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Mobile Health Applications Continuance Intention Theories and Outcomes: A Scoping Review

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Abstract: The global adoption of mobile health (mHealth) accelerated significantly following the COVID-19 pandemic. However, sustaining long-term user engagement remained impeded by persistent barriers, including limited digital literacy, substandard technological infrastructure, and systemic socioeconomic disparities. While existing literature documented these challenges, much of the evidence base relied on narrative reviews that lacked rigorous, standardized methodologies. To address this methodological gap, this study conducted a scoping review in accordance with PRISMA-ScR guidelines and structured via the PICo framework. Using a systematic search strategy, 15 peer-reviewed articles were selected and analyzed across five critical dimensions: publication timeline, sampling methodologies, target populations, analytical approaches, and underlying theoretical frameworks. Because the synthesized findings focused on general mHealth app users, they revealed critical baseline gaps in long-term continuance intention and overall app adoption. Ultimately, this review established a rigorous methodological benchmark for evaluating mHealth continuance, offering empirical insights to guide future research toward designing sustainable mHealth interventions and optimizing digital health strategies for general users.

Keywords: *Continuous Intention, mHealth, Scoping Review*

1. Introduction and Background

Mobile Health

The utilization of mobile health (mHealth) applications represents a significant field of study. mHealth applications are programs designed to run on mobile devices, such as smartphones, tablets, and wearables. (Jembai et al., 2022). These applications are utilized to monitor and manage various aspects of health and well-being, including physical fitness and nutrition, medication administration, and the treatment of chronic diseases, as well as to facilitate communication with healthcare providers (Jembai et al., 2022). MHealth applications are already leveraging mobile technology to deliver a range of health-related activities and services, and they are gaining popularity. They give people the ability to take an active role in their medical treatment, which in turn helps them achieve better health outcomes and improves their overall quality of life.

Various obstacles hinder the uptake of mHealth applications, such as technical challenges (for instance, insufficient existing technology), apprehensions regarding the regulation and effectiveness of applications, issues related to security and privacy, and the ease of use (Zakerabasali et al., 2021). Sociotechnical elements, such as difficulties faced by patients in utilizing mobile applications, inadequate health literacy, a deficiency in empowerment, and a legacy of mistrust towards the healthcare system, create significant barriers to the acceptance of mHealth applications (Zakerabasali et al., 2021). Furthermore, a study by Leigh et al. (2020) identified and weighed barriers to and drivers of health app use among healthcare professionals (HCPs), including lack of time, lack of trust in the app, and lack of awareness of the app. To summarize the findings, the following are the barriers to mHealth application adoption (Murray et al., 2015; Rosenfeld, 2019; Swain et al., 2023; Zhou et al., 2019).

Limited studies have been carried out on assessing users' ongoing intention to utilize mHealth applications. In this context, since most applications are available for free (up to 74.78%) (Xu & Liu, 2015), the reasons users continue to use mHealth remain poorly understood. The research conducted by Liu et al. (2022) examines the elements that affect patients' willingness to utilize AI service robots in outpatient environments. The results indicate that patients are more inclined to continue using the service robot when they perceive it as advantageous, easy to use, and enjoyable. Additionally, a research study conducted by J. Liu and colleagues in 2022 explored the impact of health-related stress on users' views of the effectiveness and satisfaction they derive from mHealth applications. The results demonstrated a positive correlation between health stress and the perceived effectiveness and satisfaction with mHealth apps. This study proposes that mHealth applications

can effectively mitigate health-related stress beyond structural access; user psychology plays a critical role in the efficacy of digital health. The determinants of mHealth service success from the user perspective were found to align with the hypothesis of Birkmeyer et al. (2021), who evaluated these determinants. Four critical internal dimensions, namely user attitude, satisfaction, continuous intention to use, and word-of-mouth advocacy, were identified as essential to successful implementation and sustained functionality. Understanding these factors can assist organizations in utilizing their resources more effectively. Numerous studies exist regarding the intention to utilize mHealth. Numerous studies have been carried out in the past, resulting in a wealth of articles and references. Even though several related initiatives have been undertaken, a more systematic approach is required, as highlighted in the research by N. A. Ahmad et al. (2022) and Voth et al. (2022). However, their attention is on narrative reviews that lack a defined, transparent methodology. Without a systematic approach, grasping the ongoing interest in mHealth is unfeasible. Therefore, this can be achieved by conducting a scoping review.

