Enhancing HIV Cognitive Abilities and Self-Management through Information Technology-Assisted Interventions: A Scoping Review

Hao Huang, MeiLian Xie, Zhen Yang, AiPing Wang

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Abstract

Background: HIV/AIDS remains a significant global challenge, and with the rapid advancement of technology, there has been an increasing number of interventions aimed at improving HIV/AIDS cognition and self-management behaviors among patients. However, there is still a lack of detailed literature integrating relevant evidence.

Objective: This study aims to comprehensively review existing research on interventions utilizing modern information methods to improve HIV/AIDS cognition and enhance self-management behaviors among patients. It systematically reports the theoretical frameworks and specific intervention strategies used in current research, providing a comprehensive overview of the development status of relevant studies. We aim to compile existing evidence through this scoping review to identify potential avenues for future research.

Methods: We followed the scoping review framework proposed by the Joanna Briggs Institute (JBI) for the synthesis and reporting of evidence. Relevant literature was searched using electronic databases including PubMed, Web of Science, Embase, and Cochrane Library. The time frame for inclusion was from 2018 to December 1, 2023.

Results: A total of 55 studies that met the inclusion criteria were included. The Information-Motivation-Behavioral Skills model, Social Cognitive Theory, Health Belief Model, Theory of Planned Behavior, and Information Systems Research Framework are among the most commonly used theoretical frameworks. Modern information technology interventions are mainly constructed using smartphone applications, text messaging, internet-based platforms, audio-video materials, and digital health education platforms, with smartphone applications and text messaging being the most widely used intervention media.

Conclusions: Through this review, we found that interventions utilizing modern information technology have a significant effect on improving HIV/AIDS cognition and self-management behaviors. Future research should strengthen the application of theory-driven approaches and conceptual frameworks, delve into the mechanisms underlying intervention effectiveness decline, and design sustainable intervention strategies to maximize the role of technology in addressing the challenges of HIV/AIDS.

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Interventions: A Scoping Review

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Ethical consideration

This study does not involve human subjects, therefore ethical approval is not required.

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Aims: This study aims to comprehensively review existing research on interventions utilizing modern information methods to improve HIV/AIDS cognition and enhance self-management behaviors among patients. It systematically reports the theoretical frameworks and specific intervention strategies used in current research, providing a comprehensive overview of the development status of relevant studies. We aim to compile existing evidence through this scoping review to identify potential avenues for future research.

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Conclusion: Through this review, we found that interventions utilizing modern information technology have a significant effect on improving HIV/AIDS cognition and self-management behaviors. Future research should strengthen the application of theory-driven approaches and conceptual frameworks, delve into the mechanisms underlying intervention effectiveness decline, and design sustainable intervention strategies to maximize the role of technology in addressing the challenges of HIV/AIDS.

Keywords: digital media, HIV, cognition, self-management.

1 Introduction

Currently, HIV/AIDS remains a severe and intricate global challenge. According to the 2023 report from the United Nations Programme on HIV/AIDS[1], there are currently 39 million people living with HIV (PLWH) worldwide, with 29.8 million undergoing Antiretroviral Therapy (ART). In 2022, there were 1.3 million new HIV infections, and 630,000 individuals succumbed to AIDS-related illnesses. Thanks to collaborative efforts globally, the spread of HIV has slowed, and the annual death toll continues to decline[1,2]. Beyond the typical clinical symptoms of AIDS, patients often grapple with multidimensional challenges in their daily lives, including poor treatment adherence, exacerbated family conflicts, economic burdens due to high treatment costs, and mental health issues[3,4]. Research indicates that reinforcing self-management behaviors and enhancing disease awareness can lead to

better treatment adherence, alleviate the burden of disease symptoms, and enable individuals to coexist more effectively with HIV[5,6]. Therefore, strengthening PLWH 's self-management behaviors and disease awareness becomes a crucial aspect of improving the quality of life for patients and reducing negative experiences associated with HIV.

Modern information technology rapidly and cost-effectively reduces the barriers to accessing disease-related information. It has been proven that leveraging modern technological means aids in expanding the dissemination of HIV prevention and treatment interventions[7]. Modern information technology, or new digital media, refers to user-controlled, shareable, and interactive media[8]. Widely used new digital media, such as text messages, websites, apps, and social media platforms, have significantly improved information sharing and communication. These technologies enable rapid, inexpensive, highly replicable, and widely covered interventions. Digital media achieve greater anonymity, repeatability, time flexibility, and customer sensitivity, meeting diverse learning needs[9]. They break down restrictions related to time and geography, maximizing the impact of information dissemination.

