



Digital Health Intervention Towards Suicidal Ideation Among Adolescents

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ABSTRACT

Adolescents are a vulnerable group when it comes to mental health issues like suicidal ideation. Digital health, with its increasingly advanced and developing technology in industry 4.0 area, can be an alternative intervention to prevent or even reduce suicidal ideation among adolescents. This article is a literature review that aims to discuss the use of digital health interventions to reduce suicidal ideation among adolescents. The article search method uses a database from Pubmed, Google Scholar, Science Direct, and CrossRef. There were 12 articles that were reviewed. The findings indicated that a digital health intervention can reduce or eliminate suicidal ideation in adolescents. The internet, websites, mobile applications, and messenger are all examples of digital health. The influence of digital health interventions for suicidal ideation comes from benefits of digital health such as screening for suicidal ideation (both by health workers and independently), counseling, psychoeducation, and peer support. Digital health can be used effectively by millennials or teenagers who live in modern times.

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ABSTRAK

Remaja merupakan populasi yang rentan mengalami kesehatan mental seperti ide bunuh diri. Digital Health menjadi intervensi pilihan alternatif untuk mencegah bahkan mengurangi ide bunuh diri pada remaja terutama di area industri 4.0 dengan pemanfaatan teknologi yang sudah semakin maju dan berkembang. Penelitian ini merupakan literature review yang bertujuan untuk membahas intervensi digital health terhadap ide bunuh diri pada remaja. Metode pencarian artikel menggunakan database Pubmed, Google Scholar, Science Direct, dan CrossRef. Artikel yang direview berjumlah 12 artikel. Hasil literature review menunjukkan intervensi digital health dapat mengurangi atau mengatasi ide bunuh diri pada remaja. Jenis digital health yang digunakan internet/websites, mobile application, dan messenger. Adapun manfaat yang dapat diberikan digital health yaitu skrining ide bunuh (baik oleh tenaga kesehatan, dan skrining secara mandiri), konseling, psikoedukasi, dan dukungan teman sebaya. Intervensi Digital Health efektif dapat digunakan kepada kaum generasi milenial atau remaja yang hidup di zaman modern.

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INTRODUCTION

Suicidal behavior is a major cause of death and disaster worldwide. More than 700.000 people die by suicide every year; that's the equivalent of one person killing themselves every 40 seconds (WHO, 2021). According to the World Health Organization (WHO) in 2019 around 77% of suicidal behavior occurred in low-and-middle-income countries (WHO, 2021a). Globally, the prevalence of suicidal ideation showed the highest rate in African countries at around 21% (Biswas et al., 2020). Meanwhile in Indonesia, the death rate due to suicide is 0.71 per 100.000 population with an estimated number of deaths due to suicide in Indonesia of around 1.800 cases per year (KEMKES, 2021).

Suicidal behavior is most common in adults. The highest prevalence is at the age of over 85 years, amounting to 20.9 per 100.000 (Central for Disease Control and Prevention, 2022a). Meanwhile, adolescents aged 10-24 year showed a 14% suicide rate for this age group, or equivalently 10.5 suicides per 100.000 lower than other age groups. Although most suicides are committed by adults. However, suicide is the second leading cause of death for adolescents (Central for Disease Control and Prevention, 2022). That is why suicide is one of the indicators of the target of the Sustainable Development Goals (SDGs), whereby by 2030 the death rate due to suicide must be reduced by one-third (KEMKES, 2021).

According to the World Health Organization (2021), adolescents are a population that is vulnerable to suicide. This condition occurs because adolescence is a unique and formative period, where physical, emotional, and social changes can affect decision-making styles, coping strategies, family and peer relationships, and victimization that can affect adolescent health (Wasserman et al., 2021). In addition, other factors including poverty, abuse or violence, mental disorders, previous suicide attempts, personality characteristics, and psychosocial stressors can also make adolescents vulnerable to mental health problems (Bilsen, 2018; WHO, 2021c).

