examined, were also documented. Key findings, which summarized the main results and conclusions of each study, were recorded to provide a comprehensive overview of the evidence.

Subsequent to data extraction, a cluster analysis was conducted using VOS Viewer, a software tool designed for constructing and visualizing bibliometric networks (7). The data extracted from the studies were imported into VOS Viewer to facilitate this analysis. The software was used to create bibliometric networks based on the co-occurrence of keywords and citations within the studies. Through this process, clusters of related studies were identified, revealing key problematics, typology and the geographical distribution of the studies related MHAs landscape. These thematic clusters were then visualized, illustrating the interconnections and prominent areas of study in a clear and comprehensible manner.

Note: The PRISMA flowchart illustrates the systematic process used for identifying, screening, and including studies in the review. Initially, 1,430 records were identified from the Scopus database. After removing

12 duplicates and 29 records for other reasons (e.g., language), 1,418 records were screened for eligibility. During the screening phase, 628 records were excluded based on typology, leaving 790 reports sought for retrieval. Of these, 298 reports were not retrieved, and 463 reports were assessed for eligibility. Ultimately, 234 reports were excluded for not being directly related to the subject, resulting in 229 studies included in the final review.

RESULTS

This section presents the key findings of the systematic review, which were organized according to thematic clusters identified via VOS viewer. These clusters represent the core areas of research within the domain of MHAs and provide valuable insights into the state of the field. The cluster analysis of the main problematics (Figure 2) studied in the articles includes clinical interventions and outcomes, psychological and social factors, and technology and development. Additionally, the review identifies typologies of MHAs and regional contributions to MHA research, offering a global perspective on the impact of these applications.

Analysis of Key Problematics Identified Through Cluster Analysis Using VOS Viewer

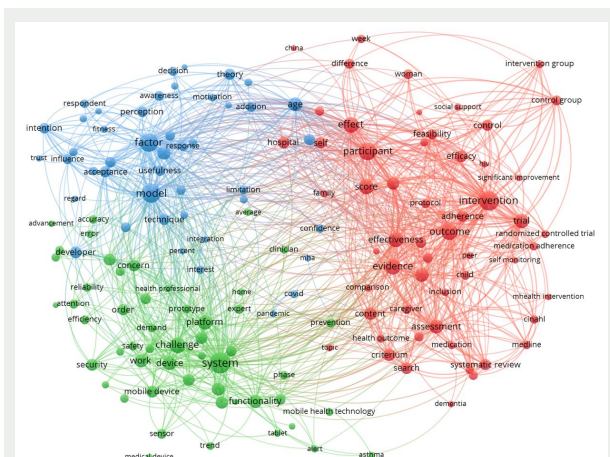


Figure 2. Visualization of Main Problematics in Database: A Cluster Analysis Using VOS Viewer

Clinical Interventions and Outcomes (Red Cluster)

The red cluster focuses on clinical interventions and outcomes, underscoring the significant role of MHAs in improving health management, particularly for chronic diseases, assuming that mHealth applications enhance patient compliance, empower individuals, and enable more intensive and closely monitored therapy. (8)

A substantial portion of the research within this cluster examines the effectiveness of mobile health interventions, with a strong emphasis on randomized controlled trials (RCTs) and clinical outcome assessments (Franc, et al., 2020). These studies consistently demonstrate the potential of MHAs to enhance disease management, reduce healthcare costs, (9) and improve patient adherence to treatment protocols (10).

MHAs designed to manage chronic conditions such as diabetes, hypertension, and asthma have been particularly well-researched (8,10). Many of these applications employ monitoring tools that allow patients to track vital signs in real-time, enabling early detection of complications (11).

The studies in this cluster report positive clinical outcomes, with evidence of improved disease control and reduced emergency room visits. However, the findings also reveal some inconsistencies in trial outcomes, particularly with regard to the sustained effectiveness of these applications over time. These discrepancies may be attributed to variations in study design, sample populations, and outcome measures, highlighting the need for standardized clinical trial protocols in MHA research.

Furthermore, the red cluster includes studies that evaluate patient engagement with MHAs, which is crucial for achieving positive clinical outcomes. High levels of patient engagement are often correlated with better health outcomes, such as improved medication adherence and self-management (11). However, barriers to engagement, such as technological illiteracy, lack of motivation, and limited internet access, have been identified as key obstacles, particularly in underserved populations. These findings indicate that while the clinical potential of MHAs is considerable, ensuring widespread adoption and sustained engagement remains a challenge.

Psychological and Social Factors (Blue Cluster)

The blue cluster addresses the psychological and social factors that influence MHA adoption and usage, focusing on user perceptions, motivations, and acceptance (12). One of the key themes in this cluster is the importance of user-centered design.

