REVIEW

A Scoping Review of Digital-Based Intervention for Reducing Risk of Suicide Among Adults

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Abstract: Suicide is a serious public health problem, especially among adults. Risk factors for suicide include the presence of mental health disorders, history of previous suicide attempts; substance or alcohol use and lack of social support. The impact of suicide risk includes psychological loss, as well as the trauma and emotional stress that can be felt by the families and communities left behind. Digital interventions have emerged as a promising alternative for suicide risk prevention. Previous research has focused on the findings of various designs, which did not provide clear intervention information to inform the implementation of the intervention. This study aims to describe a digital intervention to reduce the risk of suicidal behavior in adults. The design used in this study was a scoping review. The authors conducted a literature search from the Scopus, PubMed, and CINAHL databases. Inclusion criteria in this study were articles discussing digital interventions aimed at preventing suicide risk in adult populations, English language, full-text, RCT or quasi-experiment design, and publication period of the last 10 years (2014–2024). The major keywords used in the article search were suicide prevention, digital intervention, and adults. Data extraction used manual table and data analysis used descriptive qualitative with a content approach. The results showed that there were 9 articles that discussed digital-based interventions to reduce suicide risk in adults. The various types of digital interventions used were smartphone apps, online learning modules, and game-based interventions. These interventions offer significant potential in reducing the risk of suicidal behavior in adults. Digital interventions have an important role in reducing the risk of suicidal behavior in adults by considering aspects of suitability to individual needs and understanding digital literacy. Then, the development of mental health services and public health policies presented needs to be done with collaboration between stakeholders in suicide prevention efforts.

Keywords: adults, digital intervention, risk of suicide, suicide prevention

Introduction

Suicide is a global phenomenon and is one of the leading causes of death in the world. An estimated one million people commit suicide each year or about one person every 40 seconds.[1] The incidence of suicide occurs mostly in developing countries, which is around 60–78% occurs in Asia.[2] Research conducted in 17 Asian countries found that South Korea has the highest suicide rate, while Muslim-majority countries such as Iraq and Iran have the lowest suicide prevalence and almost 70% of suicides are committed by hanging.[3]

Factors leading to suicidal intent in adults include a complex interplay of psychological, social, economic, and environmental variables. Psychological factors such as depressive disorders, anxiety, and feelings of hopelessness, along with social factors such as loss of social support, family pressure, and stigmatization of mental health disorders, can increase the risk of suicide.[4] In addition, economic factors such as unemployment and financial hardship, along with environmental factors such as access to lethal means of suicide and an unsupportive environment, also contribute to the formation of suicidal intent in adults.[5] Individuals who have suicidal intent often experience severe mental distress, including feelings of hopelessness, profound anxiety, and severe depression.[6] This can lead to decreased cognitive functioning, emotional disturbances, and a decrease in overall quality of life.

Access and acceptability constraints to conventional interventions in suicide prevention highlight the need to explore alternatives that are more innovative and widely accessible to individuals in need. In this context, digital interventions offer the potential to overcome access barriers and increase engagement and effectiveness in suicide prevention.[7] However, there remains a need for a better understanding of the effectiveness, scope, and implications of using digital interventions in the context of adult suicide prevention.[8]

Research on digital interventions to prevent suicide risk in adults has significant implications in improving the mental health and well-being of individuals and society as a whole.[9] By identifying effective interventions and understanding the factors that influence the acceptance and use of these interventions, this research can pave the way for the development of more effective suicide prevention programs that are accessible to all individuals in need.[10] Therefore, this study is not only relevant for mental health practitioners and researchers, but also has direct implications in the formation of sustainable public health policies.[11]

Technological advances, especially in information systems, are growing rapidly, especially since smartphones were invented. Apart from sending messages and making calls, smartphones can also be used to giving interventions to patients by health workers.[12] The World Health Organization (WHO) recommends mobile phones as one of the options for providing therapy and support to those at risk of suicide.[13] Smartphone technology is considered better especially for those who are at risk of suicide but do not have access to health services, do not have time, cost issues, or shame due to bad stigma about suicide.[14] In addition, suicide prevention interventions using SMS and Apps could be good to use especially in developing countries where support for suicidal people is limited.