Suicidal behavior is often associated with the emergence of suicidal thought, often called suicidal ideation (Klonsky et al., 2016). Suicidal ideation is a broad term used to describe various contemplations, desires, and preoccupations with death and suicide (Harmer et al., 2022). Risk factors for hopelessness, depression, anxiety, loneliness, stress, and a lack of support from family or friends are factors that are often associated with the emergence of suicidal ideation among adolescents (Chan et al., 2016; Primananda & Keliat, 2019).

Prevention of suicide among adolescents needs to be done, considering that adolescents are an age group at high risk of committing suicide. Prevention can be done by preventing or overcoming suicidal ideation among adolescents. The use of health-based digital is currently a trend in the world of health, especially in the industry 4.0 area. The term "digital health" refers to advanced, innovative, and communicative medical technology (Awad et al., 2021). Digital health can provide benefits as a medium of communication, learning, and information for the community, especially dealing with health problems (Domhardt et al., 2021; Lehtimaki et al., 2021; Radovic et al., 2018; Reid Chassiakos et al., 2016; Toombs et al., 2021).

Digital use is increasing very rapidly, especially among adolescents compared to other ages (Haug et al., 2015). Several studies have also demonstrated the effectiveness of digital health in preventing suicide by overcoming suicidal ideation (Büscher et al., 2020; Forte et al., 2021; Perry et al., 2016). Seeing the great opportunities in digital health that are growing and the high use of digital equipment in adolescents

makes researchers want to investigate digital health interventions to prevent and reduce suicidal ideation in adolescents.

METHODS

The researcher used Preferred Reporting Items for Systematic Review and Meta-analysis (PRISMA) as a guide in compiling this review. In searching for articles, researchers used the Pubmed, Google Scholar, Science Direct, and CrossRef databases. The inclusion criteria in this review include articles that evaluate each intervention for digital health-based suicide ideation, adolescent respondents, ages 10-24 years (Sawyer et al., 2018), full text articles, and English. Exclusion criteria were articles evaluating any interventions for suicidal ideation using digital health that were targeted only at other relevant parties (for example, parents, doctors, providers, and health care workers or services), not interventions addressing suicide ideation, review-type articles, editors, comments, letters, and protocols.

The article search took place on December 12, 2022, and the screening stage took place from January 12, 2023 to January 20, 2023. The search strategy used the keywords Digital OR Technology OR computer OR web OR internet OR mobile OR smartphone OR SMS OR short messages service OR video OR message OR application OR cellphone OR Handphone OR Cellular OR ios OR android OR Cell OR telephone OR text OR mobile health OR mhealth OR m-health OR e-health OR ehealth OR telemedicine OR Telehealth OR telepsychiatric AND suicidal ideation OR Suicidal ideations. This search strategy is adapted for each database used. All relevant articles were filtered based on inclusion and exclusion criterias. The authors used Zotero bibliography software to assist in organizing article searches. Furthermore, articles according to the topic are reviewed one by one to determine the quality of the article using the Joanna Briggs Institute (JBI) critical appraisal tool.

RESULTS AND DISCUSSION

The article selection process follows PRISMA's guidelines can be seen in Figure 1. PRISMA's flow. In the search based on inclusion criteria, there were 152 relevant articles related to the topics reviewed. The article was then reviewed and at the end, 12 articles were reviewed by the authors. The list of article extraction can be seen in Table 1. Characteristics of the articles reviewed. In the research articles reviewed, five studies using Randomized Controlled Trials (RCT) (De Jaegere et al., 2019; Hetrick et al., 2017; Rodante et al., 2022; Spijker et al., 2012; Torok et al., 2022), three Pre Experimental Studies (Bailey et al., 2020; Robinson et al., 2016; Sindahl et al., 2019), two cross-sectional studies, one Mix Method Study (Han et al., 2019), and one Cohort study (Sueki et al., 2014).