This study will comprehensively review evidence from the last five years regarding the use of modern information technology in enhancing HIV disease awareness and self-management. It underscores the enormous potential of contemporary technology in elevating self-management and disease awareness within the HIV community, guiding future research and practice.

2 Methods

This scoping review employs the latest framework proposed by the Joanna Briggs Institute (JBI), encompassing the following stages: (1) formulation of research questions; (2) identification of relevant studies; (3) selection of studies; (4) charting the data; (5) collating, summarizing, and reporting the results[10]. Reporting for this paper follows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews checklist (PRISMA-ScR), the preferred reporting item for scoping reviews[11].jk

2.1 Formulating Research Questions

This study aims to summarize existing evidence regarding enhancing HIV disease awareness and self-management behaviors among PLWH through modern information technology.

2.2 Identifying Relevant Studies

Articles meeting the following inclusion criteria will be considered for inclusion in this scoping review: (1) Intervention involving modern information technology or new digital media; (2) Research focusing on improving HIV disease awareness or self-management behaviors of PLWH;

(3) Intervention studies or studies evaluating intervention effects; (4) Articles published within the last five years. Exclusion criteria include: (1) Studies not reporting research outcomes; (2) Grey literature; (3) Articles inaccessible for full-text retrieval.

2.3 Study Selection

English-language literature will be retrieved from electronic databases, including PubMed, Web of Science, Cochrane Library, Embase, and CINAHL. The basic search terms include HIV, Telemedicine, and Cognitive training (see Supplementary Material 1 for specific search strings). Endnote software (https://endnote.com/) will integrate articles meeting the inclusion criteria and eliminate duplicate publications. After removing duplicates, the literature will undergo a title and abstract review, followed by a full-text review to determine inclusion or exclusion. We will randomly select 25 titles and abstracts to ensure consistency among reviewers. All reviewers will screen these based on predefined inclusion criteria. Formal literature screening will only commence when 75% consistency is reached[12]. Subsequently, Hao and Mei Lian will independently screen titles and abstracts using the criteria, and full-text readings will be conducted for the article's inclusion or exclusion. In cases of disagreement between the two reviewers, a third reviewer will intervene for discussion and make a consensus[12]. Excluded articles will be documented and reported, and the results and process of the search will be presented in a flowchart following the PRISMA-ScR guidelines[11].

2.4 Data Presentation

Following discussions and agreement on the variables to be extracted for the scoping review, Hao and Mei Lian collaboratively created data charts. In the process of chart creation, if any discrepancies arise, a third reviewer will be invited for discussion to determine the final content of the charts.

We categorize and extract the following information based on the content of the articles: 1) Basic information of the articles (authors, year, study design, sample size, study location); 2) Intervention methods used in the studies; 3) Conceptual frameworks or models applied in the studies.

2.5 Collating, Summarizing, and Reporting Results

We will report the results of the included literature by focusing on the following points: 1) The theoretical frameworks or models used in the included literature; 2) Intervention methods based on modern information technology adapted in the included literature.

3 Results

3.1 Study Selection

According to our inclusion criteria, the results of English database searches are as follows: 61 articles

were retrieved from Pubmed, 44 from Web of Science, 361 from Cochrane Library, 254 from Embase, and six from CINAHL. After removing duplicates, a total of 648 articles remained. After evaluating titles and abstracts, 101 English articles were retained, and after a thorough examination of the complete texts, 55 articles were finally included. The search results are presented as a PRISMA-ScR flowchart (Figure 1).

3.2 Characteristics of the Studies

Among the 55 articles finally included, the studies ranged from a minimum sample size of 21 participants to a maximum of 2125 participants. Of these, 33 studies were randomized controlled trials, 10 were feasibility studies, 5 were observational studies, 4 were evaluative qualitative studies, and 3 were mixed methods studies. Most of the studies were conducted in the United States (n=28), followed by Kenya (n=4). Other countries, including China (n=3), South Africa (n=3), Nigeria (n=3), Uganda (n=2), Thailand (n=2), and others. The general characteristics of the study are presented in Supplementary Material 2.

Figure 1: Flow diagram.

