



REVIEW ARTICLE OPEN ACCESS

The Impact of Mobile Health Interventions on Mental Health Literacy: Protocol for a Systematic Review and Meta-Analysis of Randomized Controlled Trials

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ABSTRACT

Background: The increasing prevalence of mental health disorders is a global public health challenge. Mental health literacy is essential for preventing, recognizing, and managing mental disorders. Mobile health (mHealth) platforms, with their accessibility and portability, offer an opportunity to enhance mental health literacy.

Objective: This protocol outlines the methodology for conducting a systematic review and meta-analysis of randomized controlled trials to quantitatively assess the effectiveness of mHealth platforms in improving mental health literacy.

Methods: A comprehensive search will be conducted across databases, including Medline, Embase, PsycINFO, Web of Science, and CINAHL, using predefined keywords related to “mental health literacy,” “mHealth,” “mobile health,” and “randomized controlled trials.” The search will be supplemented by manual searches of reference lists of relevant studies and reviews to identify additional eligible studies. The key inclusion criterion is the restriction of studies to randomized controlled trials assessing mHealth interventions aimed at enhancing mental health literacy. Only studies published in English will be included. The primary outcome will be changes in mental health literacy scores, measured using validated questionnaires. The primary summary measure will be the standardized mean difference in mental health literacy scores between intervention and control groups, with 95% confidence intervals calculated for each effect size. A mixed-effects model will be used to account for variability across studies. Subgroup analyses will examine variations based on participant age, type of mHealth platform, and intervention duration. The Cochrane Risk of Bias tool will be employed to assess study quality. Sensitivity analyses will be conducted to assess the robustness of the findings, and publication bias will be evaluated using funnel plots and Egger's test.

Conclusions: To our knowledge, this is the first systematic review and meta-analysis of randomized controlled trials to evaluate the effectiveness of mHealth platforms in increasing mental health literacy. The findings will inform policy and practice by empirically assessing the role of digital health technology in promoting mental health education, potentially guiding the integration of mHealth interventions into mental health services and shaping future strategies for public health initiatives.

1 | Introduction

Mental health is integral to overall well-being, influencing how individuals think, feel, and behave [1–3]. Nearly one in eight individuals live with a mental disorder [4], highlighting the widespread nature of these conditions. Mental disorders, ranging from anxiety and depression to more severe conditions like schizophrenia, are prevalent globally and can have profound impacts on individuals and communities [4–6]. Key aspects of daily life, such as stress management, interpersonal relationships, and decision-making, are closely linked to mental disorders [1, 7–10]. According to the World Health Organization, mental health disorders contribute significantly to the global burden of disease [11], with depression alone affecting approximately 280 million people worldwide [12].

Given the far-reaching impacts of mental disorders, enhancing mental health literacy, which encompasses knowledge and beliefs about mental disorders that aid in their recognition, management, or prevention [13, 14] is imperative. Mental health literacy enables individuals to identify early signs of mental health issues, seek appropriate help, and support others in their journey to recovery [15, 16]. For instance, studies have found that mental health literacy was associated with less aversion or stigmatizing attitudes towards help-seeking and greater knowledge of mental health services [17–20]. Despite its importance, many populations do not have mental health literacy. One study conducted in the USA revealed that less than 50% of participants could correctly identify depression symptoms [21]. Similarly, in a study conducted in Sweden, self-stigma of help-seeking was more pronounced among those with lower mental health literacy [22]. Among older adults in China, low mental health literacy was associated with mental health issues, such as anxiety, depression, and poor sleep quality [23].

Mobile health (mHealth) platforms have revolutionized health services and information delivery. mHealth refers to the use of mobile devices, such as smartphones and tablets, to support public health and clinical practices [24–26]. These platforms offer a range of applications, including health monitoring [27, 28], disease management [29–32], and health education [32–34]. In the context of mental health, mHealth platforms provide an innovative approach to improving mental health literacy. For instance, the Headspace platform offers guided meditation and mindfulness exercises that have been shown to reduce stress and improve mental well-being [35, 36]. Similarly, the MoodMission platform provides users with tailored strategies to manage low mood and depression, demonstrating significant improvements in mental health outcomes [37, 38]. As the prevalence of mobile device usage continues to grow [39, 40], mHealth platforms present a unique opportunity to enhance mental health literacy on a large scale.