Kinds of Digital Health Intervention

The results of the article review show that digital health interventions that are often used to overcome suicidal ideation vary the most, namely interventions via the internet/websites in eight articles (Bailey et al., 2020; De Jaegere et al., 2019; Han et al., 2019; Hetrick et al., 2017; Iorfino et al., 2017; Robinson et al., 2016; Spijker et al., 2012; Sueki et al., 2014), messenger two articles (Kohls et al., 2022;

Sindahl et al. al., 2019), and two mobile phone applications (Rodante et al., 2022; Torok et al., 2022).

Internet/websites.

The results of the review show that most studies use the internet or websites as a medium to provide treatment for adolescents which can be accessed on smartphones. Several articles also use names for the internet/website platforms used, including Reframe IT (Hetrick et al., 2017; Robinson et al., 2016), Affinity (Bailey et al., 2020), Think Life (De Jaegere et al., 2019), Synergy Online System (Iorfino et al., 2017), and W-OFG (Han et al., 2019).

Messengers.

Communication media, such as messengers or media for delivering messages, are also part of digital health, which is used to overcome suicidal ideation in adolescents. Two studies used the messaging feature, or Short Messaging Service (SMS), on smartphones as a means of intervention. Among them, some use messages from social media such as WhatsApp, which is called Krisenchat (Kohls et al., 2022).

Mobile application.

Mobile phone applications are one of the electronic media used in the review results. Two studies using applications on mobile phones have proven effective in overcoming suicidal

ideation in adolescents. The two applications are called CALMA and LifeBuoy (Rodante et al., 2022; Torok et al., 2022).

Influence of Digital Health Interventions

The results of a review of 12 articles show that digital health can effectively reduce or prevent the occurrence of suicidal ideation in adolescents. The various benefits of digital health include screening for suicidal ideation, psychoeducation, counseling, and peer support.

Suicide Idea Screening.

The results of the review show that digital health can be a means of screening for suicidal ideation in adolescents. A questionnaire to detect suicidal ideation is one of the important items or features included in electronic media. Several articles use various digital questionnaires to detect suicidal ideation such as the Beck Scale for Suicide Ideation (De Jaegere et al., 2019; Spijker et al., 2012; Sueki et al., 2014), Suicidal Ideation Questionnaire-Junior version (SIQ- JR) (Hetrick et al., 2017; Robinson et al., 2016), The Suicide Ideation Attributes Scale (SIDAS) (Iorfino et al., 2017). The health screening carried out is not only beneficial for researchers, and health workers, but also for the user himself who can independently detect suicidal ideation. Through this system, moderators can also easily find other factors that can influence someone to have suicidal ideation, such as users who experience harassment and intimidation (Bailey et al., 2020).