A scoping review is a particular type of article suitable for writing when the topic or problem has not been extensively explored, is complex, or lacks consistency (Mays et al., n.d.). A scoping review serves to identify the key traits, trends, or elements of previous research results in the area, to pinpoint and evaluate areas lacking knowledge, and to offer a preliminary understanding before conducting a systematic literature review (SLR) (Munn et al., 2019; Sucharew & Macaluso, 2019). Furthermore, the scoping review encompasses various study designs and methodologies. It is also less complex than a systematic literature review since it concentrates on a descriptive overview of studies without assessing or critically synthesizing prior research (Munn et al., 2019). In line with the research questions, the main objective of this scoping review is to investigate existing interest in mHealth. Thus, this article seeks to answer the following questions: This scoping review aims to (1) determine the theories and trends used in current studies of continuous intention towards mHealth and (2) determine which outcomes are assessed in studies that have implemented and evaluated these mobile application platforms.

2. Methodology

In conducting this scoping review, we utilized the PRISMA extension specifically for scoping reviews (PRISMA-ScR). The choice of PRISMA-ScR was made because it effectively assists researchers in formulating research questions and establishing criteria for selecting appropriate reference materials to support a systematic search (Peters et al., 2022)

During the first stage of the scoping review, it is essential for researchers to establish a research question. Given that the primary goal of this article is to create a scoping review focused on the ongoing intention to use mHealth, the subsequent research question has been developed: (1) What theories and trends are being utilized in contemporary research on ongoing commitment to mHealth, and (2) What results are measured in studies that have put these mobile application platforms into practice and assessed them?

To conduct an extensive identification process, researchers have established specific keywords for the study. Keywords such as continuous intention, mobile applications, and IS Continuance were selected. The meanings of these terms are defined in accordance with the formulated research questions. Building on earlier research and expert opinions, investigators examined synonyms, associated terms, and different forms of the chosen keywords. To prevent retrieval bias, researchers utilized three databases: Scopus, ScienceDirect, and Google Scholar.

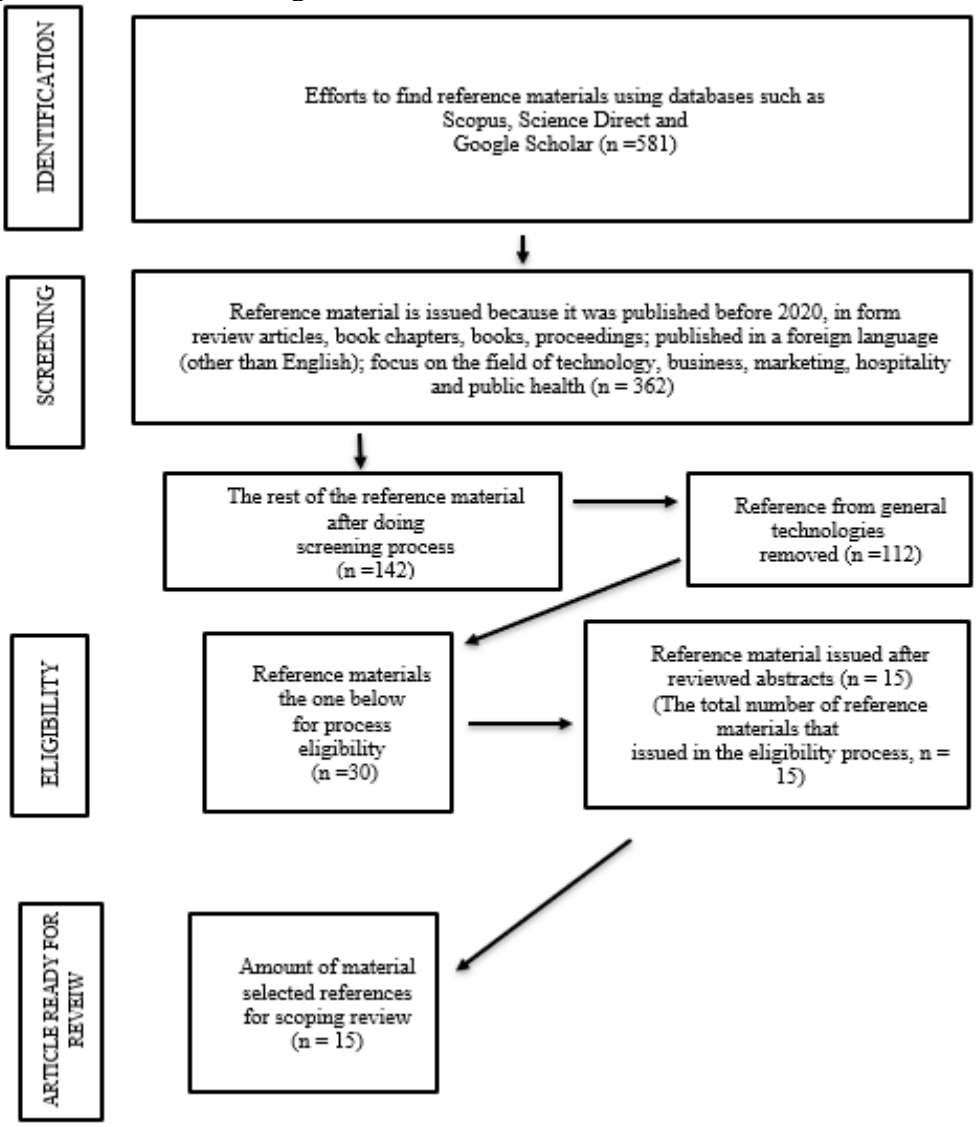
To enhance the likelihood of acquiring more relevant reference materials, scholars have employed two search methods: manual and advanced. For the manual search, researchers used techniques such as handpicking, snowballing, and backward tracking. On the other hand, in advanced searches on Scopus, researchers utilized basic functionalities like phrase searching, Boolean operators, field codes, truncation, and wildcards to construct a suitable search string. Throughout this process, researchers identified a total of 581 potential articles.