3.3 Related Theoretical
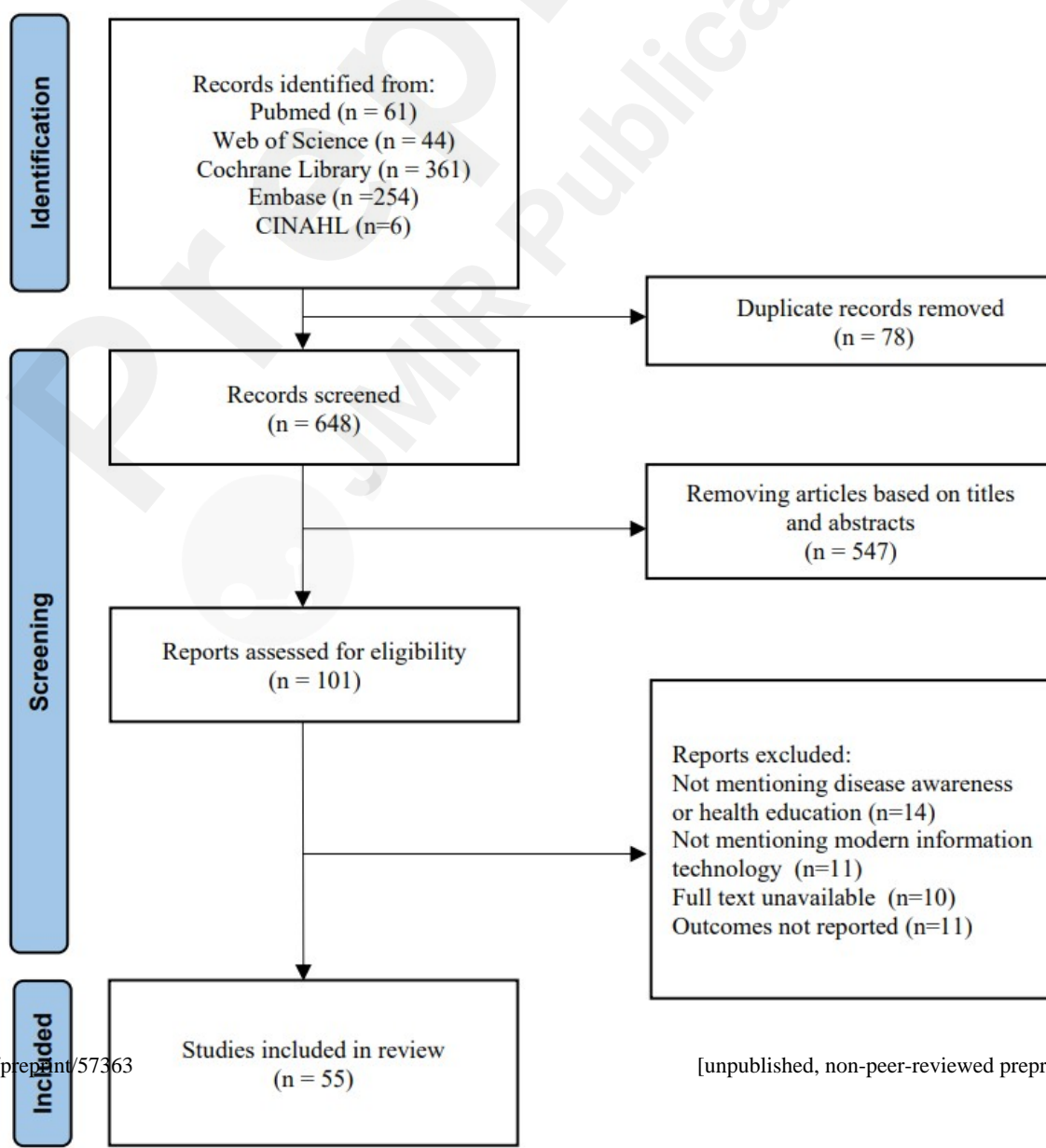
Frameworks
3.3.1 Information-Motivation-Behavioral Skills Theory (IMB Theory)

IMB theory is the most commonly used theoretical framework for designing interventions, with seven researchers basing their interventions on this theory. The IMB theory posits that information, motivation, and behavioral skills interact, with individuals acquiring information to understand the necessity of healthy behavior[13]. This, in turn, motivates them to desire and guide the adoption of such behavior. Ultimately, behavioral skills are employed to transform motivation into concrete actions.