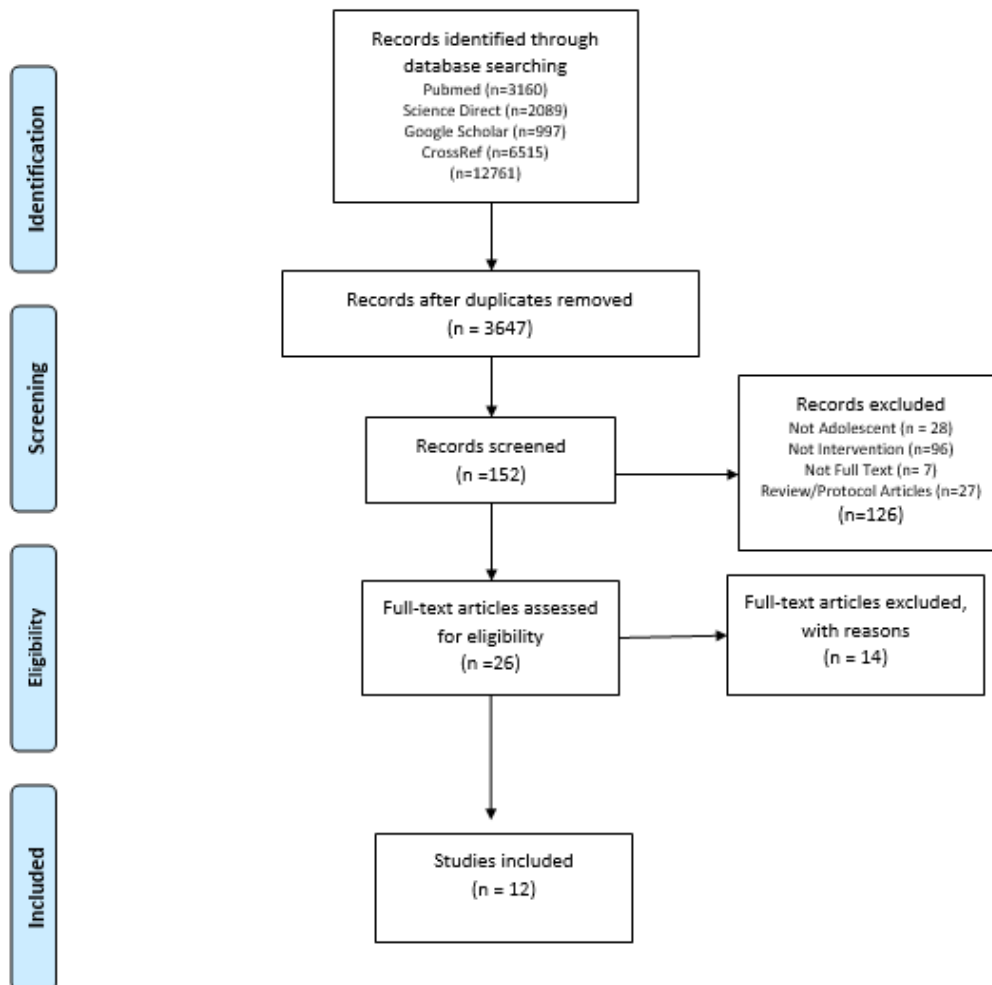


Figure 1. PRISMA's flow

Table 1.
Characteristics of the Articles Reviewed

No	Author/Year	Title	Country	Methodology	Intervention	Result
1	(Robinson et al., 2016)	Can an Internet-based intervention reduce suicidal ideation, depression, and hopelessness among secondary school students: results from a pilot study	Australia	Pretest /design post-test	The intervention consists of 8 modules according to Cognitive Behavioral Therapy standards which participants study every week for 15-20 minutes. The site also delivers therapy orally, and a series of story videos. Two activities must be completed per week related to the issues raised in the module. The site also includes a message board, a series of fact sheets covering a variety of related topics, downloadable MP3s, and lists of local and national helplines and services that participants can access if they so choose.	Results showed statistical significance with a moderate effect on suicidal ideation 0.66. A sensitivity analysis was also performed for changes in suicidal ideation, which revealed a change from pre- to post-intervention. Remained significant for the best case scenario ($t(31) = 7.5, P \leq 0.0005$) and the worst case scenario ($t(31) = 6.330, P \leq 0.0005$). Examination of self-report results showed a significant increase in the median effect size, between baseline and follow-up in suicide ideation ($d = -0.57, p = 0.033$) the mean of pre- and post-suicide being 91.5 to 75.5.
2	(Bailey et al., 2020)	An Enhanced Social Networking Intervention for Young People with Active Suicidal Ideation: Safety, Feasibility and Acceptability Outcomes	Australia	This study used an uncontrolled single-group pre-test post-test design with the assessment given two-time points (baseline and 8-week follow-up).	Participants access an online platform called Affinity which is a website consisting of 1) Peer-to-peer Online Social Networking where each user can interact with each other including, 2) Moderation from expert and peer doctors who have been given the training to provide instructions and information to users, 3) Treatment Content where users practice information content, such as listening to mindfulness audio tracks, identifying emotions from lists, and making health plans, 4) Safety and Security Measures the team performs security for each content from users such as bullying, hurting self, and others.	The suicide ideation score decreased to a greater degree in the intervention group compared to the control group from baseline to 10 weeks of follow-up (intervention $-37.3, SD 39.1$ vs control $-31.6, SD 42.8$) and from baseline to 22 weeks follow-up (intervention $-61.6, SD 41.6$ vs control $-47.1, SD 42.3$).
3	(Hetrick et al., 2017)	Internet-based cognitive behavioral therapy for young people with suicide-related behavior (Reframe-IT): a randomized controlled trial	Australia	RCT	Intervention via the internet Reframe IT consists of 8 CBT modules delivered over a 10-week intervention period. In addition, the internet that is accessed also has to learn video diaries.	In the intervention group, 35.3% (41/116) met the criteria for clinically significant change, compared to 20.8% (25/120) in the control group. The difference in effectiveness is $0.353 - 0.208 = 0.15$ (SE 0.06). This difference was evaluated using a linear probability model while considering the clustered data structure ($z = 2.51, P = .01, 95\% CI 0.03 0.26$).