Adults are active smartphone users and are also familiar with texting and smartphone apps. In addition, the use of smartphone apps can be an alternative for people who are at risk of suicide and prefer to help themselves or do not have access to mental health.[15] Several smartphone technology-based suicide prevention tools have been developed and practiced.[14] Some of them are SIAM (suicide intervention assisted by messages) which is one example of using SMS technology on smartphones to prevent suicide.[16] In addition, there are also My Plan, Ibobly and Back up applications that contain ways to prevent suicide.[17]

Efforts to digitally prevent suicide risks among adults can be facilitated through smartphone apps, online learning modules, and game-based interventions. Smartphone apps offer direct and anonymous access to crisis resources such as hotlines and online intervention guides.[7] Online learning modules provide structured content that enables participants to enhance mental health literacy and be responsive to suicidal tendencies.[18] Additionally, game-based interventions integrate therapeutic elements into gameplay and simulations to promote mental health improvement. These approaches collectively aim to enhance accessibility and effectiveness in suicide prevention efforts among adults.[19]

Research on suicide prevention has shown that traditional prevention methods and digital interventions yield varying outcomes in preventing suicide.[17] Traditional prevention methods such as individual and group therapies have been effective in reducing suicide risk among adults.[10] However, conflicting research suggests that individual therapy may not be as effective in lowering suicide rates. Studies indicate that 75% of participants in individual therapy and 60% in group therapy did not die by suicide within two years after the intervention.[20] Conversely, other study show that only 30% of users of suicide prevention apps did not die by suicide during the same period.[21] This discrepancy may be attributed to factors such as direct interaction between therapists and participants, and therapists' ability to tailor intervention strategies to individual needs.[4] Nevertheless, digital interventions play a crucial role in enhancing accessibility and efficiency in suicide prevention, particularly for communities facing barriers to traditional healthcare services.

The research gap in this study is the lack of a comprehensive understanding of the relative effectiveness of different types of digital interventions in reducing the risk of suicidal behavior in adults, as well as the lack of emphasis on factors that influence the appropriateness and acceptability of such interventions by at-risk individuals. Previous studies have tended to focus on the effectiveness of each type of digital intervention in isolation without providing a holistic picture of the picture of digital interventions for suicide risk reduction.[22–24] Therefore, this scoping review study has a high urgency to fill this knowledge gap by presenting a more comprehensive understanding of digital interventions for suicide prevention. The aim of this scoping review is to describe the various digital-based interventions that can be implemented to reduce the risk of suicide in adults.