Five studies[14-18] utilized mobile phones as a platform, operationalizing the Information-Motivation-Behavioral Skills (IMB) model to enhance HIV self-management knowledge and beliefs. They developed applications or tailored text messages aimed at improving HIV self-management behaviors and increasing HIV disease awareness among HIV patients. Additionally, two studies[19,20] facilitated changes in HIV awareness and self-management behaviors by stimulating motivation, providing relevant information, and enhancing behavioral skills among intervention participants. These changes were implemented through online websites and video conferences.

3.3.2 Social Cognitive Theory

Five studies based on the Social Cognitive Theory were used to develop their interventions. Social Cognitive Theory[21] emphasizes the importance of social learning, suggesting that individuals can acquire new knowledge and skills by observing others and adjusting and internalizing this learning through cognitive regulation and self-efficacy. In line with this theory, existing studies propose methods to enhance self-efficacy, including peer modeling and social persuasion, and build interventions based on these principles. Weitzman[22] and Côté[23] developed web-based interventions to improve self-management skills. Kalichman[24] and Tran[25] focused on individual differences among intervention recipients, providing personalized interventions based on the Social Cognitive Theory to enhance medication adherence and self-management skills. Kinuthia[26], utilizing the Social Cognitive Theory, crafted intervention messages, integrated treatment adherence with other priorities, and delivered them as text messages to intervention recipients.

3.3.3 Health Belief Model

Three researchers developed their interventions based on the Health Belief Model. Despite sharing the same name, the Health Belief Model discussed in this review encompasses studies that different scholars have proposed. Firstly, Tran[25] applied the Health Belief Model proposed by Becker[27] in his study. Throughout the research period and subsequent meetings, Tran measured perceived severity and self-efficacy for comparison and sent personalized messages as cues for action. The theory-

driven design helped in understanding the connections between patient behaviors and identifying clustered behaviors such as alcohol consumption and unemployment. Secondly, Kinuthia[26] applied the Health Belief Model modified by Janz and Becker[28]. Kinuthia utilized this model to compose messages providing care support to pregnant and postpartum women infected with HIV. Additionally, the Health Belief Model applied by Ditre and their team[29] was proposed by Champion[30]. Based on this model, the scholars provided computer-generated personalized feedback to modify smoking and opioid misuse behaviors in PLWH.

3.3.4 Theory of Planned Behavior

Two researchers used the Theory of Planned Behavior to construct their interventions. The Theory of Planned Behavior[31] posits that one can effectively predict whether an individual will adopt a specific behavior by measuring and analyzing behavioral intentions, attitudes, subjective norms, perceived behavioral control, and actual behavior. Ditre[29] integrated the Theory of Planned Behavior along with other theories to construct a comprehensive intervention, predicting and improving smoking and opioid misuse behaviors in HIV patients. Jiao[32] utilized this theory to design an intervention aimed at improving ART adherence among men who have sex with men.

3.3.5 Information Systems Research Framework (ISR)

Two researchers used the ISR as their theoretical foundation. The ISR [33] advocates for iterative cycles in the design and evaluation process to provide a systematic scientific design approach. Beauchemin[34] developed and evaluated the effectiveness of APP intervention for improving self-management behaviors in PLWH based on the ISR. Similarly, Schnall[35] used ISR to create a mobile application to enhance ART adherence among PLWH.

3.3.6 Other Theories

In addition to the five theories mentioned above, a few have been employed by researchers in intervention studies. Ezegbe[36], based on Rational Emotive Behavior Therapy Theory (REBT Theory)[37], utilized audio-visual interventions to enhance HIV disease awareness among high school students. Nestadt[38], based on Social Action Theory (SAT)[39], developed a cartoon-based program for comprehensive psychosocial responses and treatment adherence intervention for HIV-positive adolescents. Schnall[40], using Social Learning Theory[41], developed a mobile application to examine its effectiveness in reducing sexual risk behaviors among young men attracted to the same sex. Cordova[42] conducted a narrative intervention based on the Ecodevelopmental and Empowerment Framework[43,44], aiming to change risky drug use and behaviors among adolescents. Middleton[45] and Carroll[46], guided by the Capability, Opportunity, Motivation, and Behavior Model (COM-B Model)[47],