4	(Spijker et al., 2012)	Reducing Suicidal Ideation: Cost-Effectiveness Analysis of a Randomized Controlled Trial of Unguided Web-Based Self-help	Belanda	RCT	The experimental group received an online intervention via an intervention website aimed at reducing the frequency and intensity of their suicidal ideation for 6 weeks. This intervention is based on CBT (DBT, PST, and MBCT) to reduce suicide. The intervention consisted of six successive weekly modules focusing on (1) the recurrent character of suicidal ideation, (2) dealing with intense emotions, (3) identifying negative automatic thoughts, (4) learning to recognize thought patterns, (5) reformulating negative thoughts, and (6) relapse prevention.	As many as 35.9% of suicide participants reported feeling better immediately after the counseling session ($M = 3.20$). This was significantly lower than the
5	(Sindahl et al., 2019)	Texting for Help: Processes and Impact of Text Counseling with Children and Youth with	Denmark	Preliminary study	Intervention via SMS session from the children's helpline for two weeks specifically for participants younger than 23 years who are experiencing suicidal ideation. SMS sent by the	

		Suicide Ideation		counselor. Where the SMS sent contained a questionnaire and open-ended questions.	
6	(Han et al., 2019)	Use of Web Conferencing Technology for Conducting Online Focus Groups Among Young People with Lived Experience of Suicidal Thoughts: Mixed Methods Research	Australia	Mix Method	One type of synchronous online focus group, an online focus group based on web conferencing technology, provides real-time communication between participants and moderators in various geographic locations like an Internet chat room.
7	(Sueki et al., 2014)	The Impact of Suicidality-Related Internet Use: A Prospective Large Cohort Study with Young and Middle-Aged Internet Users	Jepang	A prospective observational longitudinal study (Cohors Study)	Internet interventions related to suicide (expressing one's suicidal ideation, mental health counseling, and seeking information about suicide methods) related to changes in suicidal ideation and other mental health status items related to suicide (hopelessness, depression/anxiety, and loneliness) in a prospective observational longitudinal study. A basic screening survey (T0 survey) and two waves (T11 week after T0) and T2 [7 weeks after T0]) follow-up surveys were conducted with members of a comprehensive internet survey panel through a major Japanese internet survey company (Cross Marketing Inc., Tokyo, Japan) for 6 weeks.
8	(Iorfino et al., 2017)	Using New and Emerging Technologies to Identify and Respond to Suicidality Among Help-Seeking Young People: A Cross-Sectional Study	Australia	Cross-Sectional Study	The intervention of adolescents who access the Internet and are seeking help through primary mental health care services from July 2015-July 2016 or online in the community from September 2016 to February 2017.

non-suicidal group (M = 3.78), where 60.9% reported an increase in well-being immediately after the session (U = 63.928, z = 5.347, p < .001).