Materials and Methods

Design

This study used a scoping review design. A scoping review allows researchers to comprehensively map and identify gaps in the existing literature, and to describe various types of research findings on digital-based interventions that can be implemented to reduce the risk of suicide in adults. This approach provides a broad overview of the current state of knowledge and highlights areas where further research is needed. The scoping review approach was based on the method proposed by Arksey and O'Malley.[25] This approach involves five main stages: (1) formulating the research question, (2) searching for relevant studies, (3) selecting studies, (4) extracting data, and (5) presenting results. These stages provided a comprehensive overview of the existing literature coverage on digital interventions to prevent suicide risk in adults. PRISMA Flow Diagram was used in this study to select articles based on initial research on digital-based interventions to reduce suicide risk in adults (Figure 1).[26]
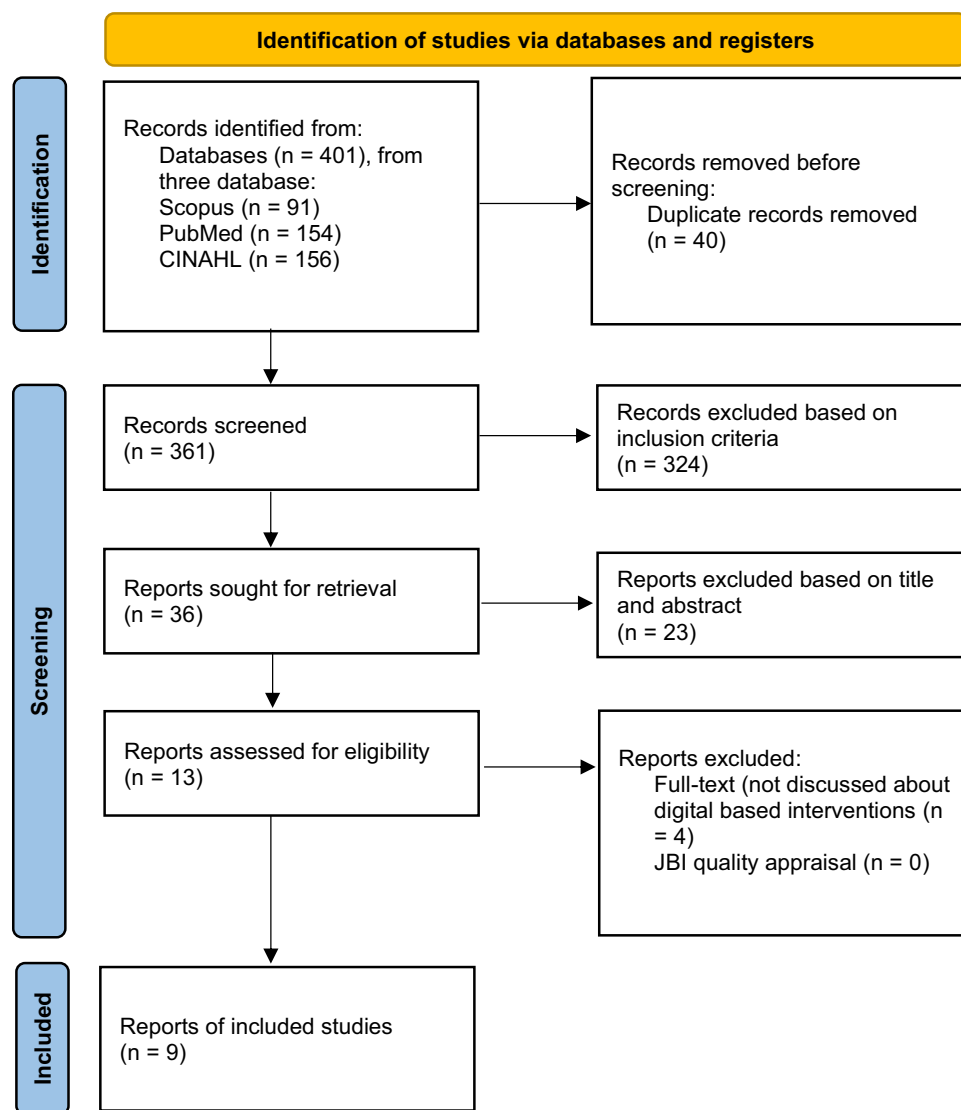

Figure 1 PRISMA Flow Diagram.
Note: Adapted from Page MJ. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ [Internet]. 2021; Available from: https://doi.org/10.1136/bmj.n71.[27]

Search Strategy and Eligibility Criteria

The databases used for article searches were Scopus, PubMed, and CINAHL. The use of these databases in this scoping review is based on their respective strengths in providing relevant and high-quality scientific literature. These three databases offer comprehensive research findings from recent studies related to digital interventions and mental health, thereby allowing for a thorough analysis of efforts to reduce suicide risk in adults. Major keywords used included "digital intervention", "suicide prevention", "risk of suicide", and "adults", with the use of boolean operators and the use of Mesh terms to improve search precision. The use of keywords was adjusted based on the search method in each database. The searching strategy used are:

Scopus: ("digital intervention" OR "digital therapy" OR "digital tool" OR "digital technology") AND ("suicide prevention" OR "suicide intervention" OR "suicide risk") AND ("adults" OR "adult population")