developed text messages to increase intervention recipients' knowledge of HIV prevention. Côté[23] implemented a web-based intervention guided by the McGill Nursing Model[48]. Sun[49], grounded in Cognitive Behavioral Theory[50], developed an application and tested its effectiveness in promoting HIV prevention among transgender women. Weitzman[22] designed web-based interventions based on The Modified AIDS Risk Reduction Model (M-ARRM)[51], examining their effectiveness for the target population. Chenneville[52], using the Cognitive Theory of Multimedia Learning[53] and Dual Coding Theory[54], designed modules to enhance health literacy in Young Men who have Sex with Men (YMSM) regarding HIV retention care. Cordoba[55], guided by the Information System Success (ISS)[56] framework, evaluated participants' experiences and satisfaction with a self-made application. In the psychological education segment of a comprehensive intervention, Ditre[29] primarily used the Transtheoretical Model[57] as guidance. Aladin[58], based on the Integrated, Design, Assess, and Share (IDEAS)[59] theoretical framework, combined behavioral theories with design thinking and developed a mobile application as an intervention. Tran[25], based on the Integrated Theory of Behavior Change[60], developed a smartphone application to promote treatment adherence and self-efficacy among PLWH.

3.4 Intervention Methods Based on Modern Information Technology
3.4.1 Smartphone Applications

Smartphones have become widely popular globally with their high portability and rich features. Within the scope of this review, it was found that interventions based on smartphone applications are the most favored among researchers. Among the included studies, 23 utilized smartphone applications as an intervention method.

This category's most popular intervention method involves providing self-management plans or tools to the intervention subjects through smartphone applications, facilitating improvements in self-management behaviors. This is commonly observed in efforts to enhance compliance with medical advice, improve awareness of HIV, and ameliorate HIV-related symptoms[14, 34, 46, 61–64]. Two studies integrated phone and text message modules to build applications to enhance treatment adherence [65, 66]. Communication-oriented mobile applications, such as WhatsApp, WeChat, and Line, were used to create group discussions for implementing interventions[16, 67, 68]. Lastly, one study utilized the entertainment features of smartphones to develop an iPhone platform game to enhance the subject's compliance[69].

Additionally, some studies have developed applications for targeted populations to implement interventions. For HIV testing behavior, sexual education, and treatment adherence among gay men, four studies have collectively developed three apps for interventions[40, 55, 70, 71]. Two studies have

developed apps targeting vulnerable adolescent groups, aiming to improve self-management behaviors and prevent disengagement from care[42, 58.] In addressing health, one study developed an application to promote HIV prevention to meet the needs of transgender women[49].

3.4.2 Short Message Service（SMS）

Similar to interventions based on smartphone applications, utilizing the SMS functionality of mobile phones for direct interventions has gained favor among many researchers. Sending text messages to improve treatment adherence is the simplest and most direct method. Three studies have systematically sent timed or instant messages to intervention subjects, covering medication reminders, peer education, and online group discussions, to enhance ART adherence among PLWH[15, 32, 72].

The included literature also takes into account specific populations. For instance, communication strategies in text message content are tailored based on local cultural backgrounds for implementing prevention programs targeting 18-22-year-olds [73]. A combination of regular educational sessions and weekly health education text messages are organized to enhance HIV prevention behaviors and reduce risky behaviors in African American youth [74]. Regularly sending text messages for infant health education and promoting treatment adherence is implemented to provide care support for pregnant women and postpartum women living with HIV[26]. Planned SMS campaigns are carried out to raise HIV awareness among construction workers and encourage HIV testing[45].

3.4.3 Online and digital health education platforms

In internet-based interventions, most researchers choose to implement intervention programs by constructing websites. Building websites allows for the rapid dissemination of health education. Three studies utilized websites to create knowledge repositories for providing safety education. These websites comprehensively covered various topics, offering comprehensive and personalized health education to intervention subjects through online interactions, sexual health information delivery, and modularized intervention methods. This approach aimed to promote HIV prevention and increase awareness of sexual health[75–77]. Using website platforms, two studies relied on teams with medical backgrounds to provide diverse learning methods. They combined social support and emphasized personalized interactive services to facilitate the effective transmission of health information[22,78.]Interventions providing counseling services through remote video conferences typically utilize internet platforms to offer online video meetings to intervention subjects. This involves hosting regular video conferences and encouraging participant involvement through email, phone calls, and other means to enhance medical adherence and disease awareness among PLWH[20,]

[23, 79].