In the pre-W-OFG survey, 39 (97.5%) youth (n=40) chose to attend online focus groups. Among the 22 participants who responded to the W-OFG invitation, 15 confirmed they would attend the W-OFGs, of which 11 participants attended the W-OFGs. Feedback collected from participants in the W-OFG and post-W-OFG surveys indicates that online focus groups are receptive to young people in suicide prevention research. Considerations for choosing a Web conferencing platform, mocking W-OFG, implementing risk management procedures, inviting participants to W-OFG, and hosting and moderating W-OFG as well as some of the potential ethical and pragmatic challenges in using these are discussed in this study.

The regression model shows the relationship either related to suicide or related to mental health consultations internet use and changes in suicidal ideation, from T1 to T2. A statistically significant positive coefficient was found for suicidal ideation (b = 0.38 [95% CI: 0.20 to 0.55]).

A total of 153 young people (66%, 153/232) reported a certain suicide rate and were given online alerts. Further escalation levels (email or telephone contact and clinical review) were initiated for 35 young people (15%, 35/232) who reported a high suicide rate. Higher levels of psychological distress (P<.001) and current alcohol or substance use problems (P=0.02) predicted each suicide rate compared to no suicide. Next, the predictors of high suicide were compared with lower suicides

Cherol Nelson Ering, Shanti Wardaningsih were higher levels of psychological distress ($P = 0.01$), psychosis-like symptoms in the past 12 months ($P = 0.01$), previous mental health problems ($P=0.01$), and a history of planning or attempting suicide ($P=0.001$).

The results of the analysis showed a significantly stronger reduction in suicidal ideation in the intervention group compared with the control group between baseline and post-test, and between baseline and follow-up ($\beta=3.61$, $p < 0.001$) and at follow-up ($\beta=4.54$, $p < 0.001$).

Regarding utilization patterns, there is a significant positive relationship between suicidal ideation and the number of counseling sessions, the average number of messages sent, and the average number of words used per message by users. User satisfaction was high, with 64.7% ($n = 413$) of users who answered a feedback survey and experienced suicidal ideation rating the help they received as at least "good" and a recommendation rate of 89.6% ($n = 571$).

The results showed that there was a greater likelihood of decreased suicidal ideation and suicidal cues before and after the intervention for the group that received CALMA (DBT+CALMA) compared to the comparison group (DBT).

9	(De Jaegere et al., 2019)	The online treatment of suicidal ideation: A randomized controlled trial of an unguided web-based intervention	Belgia	RCT	The undirected self-help online intervention under the name ThinkLife includes six modules, covering a wide range of therapeutic content. ThinkLife is largely based on Cognitive Behavioral Therapy (CBT). Additionally, it includes elements of Dialectical Behavior Therapy (DBT), Problem-Solving Therapy (PST), and Mindfulness-Based Cognitive Therapy (MBCT). Six modules each focus on different aspects, including 1) the relationship between suicidal thinking and worrying /ruminating, 2) dealing with a suicide crisis, 3) detecting automatic thoughts, 4) recognizing common thinking patterns, 5) challenging negative thoughts, and 6) dealing with setbacks in future. Each module begins with a psychoeducational section followed by weekly assignments, core exercises, and optional exercises. Post-intervention at 6 weeks and follow-up at 12 weeks.
10	(Kohls et al., 2022)	Suicidal Ideation Among Children and Young Adults in a 24/7 Messenger-Based Psychological Chat Counseling Service	Jerman	Cross-Sectional	Krisenchat is a counseling service aimed at children and young people who need general psychosocial support as well as those in an acute crisis and can be contacted free of charge, under an alias, and 24/7 via WhatsApp or SMS. As well as listening to, reassuring, and comforting users in an acute crisis, the service engages in cooperative problem-solving focused on increasing users' self-efficacy.
11	(Rodante et al., 2022)	CALMA, a Mobile Health Application, is an Accessory to Therapy for Reduction of Suicidal and Non-Suicidal Self-Injured Behaviors: A Pilot Cluster Randomized Controlled Trial	Argentina	RCT	CALMA is an application for smartphones that interacts with users, providing evidence of tools for preventing suicide; it is freely available and free to download on Apple or Google marketplace. The application consists of 1) Out of Crisis: which consists of four functions identified at the start of the application screen, 2) My moments: users can add photos, videos, audio, song, phrase, or anything else that generates well-being and serves as an anchored life, 3) My Agenda: Function based on evidence that positive events, such as