PubMed: ("digital intervention"[tw] OR "digital therapy"[tw] OR "digital tool"[tw] OR "digital technology"[tw]) AND ("suicide"[MeSH Terms] OR 'suicide prevention'[tw] OR "suicide intervention"[tw] OR "suicide risk"[tw]) AND ("adult"[MeSH Terms] OR 'adult'[tw] OR "adult population"[tw])

CINAHL: ("digital intervention" OR "digital therapy" OR "digital tool" OR "digital technology") AND ("suicide prevention" OR "suicide intervention" OR "suicide risk") AND ("adults" OR "adult population")

Inclusion and Exclusion Criteria

The authors used the PCC framework (Population, Concept, Context) in this study to determine the research questions:

Population: adults

Concept: digital interventions

Context: risk of suicide, suicide prevention

The research question is "How do digital interventions prevent suicide risk in adults?". The inclusion criteria comprised studies that described digital interventions targeting the prevention of suicide risk in adult populations, published in English to ensure international accessibility, with full-text availability, and utilizing either RCT or quasi-experimental designs to detail the interventions. The publication timeframe was restricted to the last 10 years (2014–2024) to acquire recent articles on digital-based interventions and to encompass notable advancements in digital technology during this period. Exclusion criteria included irrelevant studies, such as studies on pediatric or adolescent populations, as well as studies that were not available in English.

Data Extraction

The authors used a manual table to perform data extraction. The manual table aims to make it easier to compare research results from the articles reviewed. Manual data extraction was chosen to ensure precision and accuracy in collecting and analyzing information from various studies. This approach allows researchers to systematically record and evaluate crucial data, such as authors, objectives, instruments, results, and samples, while facilitating the identification of patterns and themes relevant to the research topic. The manual table contains authors, study objectives, intervention methods, results, and samples used. The data extraction process was conducted by two authors independently and divergence of opinion was resolved through discussion and consensus. If there was a divergence of opinion between authors during data extraction, the two authors had a discussion and consensus to discuss the data extraction. If there was still no agreement, a third authors was invited to conduct the data extraction.

Quality Appraisal

Quality appraisal is the process of evaluating or assessing the quality of a paper or research to determine how good or how valid the information presented is. The purpose of quality appraisal is to assess the reliability, relevance and usefulness of information or evidence in a particular context. The quality appraisal of the study was conducted using the Joanna Briggs Institute instrument by two authors who are experts in their fields. Differences of opinion between the two authors were resolved through in-depth discussion and consensus. The Joanna Briggs Institute (JBI) is an international organization that focuses on research and development of evidence-based clinical practice. They promote the use of

scientific evidence in health decision-making by providing clinical practice guidelines, research tools, and systematic approaches to evidence quality assessment. There are 13 statements for JBI instrument with RCT design and 9 statements for quasi experiment design.

Data Analysis

Data analysis was conducted descriptively qualitatively with a content analysis approach to identify and describe the various themes that emerged from the research results relevant to digital interventions to prevent suicide risk in adults. Data analysis included what interventions were conducted in each article. Two authors conducted the data analysis and classified the intervention methods according to similar interventions. If there were differences of opinion during data analysis, the two authors conducted discussion and deliberation. If there was still no agreement, a third authors was invited to analyze the data and conduct the data analysis process.

Results

The results of initial research from three databases namely PubMed, CINAHL, and Scopus, the authors found 401 articles. After that, the authors eliminated based on duplication of articles, there were 40 duplication articles. Then, the authors eliminated based on the inclusion criteria, there were 324 records that were not taken. Then, the authors eliminated records based on the title and abstract, there were 13 articles that were in accordance with the research objectives. Then, the authors eliminated after reading the full-text, there were 9 articles that discussed digital-based interventions to reduce the risk of suicide in adulthood. The 13 articles were assessed by JBI quality appraisal, all articles received a JBI score above 75% (Table 1).