Furthermore, there are different forms of internet-based intervention programs. For example, it is creating private discussion groups on social media platforms to enhance HIV-related knowledge and treatment literacy, thereby promoting the continuity of HIV care[80]. Constructing internet-based electronic health education programs to strengthen health literacy among PLWH in HIV care through interactive content[52] and developing intervention programs using publicly available internet resources[19], and constructing HIV prevention interventions through video blogs that feature storytelling and interactive gaming[81].

Finally, a minority of studies have implemented interventions by constructing digital health education platforms. These studies employ computer-based personalized approaches, providing tailored health information and training videos through digital platforms to enhance treatment adherence and HIV-related knowledge and improve healthcare behaviors among intervention subjects[29,82,83].

3.4.4 Performing and Multimedia Interventions

The commonality of audio and video interventions is the use of virtualized digital content to create various intervention plans tailored to different populations and needs. These interventions are delivered in audio and video, emphasizing the dissemination of disease-related knowledge and fostering connections between individuals and communities. Ultimately, they aim to enhance the understanding of intervention subjects, boost self-efficacy among PLWH, and improve preventive behaviors.

For the adolescent population, considering their capacity for acceptance and understanding, researchers have developed a series of cartoon tutorials to strengthen parent-child communication, problem-solving, and negotiation skills. Participants pair with caregivers to attend the courses, enhancing internal family connections through learning and discussions[38]. For children, researchers have created captivating characters and carefully curated story content. With the assistance of qualified therapists, they deliver digital interventions to children using audio and video formats, achieving intervention goals while providing entertainment[84].

For specific populations, such as the gay and bisexual community, researchers have developed popular web series or short videos with a theme focused on gay, bisexual, and other men who have sex with men (GBMSM). These videos capture the curiosity of the target audience while promoting HIV and other sexually transmitted infection testing behaviors[85,86]. Finally, some studies combine

various communication channels, such as interactive games, street interviews, and therapist-guided group psychological discussions, to enhance the effectiveness of performing multimedia interventions, providing participants with knowledge about preventing HIV/AIDS and sexually transmitted infections[17,18,36].

4 Discussion

Through the scope review in this article, it is evident that a large number of studies are based on one or more theoretical frameworks for intervention construction. Currently, the application of modern information technology primarily involves intervention construction, development of smartphone apps, feasibility studies, and analysis to intervene with the relevant population, yielding generally positive feedback. Thanks to the rapid advancement of modern technology, there has been an increasing emergence of modern information technologies, which better improve or innovate medical intervention measures and hold significant potential for the future development of medical technology. Modern information technology (or new media technology) plays a crucial role in HIV/ AIDS research. This article explores the potential of information technology in enhancing HIV/AIDS awareness from multiple dimensions and systematically summarizes the theoretical frameworks and specific implementation methods of relevant studies. Through this research, we not only summarize the application cognition of modern information technology in health intervention but also provide new ideas and methods to improve HIV/AIDS awareness among the elderly, which is meaningful for enhancing HIV/AIDS awareness and inspiring future related research.

As early as 2000, scholars reported that theory-driven intervention measures have been proven to be more effective than non-theory-driven ones[87]. However, among the 60 studies included in this article, only 42% (n=25) of the intervention schemes were based on theory-driven approaches, with the remaining studies either not reporting the research framework used or not employing any theoretical framework. Among these 25 studies, the most commonly used theory was the Information-Motivation-Behavior (IMB) theory[13]. In health education interventions based on the IMB theory, accurate information about HIV/AIDS is first provided, emphasizing personalized interventions to increase individual awareness levels. Subsequently, by highlighting the serious threat of HIV/AIDS to individual health, individuals' positive motivations for prevention and treatment are stimulated, encouraging proactive behavior change. Finally, by providing practical behavioral skills training, individuals are helped to overcome barriers to implementing healthy behaviors, such as correctly using condoms and undergoing regular HIV testing, to achieve the intervention's objectives. The

widespread application of the IMB theory in HIV/AIDS health education reflects its effectiveness in integrating information, motivation, and behavioral skills, providing theoretical support for designing targeted and effective health interventions. Additionally, some studies have integrated multiple theoretical frameworks as comprehensively as possible to construct intervention schemes[22,23,26,52,63]. Therefore, we encourage future research to utilize theory-driven approaches as much as possible to enhance the quality of interventions and improve intervention outcomes.