The screening process is the second phase in the organized search approach. This step allows researchers to pinpoint relevant articles for a scoping review. (Kitchenham & Charters, 2007) emphasize that researchers

should select only the criteria that address the research question. Given that the intention to continue using mobile applications is an emerging topic, with adoption no longer the primary concern and the field now in the post-adoption stage, the articles chosen were published between 2020 and 2023. According to Linares-Espinós et al. (2018), the selection was limited to English-language articles to reduce confusion, lower costs, and save time. As a result of this process, several articles that did not fulfil the criteria were eliminated, leaving a total of 362 articles retained for ranking in the subsequent selection.

The third process completed is eligibility. In this stage, to confirm the selected reference material's relevance, the researcher analyzed two primary components: the title and the abstract. During this phase, 219 articles were excluded because they addressed general mobile applications and other areas such as marketing and education, rather than focusing on specific health technology sectors. Following this step, only 142 articles were chosen for the subsequent process.

Figure 1: PRISMA Flow Diagram



In this scoping review, we developed a data chart that includes the authors' names, publication year, study context, and methods. Subsequently, in line with the established research questions, key information is extracted from the selected reference materials. Considering that this review emphasizes empirical data from earlier studies, the data extraction procedure was carried out in three stages: abstracts, research findings, and

research discussions. Information from a different section will also be examined if considered important. Analyzing themes can help identify, explore, organize, clarify, and present the themes that have been investigated (Braun & Clarke, 2006). In this scoping review, themes have been formulated based on the commonalities or significance of the information gathered. The analysis identified five main themes: publication year, sampling technique, demographic characteristics, analysis methods, and theoretical framework. The researchers have verified the themes' accuracy to confirm their relevance to the research question. Any differences of opinion among the researchers regarding the established themes have been addressed, and input from an external expert will be sought if the researchers cannot reach a consensus.

Parameter	Details / Specification
Database Searched	Scopus, ScienceDirect and Google Scholar
Search Date Range	2001 – 2023
Search Execution Date	Dec-23
Search Field / Query	TITLE-ABS-KEY (("continuance intention" OR "continued use") AND ("mHealth" OR "mobile health" OR "mobile application*"))
Inclusion Criteria	1. Peer-reviewed journal articles published in English (2001–2023). 2. Empirical studies focusing on mHealth continuance intention or long-term usage. 3. Quantitative, qualitative or mixed-methods empirical designs.
Exclusion Criteria	1. Non-peer-reviewed papers, book chapters, dissertations, and review articles. 2. Studies evaluating short-term initial adoption only. 3. Technologies without a mobile application interface (e.g., desktop/portal-only systems).

3. Results

In this scoping review, 40% of publications were published in 2020, with the remainder published between 2021 and 2023. Convenience sampling is the most frequently used method (80%), while the main population studied in previous studies is app users (73%). In addition to app users, patients, nurses, and undergraduate students are the focus of previous studies. Most of the previous studies (93%) were quantitative, and the rest were mixed methods (mixed methods) (7%). In past studies, the Expectation-Confirmation Model was utilized by most researchers, accounting for 27%, while the Technology Acceptance Model (TAM) was employed by 13%, and the remaining studies each comprised 7%.