12	(Torok et al., 2022)	The effect of a therapeutic smartphone application on suicidal ideation in young adults: Findings from a randomized controlled trial in Australia (Franklin et al., 2016)	Australia	RCT	<p>pleasurable activities, serve as a protective factor for suicidal ideation, thereby reducing vulnerability to future suicide crises, 4) Profile: contains user data, telephone number, 5) Tips: the function of providing psychoeducational material related to suicide crises and how to prevent unwanted behavior during this crisis. Users receive weekly notifications as reminders of this section, 6) I Need Help: modalities consist of interventions based on DBT skills. Which consists of various cards that can be pressed by the user such as Problem-Solving cards, CALMA Thermometers (Emotional scale), DBT skills cards, and Emergency Card cards. User option to make one or multiple calls previously loaded or emergency contact standard emergency number. The intervention was given for 4 weeks.</p> <p>Participants in the intervention condition received a brief, 7-module, self-contained DBT smartphone application ("LifeBuoy") designed to enhance emotional regulation and enhance distress tolerance skills. DBT is one of the most effective therapeutic approaches for reducing suicidal thoughts and suicide attempts in young people. The intervention was given for three months.</p>	<p>Lifebuoy was associated with a superior increase in the severity of suicidal ideation. There was a significant time condition effect for the suicide ideation score in favor of LifeBuoy at T1 ($p < 0.001$, $d = 0.45$) and T2 ($p = 0.007$, $d = 0.34$)</p>
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Psychoeducation.

Education provided by researchers includes Cognitive Behavior Therapy (CBT) (Bailey et al., 2020; De Jaegere et al., 2019; Hetrick et al., 2017; Robinson et al., 2016; Rodante et al., 2022; Spijker et al., 2012), Dialectical Behavior Therapy (DBT) (De Jaegere et al., 2019; Spijker et al., 2012), Problem Solving Therapy (PST) (De Jaegere et al., 2019; Spijker et al., 2012), and Mindfulness Based Cognitive Therapy (MBCT) (Bailey et al., 2020; Rodante et al., 2022; Spijker et al., 2012) which is provided through a module which can be downloaded (Bailey et al., 2020; De Jaegere et al., 2019; Iorfino et al., 2017; Robinson et al., 2016; Spijker et al., 2012), read when there is notification of tips related to psychoeducational material (Rodante et al., 2022), using audio/mp3 tracks (Bailey et al., 2020; Hetrick et al., 2017; Robinson et al., 2016), video (Hetrick et al., 2017; Robinson et al., 2016), messages both via SMS and chat via social media such as Whatsapp (Kohls et al., 2022; Sindahl et al., 2019), email, video calls (Iorfino et al., 2017), and focus group discussions through Video Conferences/Web Conferences such as Zoom/GoToMeeting (Han et al., 2019). The results of the review show that the use of interventions via the website is cheaper in terms of price compared to traditional treatments or interventions that are usually carried out face-to-face (Spijker et al., 2012).

Counseling.

This review shows that counseling is one of the interventions used to overcome the problem of suicidal ideation in adolescents. Various studies have shown one of the advantages of technology: users and therapists or counselors can connect without face-to-face contact (Hetrick et al., 2017; Kohls et al., 2022; Rodante et al., 2022; Sindahl et al., 2019; Sueki et al., 2014). An article shows that the counselors involved are not only therapy or health workers, but trained peers can also become counselors (Bailey et al., 2020).