While mHealth platforms have demonstrated potential in various health domains, their effectiveness in improving mental health literacy specifically warrants further investigation. Previous studies have highlighted the benefits of mHealth interventions in managing mental health conditions and providing support [41–47]. Still, there is a need to systematically evaluate their impact on mental health literacy. Moreover, while Yeo et al. 2024 conducted a meta-analysis on the effectiveness of

digital mental health literacy interventions in improving both proximal mental health literacy outcomes and distal mental health outcomes, it did not provide insights on the effectiveness of the mHealth platform in particular, which are more accessible and widely used than other digital interventions, such as web-based platforms or telemedicine [48]. Thus, this meta-analysis aims to fill this gap by synthesizing evidence from randomized controlled trials (RCTs) to quantitatively assess the effectiveness of mHealth platforms in enhancing mental health literacy compared to control groups, including standard care or no intervention.

2 | Methods

This systematic review and meta-analysis followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Supporting Information File). The review protocol was registered with Open Science Framework at <https://doi.org/10.17605/OSF.IO/WMX3H>.

2.1 | Research Question

What is the effectiveness of mHealth platforms in enhancing mental health literacy compared to control groups (e.g., standard care or no intervention)?

2.1.1 | Eligibility Criteria

For this review, studies will be included if they focus on RCTs that assess mHealth interventions aimed at improving mental health literacy. The emphasis on RCTs is due to their ability to provide more robust evidence through minimizing bias [49]. Studies involving participants of all ages, genders, and ethnicities will be considered, ensuring that the review captures a broad spectrum of populations. Only studies measuring mental health literacy outcomes with validated instruments, including but not limited to the Mental Health Literacy Scale (MHLS) and the Depression Literacy Questionnaire (D-Lit), will be reviewed to ensure the reliability and consistency of the findings. Moreover, the effectiveness of mHealth platforms on mental health literacy must be compared to control groups (e.g., standard care or no mental health literacy intervention). To maintain the quality and relevance of the review, only studies published in peer-reviewed journals between 2010 and 2024 will be considered. In contrast, non-randomized studies, qualitative research, and those not reporting relevant outcomes will be excluded from the analysis. A summary of the inclusion and exclusion criteria can be found in Table 1.

2.2 | Study Records

2.2.1 | Information Sources

A comprehensive search will be conducted in the following electronic databases: Medline, PsycINFO, Embase, Web of Science, and CINAHL. Embase and Medline will be utilized as

key databases for their comprehensive collection of peer-reviewed biomedical literature, including studies on digital health interventions and mental health literacy, ensuring access to relevant research in the field. PsycINFO will be employed to ensure the inclusion of mental health-related literature, thereby capturing research on mHealth interventions and their impact on mental health literacy. Additionally, CINAHL will be used as a source for health education literature, providing extensive insights into mental health literacy within the allied health fields. Moreover, as this review covers fields related to psychology, health sciences, and technology, the Web of Science will be used to provide a comprehensive perspective from various disciplines. Additionally, reference lists of included studies and relevant reviews will be manually searched for any additional eligible studies.

2.3 | Search Strategy

The search strategy will be developed with the assistance of a professional librarian and will include a combination of keywords and Medical Subject Headings (MeSH) terms related to mHealth, mental health, mental health literacy, and RCTs. Search terms will include: “mobile health,” “mHealth,” “mental health literacy,” “randomized controlled trial,” “RCT,” “digital health,” and “mobile applications.” A key concept map of our search strategy is provided in Table 2. Moreover, the reference lists of the included peer-reviewed studies will be manually reviewed to identify any missed relevant articles during the initial search. To maximize search yield, we will initially exclude keywords related to RCTs from our search strategy. However, if the results yield an excessive number of

TABLE 1 | Inclusion and exclusion criteria utilized in our review.

Concept	Inclusion	Exclusion
Intervention	mHealth interventions (e.g., mobile health apps, remote monitoring tools) for health management and behavior change deployed on portable devices (e.g., smartphones, tablets, wearables).	Use of telecommunication technologies designed for stationary, non-portable use (e.g., hospital-based decision support systems, fixed monitoring systems, or telehealth platforms for computer use)
Outcome	Mental health literacy (measured using validated mental health literacy instruments)	Non-validated mental health literacy tools or assessments; categorical outcome (e.g., percentage of participants with improved literacy Yes/No or odds ratios)
Publication status	Peer-reviewed literature published between 2010 – 2024 in the English language	Gray literature (e.g., conference abstracts, reports)
Type of study	RCTs	Studies comparing more than two interventions where standard care or pharmacological treatments influence results

TABLE 2 | Key concepts map of search strategy.