Table 1: Data Chart of Previous Studies, including in the Scoping Review

Data	Frequency	Percentage
Publication Year		
2020	6	40
2021	3	20
2022	4	27
2023	2	13
Sampling Technique		
Simple Random	1	7
Convenience Sampling	12	80
Purposive Sampling	2	13
Population		
Apps User	11	73
Patients	1	7
Nurses	1	7
undergraduate students	2	13
Analysis		
Quantitative	14	93

Mixed Method	1	7
Theory		
Unified Technology of Acceptance and Use of Technology (UTAUT)	1	7
Unified Theory of Acceptance and Use of Technology (UTAUT) & DeLone & McLean models	1	7
Innovation Resistance Theory	1	7
Technology Acceptance Model (TAM)	2	13
Expectation Confirmation Model (ECM)	4	27
Technology Acceptance Model (TAM) & the Expectation-Confirmation Model (ECM)	1	7
Technology Adoption Model	1	7
Privacy Calculus Model	1	7
Technology Acceptance Model & Health Belief Model	1	7
Information Systems Continuance Model	1	7
Technology Acceptance Model (TAM) & Investment Model (IM)	1	7

4. Theories and Trends Used in Current Studies of Continuous Intention

According to Table 1, four out of the 15 studies utilized Expectation Confirmation Theory (ECM). For instance, the study by Bölen (2020) incorporated ECM alongside additional variables, including perceived aesthetics, individual mobility, and habit. Wu et al. (2022) combined ECM with IT mindfulness and IT identity. Dinari and Tjhin (2023) merged ECM with perceived privacy, perceived security, and trust. The ECM, as a core theory, incorporates additional variables pertaining to emotional factors (such as device annoyance and enjoyment) along with health and fitness elements (such as motivation for pursuing goals and self-quantification practices), and was finally utilised by Siepmann and Kowalczuk (2021). In addition to ECM, the Technology Acceptance Model (TAM) was the second most utilized theory in previous research. For example, studies examining user-adaptive behavior in telemedicine combined TAM with other aspects like convenience value and health-related stress. (Lu et al., 2023), while a study by Ahmad et al. (2020) merged TAM with social influence and enjoyment. Aside from that, the other ten (10) studies utilized various theories. For example, a particular research study utilized the Unified Technology Acceptance and Use of Technology (UTAUT) model, incorporating additional elements like risk perception and privacy concerns (Yaseen & Al Omoush, 2023) a comprehensive Unified Theory of Acceptance and Use of Technology (UTAUT) combined with the Delone & McLean frameworks (Chow & Legowo, 2023), Innovation Resistance Theory with trust as additional variable (Kautish et al., 2023), an integrated technology acceptance model (TAM) and the expectation-confirmation model (ECM) with additional variables which are trust, attitudes and fear of Covid (Gaber & Hassan, 2022).

Aside from that, research conducted by Liu et al. (2022) integrated the Technology Adoption Model with individual characteristics, specifically independent personality and trust in AI. Additional variables, such as willingness to disclose and expectations regarding data sharing, were applied by Bélanger et al. (2021) in their Privacy Calculus Theory. In addition, extra variables such as social factors (like subjective norms) and psychological influences (such as flow experience, health consciousness, and behavior change techniques) from other research were incorporated into an integrated Technology Acceptance Model (TAM), Health Belief Model (Birkmeyer et al., 2021) and Information Systems Continuance Model, in conjunction with an integration of the Technology Acceptance Model (TAM) and the Investment Model (IM)(Cho et al., 2020).

Outcomes Assessed

Four studies that utilised the Expectation-Confirmation Model (ECM) as their primary theoretical framework to evaluate long-term user engagement were reviewed. Across these investigations (Ahmad et al., 2020; Bölen, 2020; Dinari & Tjhin, 2023; Wu et al., 2022), core ECM constructs consistently predicted the continuous intention to use mHealth, with notable exceptions regarding perceived ease of use (PEOU) and perceived usefulness (PU). Beyond the baseline ECM framework, external extensions yielded mixed results. Bölen (2020) identified perceived aesthetics, personal mobility, and habitual behavior as significant determinants of continuous intention. In contrast, Dinari and Tjhin (2023) found that integrated variables, such as trust and