We found that the majority of studies utilized mobile phones as a platform for cognitive interventions, demonstrating diversity and innovation in HIV/AIDS cognitive interventions. From the results of this study, it is evident that the intelligent applications developed by various studies transcend the traditional role of communication tools in cognitive interventions. Leveraging the high portability and ubiquity of smartphones, these interventions offer convenient and personalized ways to reach the target population. By harnessing the mature functionalities of smartphones, such as integrating phone calls, text messaging modules, and chat applications, these interventions provide communication pathways and methods rooted in traditional communication for intervention purposes[16,65–68]. The customization of applications tailored to specific populations, such as men who have sex with men (MSM)[40,55,70,71], vulnerable adolescents[58], and transgender women[49], highlights the flexibility and adaptability of smartphone applications in meeting the diverse health needs of different groups.

Despite the promising future and wide-ranging applicability of smartphone application interventions, as evident from the studies included in this scope review, only one study[65] mentions the relevance to the elderly population. Elderly individuals may face unique challenges and needs related to HIV/AIDS, such as unfamiliarity or discomfort with digital technology and preferences for accessing health information through specific channels. Therefore, it may be crucial to develop specialized smartphone application interventions for the elderly population. Such interventions can be tailored to the specific needs and preferences of older adults, offering user-friendly interface designs and content that align with their particular contexts and lifestyles.

Through this review, it's evident that a significant portion of studies prefer using text messaging for interventions, with only one study[15] emphasizing the importance of protecting user privacy. Text messaging interventions involve the collection, storage, and use of users' personal information. Therefore, safeguarding user privacy is crucial, especially when sensitive health information is involved. The lack of adequate protection for user privacy may lead to distrust and resistance among

users, impacting their acceptance and engagement with the intervention.

While most studies reported positive outcomes, there are still some noteworthy findings to consider. Firstly, researchers found that the effectiveness of interventions targeting HIV-infected pregnant and postpartum women was only evident in the postpartum contraception group, with no significant differences observed in other outcome variables compared to the control and routine groups[26]. Similarly, a study focusing on ART adherence among HIV-positive youth reported that there were no significant changes in knowledge and behavior among participants after completing the intervention, although there was an improvement in their willingness to adhere[75]. Additionally, another study found that while their intervention effectively improved risky behaviors among the target population, the behavior changes did not persist beyond 12 months[76]. Similarly, several other studies reported almost consistent results, indicating that over time, initially effective interventions gradually lost their effectiveness[40,52,58]. This may be attributed to several reasons: (1) The initial intervention may have succeeded due to novelty and excitement, but participants may experience cognitive fatigue over time, leading to a weakening of the intervention's effects. (2) Participants may face social pressure or discrimination after the intervention, which could weaken the long-term effects. (3) Over time, individuals may lack the motivation to adhere to the intervention or external support, leading to discontinuation of long-term intervention. (4) The study design itself may lack long-term or personalized intervention, failing to meet the needs of long-term intervention. To better understand and address this phenomenon, researchers are encouraged to consider aspects such as long-term intervention design and implementation, individual differences, cultural and social factors, and promote the effective implementation of interventions.

5 Limitations

This scope review has several limitations. Firstly, we excluded grey literature, such as conference abstracts and dissertations, from our inclusion and exclusion criteria, which may have restricted the literature hit during the search. Secondly, all the studies included in the review were in English, potentially overlooking high-quality articles written in other languages. Lastly, some studies utilizing modern information technologies may have used different keywords, which could have resulted in the omission of relevant research within the scope of this review.

6 Conclusions

Through this scoping review, ample evidence has been provided to suggest that theory-driven interventions can be feasibly constructed to improve HIV/AIDS cognition or self-management

behaviors among relevant populations. However, some studies still face similar issues, such as insufficient utilization of existing theories or conceptual frameworks in intervention development. This leads to studies failing to achieve their intended goals as originally designed, thereby slowing down the problem-solving process and potentially impacting the final outcomes. Therefore, we recommend that future intervention studies should be developed and implemented under the guidance of theory-driven approaches and conceptual frameworks. Additionally, future research needs to delve deeper into the mechanisms underlying the gradual weakening of intervention effects, especially in the design of personalized and adaptive intervention strategies, along with the implementation of strategies to enhance sustainability. This will enable technology to effectively leverage its advantages in improving disease outcomes and quality of life among relevant populations.

Author's Contributions

HH and MLX designed and produced this manuscript. ZY, MLX and HH contributed to the screening of literature and the creation of summary tables. APW contributed to the conception, design and critically revised the manuscript.

Conflict of Interest

None declared.

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Supplementary Files

Multimedia Appendixes

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