Based on the country of origin of the 9 articles, 3 articles from the USA, 1 article from the Netherlands, 2 articles from Australia, 1 article from Denmark, 1 article from Spain, and 1 article from Argentina. The authors found that the sample range in the 9 articles was 21–455 adults older than 18 years. All articles in this review used an RCT design. All digital-based interventions in this review showed a significant effect in reducing suicide risk in adults (p value <0.05) (Table 2).

The results of the scoping review of 9 articles showed a variety of digital intervention approaches to prevent suicide risk in adults. Some interventions involve meeting with a counselor for instruction on the use of smartphone apps that are tailored to individual needs and conducted independently outside the clinic. Meanwhile, there are also app interventions that are designed as short games, accessed through an internet connection, and offer points for quick and accurate performance. The intervention modules include stress management, emotion regulation, identification of suicidal thoughts, and relapse prevention. In addition, some interventions include psychoeducation, safety planning, and positive acceptance through an emphasis on reasons to live and positive events in daily life. Overall, these digital interventions offer a variety of strategies to help individuals overcome suicidal thoughts and manage mental crises.

Table 1 JBI Critical Appraisal Tool

Authors, Published Year	JBI Critical Appraisal Tool	Study Design
(Bush et al, 2017)[27]	92,3% (12/13)	RCT
(Franklin et al, 2016)[28]	100% (13/13)	RCT
(Van Spijker et al, 2014)[29]	84,6% (11/13)	RCT
(Guille et al, 2015)[19]	84,6% (11/13)	RCT
(Torok et al, 2022)[30]	88,9% (8/9)	RCT
(O'Toole et al, 2019)[31]	84,6% (11/13)	RCT
(Porras-Segovia et al, 2022)[32]	92,3% (12/13)	RCT
(Rodante et al, 2022)[33]	92,3% (12/13)	RCT
(Tighe et al, 2017)[34]	84,6% (11/13)	RCT

Table 2 Extraction Data

No	Authors and Years	Outcomes	Country	Samples	Design	Interventions and Questionnaires	Results
1.	(Bush et al, 2017)[27]	To evaluate the impact of Virtual Hope Box (VHB), a smartphone application to reduce suicidal ideation, and reasons for living among patients at high risk for suicide and self-harm.	USA	118 patients (Mage=46.50 +13.75)	RCT	A Virtual Hope Box based on modules and games Perceived Stress Scale, and Columbia-Suicide Severity Rating Scale	VHB users reported that there was a significant reduction in suicidal ideation in respondents (p<0.05).
2.	(Franklin et al, 2016)[28]	To determine the impact of A Brief Mobile App in reducing the risk of suicide	USA	114 individuals young adults (M= 23.02 years old and 80.70% female)	RCT	A Brief Mobile App based on modules Index of Dysregulated Behaviors (IDB), Self-Injurious Thoughts and Behaviors Interview (SITBI)	The results showed that there were the largest and most consistent reductions in self-cutting episodes (32%–40%), suicide plans (21%–59%), and suicidal behavior (33%–77%). The results of the study showed that there was a significant influence in reducing suicidal behavior in respondents (p value <0.05)
3.	(Van Spijker et al, 2014)[29]	To test the effectiveness of self-directed online self-help for reducing suicidal thoughts.	Netherlands	236 adults Mage=40.46, SD=14.07 (65.5% female)	RCT	Online Self-Help based on intervention module the Beck Scale for Suicide Ideation (BSS)	The intervention group showed a significant effect in reducing suicidal thoughts.
4.	(Guille et al, 2015)[19]	To assess the effectiveness of a web-based cognitive behavioral therapy (wCBT) program for the prevention of suicidal ideation.	USA	199 adults with Mage=24.9 and SD=8.7 (female 51%)	RCT	Web-Based Cognitive Behavioral Therapy Intervention The Patient Health Questionnaire–9	The results showed that the intervention could reduce the risk of suicide in respondents (p = 0.03).
5.	(Torok et al, 2022)[30]	To assess a therapeutic smartphone application ("LifeBuoy") in reducing the severity of suicidal ideation	Australia	455 young adults from Australia experienced recent suicidal ideation and aged 18 to 25 years	RCT	therapeutic smartphone application based on module the Suicidal Ideation Attributes Scale (SIDAS)	The results showed that the intervention could significantly reduce suicidal ideation scores in favor of LifeBuoy at T1 (p < 0.001, d = 0.45) and T2 (p = 0.007, d = 0.34).
6.	(O'Toole et al, 2019)[31]	To evaluate the impact of App-Assisted Treatment on the risk of suicide and depression.	Denmark	214 participants (M = 28.7, SD = 9.5) (65% women)	RCT	App-Assisted Treatment based on psychoeducation and smart application the Suicide Status Form II	The results of the study show that there is a significant influence in reducing suicidal behavior in adolescents (p value=0.05)
7.	(Porras-Segovia et al, 2022)[32]	To assess the MEmind to reduce the risk of suicide in patients at high risk for suicide	Spain	393 patients aged 18 years or older Mage= 41.9 and SD=14.3 (67% female)	RCT	the MEmind based on smart application the Columbia Suicide Severity Rating Scale	The results of the study showed that there was a significant effect in reducing the risk of suicide after being given a smartphone-based intervention (p value=0.05)