Key concepts	Search terms
mHealth	“mobile health,” “mHealth,” “mobile application,” “mobile app,” “smartphone,” “digital health,” “mobile device,” “mobile technology,” “mobile phone,” “tablet,” “eHealth,” “web app,” “app,” “apps,” “gamification,” “iPhone,” “Android,” “digital platform,” “mobile tool,” “digital application,” “digital app,” “smart device,” “wearable device,” “fitness tracker,” “smartwatch,” “Apple Watch,” “Fitbit,” “Garmin,” “Samsung Galaxy Watch,” “mobile intervention,” “mobile platform,” “mobile solution,” “health app,” “mobile intervention,” “mobile,” “smartphone,” “iOS,” “Android,” “digital mental health intervention,” “mental health app,” “digital health platform,” “electronic health platform,” “eHealth platform,” “uHealth platform,” “ubiquitous health”
Mental health	Mental health, mental illness, mental disorder, psychological health, emotional health, mental wellness, mental well-being, psychological well-being, psychosocial well-being, anxiety, depression, behavioral disorder, cognitive health, psychological function, burnout, mental health condition, suicide
Mental health literacy	Literacy, knowledge, education, awareness, self-efficacy, help-seeking, help seeking, support-seeking, support seeking, stigma, competence, empowerment
RCTs	RCT, randomized controlled trial, randomized controlled trial, randomized clinical trial, randomized clinical trial, controlled clinical trial, random assignment, randomized study, randomized study, random allocation, controlled trial, clinical trial, experiment, intervention, control group, comparison group, random selection

nonrelevant studies, we will refine our search by reintroducing RCT-specific keywords. This will be done through a sensitivity analysis to assess the impact of these keywords on search precision.

2.4 | Study Selection

Two independent reviewers will screen the titles and abstracts of all retrieved records using the Covidence software for systematic screening and management [50]. Full-text articles will be obtained for studies deemed potentially eligible and will be assessed by both reviewers. Discrepancies between reviewers will be resolved through discussion or consultation with a third reviewer. A PRISMA flow diagram will be used to document the study selection process [51].

2.5 | Data Collection Process

Data will be extracted independently by two reviewers using a standardized data extraction form. The extracted data included study characteristics (e.g., authors, year of publication, country), participant characteristics (e.g., sample size, age, gender), intervention details (e.g., type of mHealth platform, duration), and outcomes (e.g., mental health literacy scores). Any discrepancies in data extraction will be resolved through discussion or by consulting a third reviewer.

2.6 | Data Items

The primary outcome will be the change in mental health literacy scores, measured using validated instruments, including but not limited to the MHLS and the D-Lit questionnaires. Secondary outcomes will include intervention adherence and user satisfaction.

2.7 | Risk of Bias

The risk of bias for each included study will be assessed independently by two reviewers using the Cochrane Risk of Bias tool [52]. This tool evaluates potential biases in sequence generation, allocation concealment, blinding of participants and personnel, blinding of outcome assessment, incomplete outcome data, selective reporting, and other biases. Discrepancies will be resolved through discussion or consultation with a third reviewer. Publication bias will be assessed using funnel plots and Egger's test. Sensitivity analyses will be conducted to evaluate the robustness of the findings by excluding studies with a high risk of bias.

2.8 | Summary Measures

The primary summary measure for this study is the standardized mean difference (SMD) in mental health literacy scores between the intervention and control groups. 95% confidence intervals (CIs) will be calculated for each effect size. If eligible

studies report findings in categorical data (e.g., percentage of participants with improved literacy Yes/No or odds ratios), we will not attempt to convert these findings to continuous data. Only studies reporting continuous data (e.g., means and standard deviations) will be included for meta-analysis. For missing data, we will follow a structured approach, where we will attempt to contact study authors to obtain the missing information. If this is unsuccessful, we will apply statistical imputation methods where the data are missing at random and sample sizes are sufficient to support such approaches. Specifically, we will consider multiple imputation and regression-based imputation as the preferred methods, given their ability to reduce bias and account for uncertainty in the missing values. Simple methods such as mean substitution will be avoided due to their potential to distort variability and underestimate standard errors. Sensitivity analyses will be performed to compare pooled results with and without imputed data to evaluate the robustness of the findings. If the necessary data cannot be obtained despite these efforts, the study will be excluded from the quantitative synthesis, though it may still be considered for inclusion in the qualitative synthesis.