Studies indicate that user acceptance of MHAs is largely influenced by how intuitive and user-friendly the applications are (13). As suggested by the Technology Acceptance Model (TAM) (Figure 3), perceived usefulness and ease of use are critical factors in determining whether a user will adopt and continue using an MHA. (contributors, Technology acceptance model, 2020) If users believe that an application improves their health and is easy to navigate, they are more likely to engage with it consistently (12).

The blue cluster also emphasizes the role of social influence in shaping attitudes toward MHAs, which is further explained by the Unified Theory of Acceptance and Use of Technology (UTAUT) (Figure 4). Social influence, particularly recommendations from healthcare professionals and family members, plays a pivotal role in encouraging the use of MHAs. (Gokhan, 2023) The perception of MHA benefits, however, is not uniform across all populations. Age, gender, socioeconomic status, and cultural background are important moderating factors that influence how different groups perceive and accept MHAs (14). For example, older adults, who may lack digital literacy, often express reluctance to adopt these technologies unless there is sufficient support and education (15).

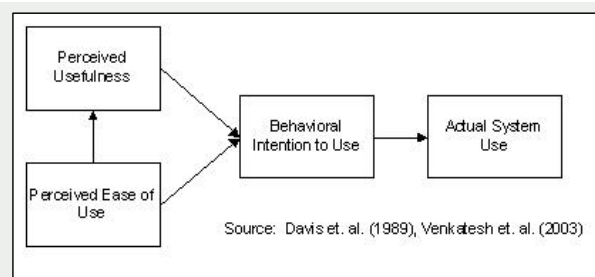


Figure 3. Technology Acceptance Model (TAM) Framework (contributors, Technology acceptance model, 2020)

In addition to acceptance, the blue cluster highlights the importance of motivation and behavioral intention in driving MHA usage. Motivational factors, such as the desire to manage one's health more effectively or the encouragement from family members, are powerful drivers of adoption. However, the absence of intrinsic motivation or clear health benefits may deter users from engaging with the applications over time (16). Thus, understanding and addressing the psychological and social factors that impact MHA adoption is crucial for improving user retention and maximizing the clinical impact of these tools.

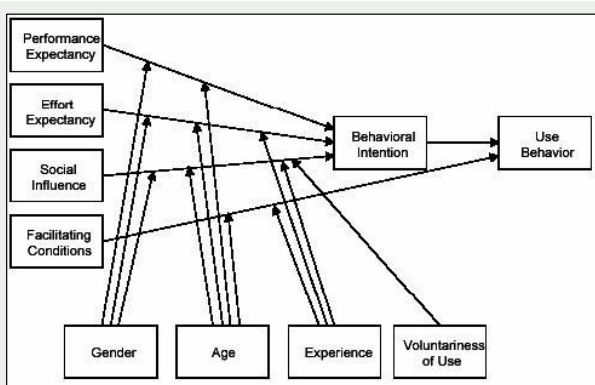


Figure 4. Unified Theory of Acceptance and Use of Technology (UTAUT) Framework contributors.

Technology and Development (Green Cluster)

The green cluster focuses on the technological and developmental aspects of MHAs, examining the design, functionality, and security of these applications. Key terms in this cluster include system design, platform interoperability, device compatibility, and security. As MHAs become more integrated into clinical workflows, technological advancements must address the increasing demand for seamless integration with existing healthcare systems. Many studies within this cluster highlight the challenges of ensuring interoperability between different platforms, which can hinder the smooth exchange of health data between devices and healthcare providers (17).

One of the most pressing concerns identified in the green cluster is data security. As MHAs handle sensitive personal health data, ensuring robust encryption and compliance with privacy regulations is essential to building user trust and ensuring regulatory compliance. Data breaches or misuse of health information could undermine the adoption and effectiveness of MHAs,

particularly in regions with stringent data protection laws. Therefore, developers must prioritize the security of health data, embedding secure transmission protocols and data protection measures into the design of these applications.

Additionally, the green cluster addresses the challenge of ensuring MHAs are accessible and functional across a wide range of devices and platforms. With increasing smartphone penetration globally, ensuring that applications work across different operating systems and devices is essential for broad adoption. Developers must also consider low-cost, low-tech solutions for users in resource-constrained environments, particularly in rural or underserved regions (18). These regions often face infrastructure challenges, such as limited internet access or poor mobile network coverage, which can hinder the effective use of MHAs (4).