(*Continued*)

Table 2 (Continued).

No	Authors and Years	Outcomes	Country	Samples	Design	Interventions and Questionnaires	Results
8.	(Rodante et al, 2022)[33]	To evaluate a mobile health application, CALMA, to reduce non-suicidal and suicidal self-injurious behavior.	Argentina	21 participants >18 years old (Mage=31.82, SD=6.94)	RCT	CALMA, a Mobile Health Application based on games the Self-injurious thoughts and behaviors interview (SITBI)	The results of this study indicate that this intervention is effective in reducing non-suicidal and suicidal self-injurious behavior (p value <0.05)
9.	(Tighe et al, 2017)[34]	To evaluate the effectiveness of a self-help mobile application (ibobbly) on suicidal ideation	Australia	61 participants aged 18–35 years (Mage= 24.97, SD=6.28)	RCT	applications (ibobbly) based on modules and games the Depressive Symptom Inventory — Suicidality Subscale (DSI-SS)	The results of the intervention showed that there was a significant effect in reducing suicidal ideation in respondents (p=0.0195).

Several studies highlighted the use of smartphone apps tailored to individual needs, which allow patients to access help independently outside the clinic environment. This approach involves initial instruction from a counselor, followed by monitoring and content adjustment by a clinician, allowing patients to manage their stress and emotion regulation more effectively. In addition, some studies noted the use of apps designed as short games, challenging users to earn points based on their performance in completing prescribed exercises. Other approaches include the use of smartphone sensors to track physical activity and sleep, providing feedback to users on their activity patterns. Some interventions also emphasize psychoeducation, safety planning, and highlighting reasons to live and positive events in daily life as strategies to reduce suicide risk.

Use of Smartphone Apps

One type of intervention that stands out is the use of smartphone apps tailored to individual needs. These interventions involve an initial interaction with a counselor to provide instructions for using the app, followed by supervision and customization of the content by a clinician to ensure relevance and effectiveness in managing stress and emotion regulation.[19,31] Such apps offer accessibility and flexibility for individuals to get help whenever needed, and allow for monitoring and interventions that can be personalized according to the patient's condition.[30,32]

Use of Apps with Games

Another type of intervention found was apps designed as short games, challenging users to earn points based on their performance in completing prescribed exercises. This approach provides an innovative and engaging alternative to teaching emotion regulation and stress management skills, which can increase user engagement in the recovery process.[33] In this app, participants will be given instructions to perform daily activities.[34]

Use of Online Module-Based Apps

Another digital intervention is online learning modules that provide psychoeducation and practical exercises in managing suicidal thinking. These modules often provide theoretical information on suicidal thinking, emotional regulation techniques, and relapse prevention, allowing individuals to learn skills that they can apply in their daily lives.[27] In addition, some studies emphasize the importance of safety planning and self-acceptance in managing mental crises.[28] Such interventions involve collaboration between the patient and therapist to develop a personalized action plan, as well as the use of self-acceptance and motivational techniques in overcoming suicidal thoughts.[29]