perceived privacy, showed no statistically significant relationship with user satisfaction. These discrepancies highlight a divergence from alternative theoretical integrations in the literature, such as the unified model proposed by Gaber and Hassan (2022). Their results, grounded in the technology acceptance model (TAM) and the expectation-confirmation model (ECM), uncovered that the intention to continue using is affected by satisfaction, perceived usefulness, perceived ease of use, and attitude. Research conducted by Yan et al. (2021) utilized the Information Systems Continuance Model as its main theoretical framework and discovered that perceived usefulness, ease of use, flow experience, and behavioral change techniques are crucial elements affecting continuous intention, with satisfaction acting as a mediator for these effects. Awareness of health improves the beneficial connection between perceived usefulness and satisfaction but weakens the positive link between perceived ease of use and satisfaction. Conversely, Kautish et al. (2023) found that all obstacles (usage, value, risk, tradition, and image) have a notable impact on willingness to use telemedicine applications.

The analysis of moderation validated that trust enhances the connection between all five obstacles and the intention to buy, employing the Innovation Resistance Theory as its primary framework (Bélanger et al., 2021) in their research, which utilized the privacy calculus model as the foundational theory, it was discovered that the intention to continue using fitness technology is directly influenced by the willingness to share information and the perceived advantages of using the device, In their research, Siepmann and Kowalczuk (2021)The ECM was found to be pertinent in the context of smartwatches and highlighted the importance of self-quantification as a key factor in comprehending motivation for goal pursuit, perceived utility, validation, and device frustration. Furthermore, the research highlights that device-related frustrations pose a major obstacle to continued smartwatch use. Furthermore, research on mHealth utilizing the Technology Acceptance Model (TAM) and the Health Belief Model demonstrates that health-related factors, including perceived disease risk and health awareness, have a considerable impact on users' perspectives on mHealth. Users' attitudes towards mHealth, in turn, have a strong positive impact on user satisfaction and the intention to continue using the service. Additionally, four aspects unique to mobile—customization, engagement, application design, and social connectivity—greatly improve user satisfaction. User satisfaction is vital for increasing the likelihood of continued use and fostering positive word-of-mouth. Moreover, studies on health and fitness apps, utilizing both the Technology Acceptance Model (TAM) and the Investment Model (IM), discovered that components from each model have a significant impact on the willingness to keep using these applications. The perceived ease of use of the applications enhances their perceived usefulness, which in turn affects users' intentions to continue using them. Furthermore, both the perceived usefulness and ease of use of the applications significantly influence user satisfaction, the amount invested, and the quality of the available alternatives.

These three factors influence users' dedication to the applications, which in turn affects their intentions to continue using them (Liu et al., 2022). The Unified Theory of Acceptance and Use of Technology (UTAUT), together with the DeLone & McLean IS Success Model, was found to capture both technical performance and user behaviour during the pandemic. Utilising this combined framework, Chow and Legowo (2023) demonstrated that system attributes (information, system, and service quality) and behavioural determinants (effort expectancy, facilitating conditions, and social influence) significantly predict user satisfaction, which in turn drives the intention to continue using contact tracing applications. Expanding on these behavioral drivers, (Al-Omoush et al., 2023) confirmed that performance expectancy serves as a primary direct predictor of sustained contact tracing app adoption during COVID-19. Crucially, their findings indicate that social influence strongly shapes how individuals perceive and respond to health risks, suggesting that peer and societal compliance pressures are foundational to technology adoption during public health crises. The role of social influence is vital in the choice of using contact tracing apps, emphasizing the need for heightened public awareness that extends beyond individual beliefs to inspire and encourage others to use the app for their own protection and that of their families and communities. Furthermore, favorable circumstances are positively linked to users' beliefs about the efficacy of contact tracing apps.

5. Conclusion

The low adoption of digital health technologies poses a challenge, as these technologies require regular health consultations. Research indicates a reluctance to adopt new technology and varying opinions on how social influence impacts the utilization of mHealth. There is a need for systematic reviews to better understand the users' intention to use mHealth. This article presents a scoping review on the sustained use of mHealth

applications. It seeks to identify the platforms used, the theories and trends underpinning current research, and the outcomes evaluated in these studies. The information provided can guide future research endeavours and serve as a foundation for a systematic review to determine the efficacy of eHealth platforms in fostering healthy nations. Digital health designers and researchers need to prioritise the participation of people of various ages, including the elderly, in the design and research of digital technologies. This scoping review aims to enlighten stakeholders about these eHealth platforms, including patients, caregivers, health professionals, and policymakers.

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