Typology of Mobile Health Applications

The typologies identified in the review categorize MHAs based on their application in clinical and diagnostic settings. The green cluster (Figure 5) includes MHAs focused on clinical and diagnostic applications, which assist healthcare professionals in diagnosing and monitoring patients. These applications often integrate with medical devices, such as blood pressure monitors and glucose meters, to provide real-time health data that can inform clinical decision-making (2). This typology reflects the growing trend of telemedicine and remote patient monitoring, which are particularly relevant in areas with a shortage of healthcare professionals or in situations where in-person visits are not feasible (4,19).

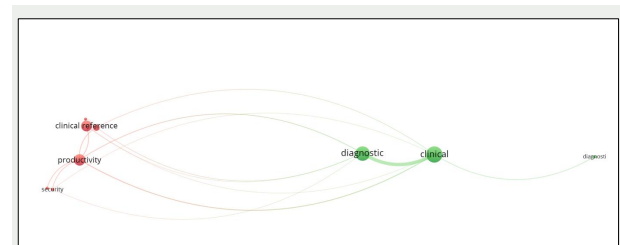


Figure 5. Visualization of Main Types of Mobile Health Applications in Database: A Cluster Analysis Using VOS Viewer

In contrast, the red cluster identifies MHAs that focus on clinical reference, productivity, and security. These applications are designed to enhance the efficiency of healthcare professionals by providing easy access to clinical guidelines, drug references, and other resources. They also prioritize data security, ensuring that patient information is protected while still enabling healthcare professionals to make informed decisions. Such applications are particularly valuable in fast-paced clinical environments where access to real-time information can significantly impact patient outcomes (20).

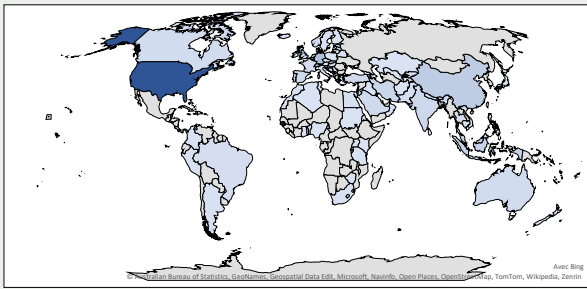


Figure 6. Global Distribution of Contributions: An Analysis by Region

The analysis of the regional distribution of publications on MHAs showcases distinct patterns across different parts of the world. Here are the key insights:

United States: Represented in dark blue, the United States leads with the highest number of publications on mobile health applications. This indicates a strong focus and extensive research activities in this region.

Europe: Several European countries make significant contributions to MHA research. Notably, the United Kingdom, Germany, France, and the Netherlands are active in this field, with shades of blue indicating substantial publication volumes.

Asia: Countries such as China, India, Japan, and South Korea show notable activity in MHA research, contributing a significant number of publications. These countries are represented with varying shades of blue, reflecting their active participation in the domain.

Oceania: Australia emerges as a prominent contributor to MHA research in the Oceania region, with a considerable number of publications.

Latin America and Africa: While countries in Latin America and Africa are represented, they contribute relatively fewer publications compared to other regions. The lighter shades of blue indicate a lower volume of research activity in these areas.

Overall, these findings highlight the global distribution of research efforts on mobile health applications, with certain regions exhibiting higher levels of activity and others contributing to a lesser extent. Understanding these regional patterns can help identify areas for potential growth and collaboration in MHA research.

DISCUSSION

The findings of this systematic review offer valuable insights into the current state and trends in MHAs research. By analyzing the thematic clusters identified through VOS Viewer, we can better understand the core areas of focus and the global distribution of contributions. This discussion section delves into these insights and provides a comprehensive interpretation of the results.

Clinical Interventions and Outcomes

The red cluster emphasizes the significant role of MHAs in improving health management, particularly for chronic diseases. The reviewed studies demonstrate that MHAs can enhance patient compliance, empower individuals,

and enable more intensive and closely monitored therapy. RCTs and clinical outcome assessments consistently highlight the potential of MHAs to improve disease management, reduce healthcare costs, and increase patient adherence to treatment protocols. For instance, applications designed to manage chronic conditions like diabetes, hypertension, and asthma have shown positive clinical outcomes, such as improved disease control and reduced emergency room visits.

However, the discrepancies in trial outcomes indicate the need for standardized clinical trial protocols. Variations in study design, sample populations, and outcome measures contribute to these inconsistencies, underscoring the importance of uniformity in future research. Additionally, while high levels of patient engagement are linked to better health outcomes, barriers such as technological illiteracy, lack of motivation, and limited internet access need to be addressed to ensure widespread adoption and sustained engagement.