Discussion

The results of the scoping review showed that digital-based interventions can significantly reduce the risk of suicidal behavior in adults, with a p value <0.05. Studies supporting the effectiveness of the interventions highlighted that smartphone apps, online learning modules, and game-based interventions were consistently able to reduce the intensity of suicidal thoughts, improve emotion regulation skills, and provide effective psychosocial support for participants. These results are consistent with the findings of related literature suggesting that digital interventions have the potential to be effective tools in suicide prevention, especially due to the ease of access, flexibility, and use of technology familiar to many.[35] However, other studies have shown no significant difference between intervention and control groups in reducing the risk of suicidal behavior.[21,36] Factors such as the appropriateness of the intervention to individual needs, the level of user engagement, and the duration of the intervention affect the implementation of digital-based interventions.[37]

The results showed that there were three main types: smartphone apps, online learning modules, and game-based interventions. Smartphone apps were one of the most commonly used intervention types in the research, providing an easily accessible platform to deliver psychoeducation, skills training and counseling support to at-risk individuals.[20] Online learning modules, on the other hand, are a more structured approach that provides theoretical information on suicidal thinking, emotional regulation techniques, and relapse prevention through interactive learning platforms.[38] Meanwhile, game-based interventions explore a more innovative approach by packaging skills training and stress management strategies in an engaging and challenging format for users.[11,39]

Efforts to prevent suicide risk among adults through smartphone apps, online learning modules, and game-based interventions offer diverse yet complementary approaches. Smartphone apps provide direct support with features like crisis hotlines and mood tracking, ideal for individuals needing discreet assistance.[40] Online learning modules enhance mental health literacy with structured content on problem-solving strategies and support networks, empowering participants to proactively recognize and respond to suicidal tendencies.[7] Meanwhile, game-based interventions engage users in immersive experiences that promote emotional regulation and problem-solving skills within a supportive virtual environment.[28]

Smartphone apps offer advantages in accessibility and immediate responsiveness, allowing users to access help quickly and anonymously. Features such as rapid access to crisis hotlines and relaxation guides can reduce suicidal ideation and increase help-seeking when needed.[31] Online learning modules excel in improving mental health literacy and strategic understanding for participants, aiding in the proactive recognition and response to suicidal behavior. These interventions have proven effective in enhancing knowledge of mental health and stress coping abilities, directly impacting the reduction of suicidal behaviors.[18] Additionally, game-based interventions provide a more engaged and profound approach to developing emotional regulation and problem-solving skills, often within supportive simulation environments that foster positive social interactions. This enhances emotional regulation and problem-solving skills through interactive experiences, providing a supportive environment for individuals to develop adaptive strategies in facing mental health crises.[41]

Each type of intervention has its own advantages and disadvantages. Smartphone apps provide time and place flexibility for users to access help whenever needed, while online learning modules provide a more structured and in-depth approach to delivering educational material.[10] On the other hand, game-based interventions offer a more engaging and challenging learning experience, which can increase user engagement and motivation to involve themselves in the recovery process.[42] Nonetheless, each type of intervention requires careful evaluation to understand its effectiveness in reducing the risk of suicidal behavior and to identify factors that influence its acceptance and successful use in mental health contexts.[43]

The suitability of digital-based interventions to individual needs plays a critical role in their effectiveness. Some of the factors that influence the appropriateness of interventions include the level of digital and technological literacy, user preferences, clinical needs, and individualized challenges faced by each individual.[44,45] The use of smartphone apps may be more effective for individuals with high levels of digital literacy and a preference for quick and easy access to information and support.[46,47] On the other hand, individuals with a preference for more structured and in-depth learning may benefit more from online learning modules. In addition, clinical factors such as symptom severity and emotional support needs may also influence the appropriateness of the intervention.[48,49]