2.9 | Synthesis of Results

All data analyses and statistical modeling in this study will be performed using R (version 4.4.3) [53]. Meta-regression will be conducted using mixed-effects modeling to account for both fixed effects (e.g., participant age, intervention type, baseline mental health status) and random effects (between-study variability). The outcome of the meta-regression will be the effect size (e.g., standardized mean difference) across the studies, which will be analyzed in relation to the study-level covariates. This approach will enable the examination of study-level covariates and their impact on effect sizes, while also accounting for heterogeneity across studies. The model will only be applied if the sample size is sufficient to provide reliable estimates for the fixed and random effects. Statistical heterogeneity will be assessed using the I^2 statistic, with values of 25%, 50%, and 75% indicating low, moderate, and high heterogeneity, respectively [54]. Sensitivity analyses will be conducted to assess the robustness of the results by identifying influential studies, using methods such as visual inspection of forest plots and examination of Cook's distance. The impact on the overall effect size and confidence intervals will be evaluated by comparing results before and after removing each influential study. These analyses will supplement the main analysis and are not intended to replace it, as removing outliers is known to potentially introduce bias [55]. Subgroup analyses will be performed based on participant age, type of mHealth platform, and intervention duration.

3 | Discussion

This protocol outlines a systematic approach to quantitatively evaluate the impact of mHealth platforms on mental health literacy, addressing a significant gap in understanding the effectiveness of digital interventions in this area. By synthesizing data from RCTs, the findings will provide rigorous, evidence-based insights into how mHealth can be utilized for

mental health literacy. These results are expected not only to contribute meaningfully to the existing body of literature but also can guide policymakers on how mHealth can be effectively leveraged to enhance mental health literacy among different populations, building on existing digital literacy programs. Furthermore, the findings can inform the development and adaptation of mHealth platforms tailored to specific groups, such as rural or Indigenous populations [47], where access to traditional mental health services may be limited, expanding the access to mental health resources.

As the world faces a global mental health crisis, with the increasing prevalence of mental health disorders across all demographics, this study is particularly timely. Given the widespread accessibility of mobile technologies, mHealth interventions present an innovative solution to bridging gaps in mental health education and care. Moreover, this study will build upon existing digital literacy programs by exploring how these platforms can be adapted and integrated into broader health education strategies [56]. The findings will be critical in shaping policies that integrate mHealth into mental health education and prevention strategies, thereby broadening access to mental health resources and support, particularly in underserved populations. This study has the potential to drive impactful changes in both clinical practice and public health policy, ensuring that digital tools are effectively harnessed to improve mental health literacy on a global scale.

4 | Strengths and Limitations

This meta-analysis will quantitatively evaluate the impact of mHealth platforms on mental health literacy. This study will exclusively focus on RCTs, which are widely considered one of the most rigorous methods for evaluating intervention effectiveness [49]. By doing so, this study can provide a high level of evidence and thus can minimize the risk of bias and enhance reliability. Moreover, conducting subgroup analyses, particularly those focusing on age and the type of mHealth interventions can provide more nuanced insights into which platforms and methods are most effective. However, certain limitations should be considered in this study. Our study may have a potential language bias due to the inclusion of only English-language studies, potentially excluding relevant research published in other languages. Moreover, cultural differences in mental health perceptions across study samples may influence the effectiveness of mHealth interventions, which will require further exploration in future studies.

Author Contributions

Jamin Patel: conceptualization, investigation, visualization, writing – original draft preparation, review and editing. **Madeline Li:** investigation, writing – original draft preparation, review and editing. **Nadine Elshahli:** investigation, writing – original draft preparation, review and editing. **Tarun Reddy Katapally:** conceptualization, investigation, funding acquisition, supervision, writing – review and editing.

Ethics Statement

This study is a meta-analysis and does not involve gathering primary data, thus ethical approval is not required. However, we will evaluate and

address ethical considerations relevant to the studies included, such as informed consent and confidentiality.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

Data sharing is not applicable to this article as no datasets were generated or analyzed during the current study.

All extracted data will be made available in the [supplementary file](#) and deposited in a Figshare repository, which will be accessible to all readers.

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Supporting Information

Additional supporting information can be found online in the Supporting Information section.

PRISMA-P (Preferred Reporting Items for Systematic review and Meta-Analysis Protocols) 2015 checklist: recommended items to address in a systematic review protocol*. Search strategy mHealth.