Psychological and Social Factors

The blue cluster highlights the importance of user-centered design in the adoption and usage of MHAs. User acceptance is significantly influenced by the perceived usefulness and ease of use of the applications, as suggested by the TAM. Social influence, particularly recommendations from healthcare professionals and family members, also plays a crucial role in encouraging MHA usage, as explained by the UTAUT.

Understanding the psychological and social factors that impact MHA adoption is essential for improving user retention and maximizing clinical impact. Motivational factors and behavioral intention are powerful drivers of adoption, but the absence of intrinsic motivation or clear health benefits can deter users. Therefore, developers must focus on creating intuitive, user-friendly applications and providing adequate support and education to address the needs of different demographic groups.

Technology and Development

The green cluster addresses the technological and developmental aspects of MHAs, focusing on design, functionality, and security. Ensuring interoperability between different platforms is a significant challenge, as it hinders the smooth exchange of health data. Data security is another critical concern, with robust encryption and compliance with privacy regulations being essential to building user trust and ensuring regulatory compliance. Developers must prioritize data security by embedding secure transmission protocols and data protection measures into MHA designs. Additionally, ensuring that MHAs are accessible and functional across various devices and platforms is crucial for broad adoption. In resource-constrained environments, developers should consider low-cost, low-tech solutions to overcome infrastructure challenges such as limited internet access or poor mobile network coverage.

Typology of Mobile Health Applications

The review identifies different typologies of MHAs, categorizing them based on their application in clinical and diagnostic settings. Applications focused on clinical reference, productivity, and security enhance the efficiency of healthcare professionals by providing easy access to clinical guidelines and resources. These applications are valuable in fast-paced clinical environments where real-time information can significantly impact patient outcomes.

Global Distribution of Contributions

The analysis of regional distribution reveals distinct patterns in MHA research contributions. The United States leads with the highest number of publications, indicating a strong focus and extensive research activities. Europe, particularly the United Kingdom, Germany, France, and the Netherlands, also shows significant contributions. Asian countries like China, India, Japan, and South Korea, as well as Australia in Oceania, are prominent contributors. In contrast, Latin America and Africa have relatively fewer publications.

Understanding these regional patterns can help identify areas for potential growth and collaboration in MHA research. Encouraging research in underrepresented regions and fostering international collaborations can drive the global advancement of MHAs.

Interconnectedness of Clusters

The findings from this review highlight the interconnectedness of clinical outcomes, psychological and social factors, and technological advancements. Clinical outcomes are closely linked to user-centric designs informed by psychological and social insights. Similarly, technological advancements facilitate better user experiences and ensure effective clinical integrations. These interconnected elements underscore the importance of a holistic approach in developing and deploying MHAs to achieve the best possible outcomes.

Implications for Global Healthcare

MHAs have the potential to significantly bridge healthcare gaps, particularly in resource-limited settings. Realizing this potential requires context-specific adaptations to ensure that MHAs are effective and acceptable to diverse populations. Ethical considerations, such as data privacy and equitable access, must be addressed to ensure fair and widespread adoption. By tailoring MHAs to the unique needs of various regions, stakeholders can enhance the impact and reach of these applications.

Limitations

This review has several limitations that should be acknowledged. Although the literature search was conducted across three databases (Scopus, Web of Science, and PubMed), Scopus served as the primary source, given its broad multidisciplinary coverage

of journals relevant to the mHealth field. While this approach is well-established in systematic reviews of digital health literature, it is possible that relevant studies indexed exclusively in other specialized databases were not captured. Additionally, the review was restricted to English-language publications, which may have introduced language bias and excluded relevant research published in other languages, particularly from underrepresented regions such as Latin America and Africa. The bibliometric cluster analysis using VOSviewer, while effective for identifying thematic trends, reflects co-occurrence patterns in the literature and may not capture all nuanced theoretical perspectives within each cluster. Finally, given the rapid evolution of mobile health technologies, some findings may not fully reflect the most recent developments beyond the 2023 cut-off date. Future reviews should consider broader database searches, multilingual inclusion criteria, and updated time frames to build on these findings.

CONCLUSION

Despite the promising potential of MHAs, several challenges remain. There is a need to standardize clinical trials for diverse populations, overcome barriers to user acceptance, and address infrastructural limitations. Collaborative efforts and increased investment in digital health are essential to overcoming these challenges. By fostering cooperation among researchers, developers, and policymakers, the full potential of MHAs can be realized, leading to improved health outcomes globally. This systematic review provides a comprehensive analysis of the key problematics, psychological and social factors, technological and developmental aspects, and typologies of MHAs. The findings highlight the global distribution of contributions and identify areas for future research. By addressing the identified challenges and leveraging the insights gained, stakeholders can work towards enhancing the adoption, effectiveness, and impact of mobile health applications worldwide.

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