Several strategies are needed to improve user fidelity in running digital-based interventions. Personalizing digital-based interventions according to individual needs and preferences can increase user acceptance and participation.[50,51] This can be

done through customization of content, intuitive navigation, and providing appropriate feedback on user progress. Involving users in the development and evaluation of the intervention can increase their sense of ownership and involvement in the recovery process.[21,52] In addition, providing adequate technical and clinical support, including technical assistance and online counseling, can increase users' comfort level and confidence in using the intervention.[12]

Digital interventions for suicide prevention in adults include the use of smartphone applications, online learning modules, and game-based interventions. These interventions have proven effective in reducing suicidal behavior risk by providing easy access to stress management and emotional regulation tools, as well as increasing patient engagement in managing their mental health.[24] Nurses have a crucial role in this context, as they are on the front lines of providing support and education to patients regarding the use of digital interventions.[35] Nurses can assist patients in downloading and operating applications, teach them how to utilize online learning modules, and monitor patient progress and responses to these interventions.[53]

The ability of nurses to understand and implement digital interventions is essential for reducing suicide risk in adults. In today's technological era, digital interventions such as smartphone applications, online learning modules, and game-based programs have become effective tools for stress management and emotional regulation.[54] Nurses trained in the use of this technology can play a key role in ensuring that patients receive the maximum benefit from these interventions.[55] They can provide education on how to download and use the applications, monitor patient progress, and offer ongoing support. This capability not only enhances patient engagement but also enables nurses to more quickly identify warning signs and intervene early in the risk of suicide.[56]

The implications of the findings from this study are highly relevant in the context of clinical practice and mental health policy. The integration of digital-based interventions in mental health services can provide a valuable addition in adult suicide prevention.[31] The recommendations emerging from this study can shape the development of more inclusive and responsive mental health services, by integrating digital interventions as an integral part of available treatments. In addition, this study provides important recommendations for the development of more effective suicide prevention services and programs, by integrating digital-based interventions into existing suicide prevention programs, it can expand the reach of services, increase user engagement, and provide a more personalized and affordable approach for individuals who need help.

Limitations

The limitation of this study is that the wide range of literature found cannot affect the overall representation of available digital interventions. Although efforts were made to select a broad database, there may still be publications that were not included in this study. In addition, there is a risk of selection bias due to the study using only three major databases. Also, variations in sample size between the included studies may affect the accuracy and generalizability of the findings. The limitations of this study also lie in the heterogeneity of the reviewed articles. The populations are not homogeneous due to varying age ranges, and the questionnaires used in the 9 articles differ, making it difficult to draw interpretations from the scoping review results. Furthermore, due to the focus on English articles, this study may miss insights presented in other languages, which may limit the complete picture of digital interventions available globally.

Conclusion

The results of this scoping review show that there are 9 articles that discuss digital interventions in suicide prevention efforts in adults. The findings of this scoping review indicate that digital-based interventions, such as smartphone apps, online learning modules, and game-based interventions, have the potential to be effective in reducing the risk of suicidal behavior. Implementation of digital-based interventions requires several strategies, including tailoring to individual needs, digital literacy, and data privacy and security issues. The implementation of digital-based interventions also needs to ensure health workers who can ensure the sustainability of online counseling.

Based on these research findings, practitioners and policymakers are advised to integrate these digital tools into existing mental health services, ensuring broad accessibility across various population groups. It is important to promote evidence-based practices by continuously evaluating effectiveness and updating interventions based on user feedback and current research. Training programs should be provided to healthcare providers to effectively utilize these tools in treatment plans, emphasizing privacy protection and data security.

The implications of this study include the need for the integration of digital interventions in mental health services, the development of more inclusive suicide prevention programs, and increased user access and engagement with these services. Future research could focus on exploring factors that influence the suitability and acceptability of digital interventions by at-risk individuals, as well as identifying effective strategies to increase user engagement in the use of such interventions. In addition, to examine the effectiveness of digital-based interventions in reducing suicide risk in adults, further research could utilize systematic review and meta-analysis designs.

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Disclosure

The authors report no conflicts of interest in this work.

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