Peer-to-Peer Support.

The results of the review show that by utilizing technology, adolescents can connect online where users can upload videos, photos, and comments where other users or moderators can provide comments, and reactions such as features like "likes" and "emoticons" (Bailey et al., 2020; Rodante et al., 2022). This method allows adolescents or users to get support from their friends in cyberspace (Bailey et al., 2020).

Digital Health refers to the use of information and communication technologies in medicine and other health professions to address disease and health risks and to promote health. Digital health is broad in scope and includes wearable devices, mobile health, remote health, health information technology, and remote medicine (Ronquillo et al., 2022). The results of the review show several digital health sources that are used for suicidal ideation in adolescents such as websites/internet, mobile applications, and messengers.

Early detection of suicidal ideation in adolescents is one of the factors that helps prevent suicidal behavior. The results of the review show that digital health can detect suicidal ideation in adolescents. This result is also supported by several digital suicide screenings that can prevent suicide (Dunlap et al., 2019; Mann et al., 2021). There are many tools used in various countries to detect suicidal ideation but relying on screening results alone is not enough to prevent or overcome suicidal ideation it is also necessary to know the patient and their past mental health history (O' Rourke et al.,

2022). Digital health makes it easy for the world of health services to make it easier to detect suicidal ideation in adolescents. However, it is necessary to ensure the accuracy of the data or screening results.

Psychoeducation is an important therapy for overcoming the problem of suicidal ideation. The results of the review show that psychoeducation through digital health has proven to be effective in overcoming suicidal ideation. Psychoeducation can be defined as education for someone who is experiencing mental health problems, such as symptoms, treatment, and prognosis of the disease (Zhao et al., 2015). Psychoeducation combines elements of cognitive-behavioral therapy, group therapy, and education (Sarkhel et al., 2020). Several other studies have also shown the effectiveness of psychoeducation through digital health compared to traditional psychoeducational therapy (Büscher et al., 2020; Mühlmann et al., 2021).

Online health counseling has been proven to be effective in overcoming suicidal ideation in adolescents. The results of this review are supported by research showing that online counseling approaches for adolescents, both by peer counselors and health workers, can overcome suicidal ideation in adolescents (Weiss et al., 2020). The benefits of online counseling as an alternative treatment option are that it is easily accessible, the location can be anywhere, it is more convenient, anonymity, face-to-face facilitation, and relatively low psychotherapy can make online counseling, in certain cases, the treatment of choice (Giotakos & Papadomarkaki, 2016). The role of lay people as peer counselors who can play a role in suicide prevention services includes members of the same sociodemographic subgroup, for example, racial minorities, who work in the same workplace, who are in the same institution, such as a campus/school, or also in a correctional facility, and who have experienced the same mental problems (Oulanova et al., 2014).

Digital health is not only proven to provide benefits for overcoming suicidal ideation but also, from a cost perspective, digital health is cheaper than general therapy. The results of this review are in line with the results of a systematic review that reviews several research articles and shows some evidence that digital health interventions can affect cost-effectiveness with beneficial effects in terms of both costs and health outcomes (Gentili et al., 2022). The provision of digital health products needs to be considered in terms of the proportion of costs involved, for example, the development of digital platforms and their maintenance (Gomes et al., 2022). Digital health for dealing with suicidal ideation is very economical and promising, but the cost-effectiveness of the developed platform needs to be considered.

LIMITATION OF THE STUDY

There are still a few recent articles about digital health intervention to overcome suicidal ideation, especially among adolescents.

CONCLUSIONS AND SUGGESTIONS

Providing digital health interventions to adolescents to overcome the problem of suicidal ideation has proven to be effective. Various digital health sources, such as websites/internet, applications, and messages (SMS/social media), can be used or developed to become alternative

intervention options for adolescents. Digital health provides a variety of intervention options that can be used together, such as psychoeducation, counseling, and screening for suicidal ideation.

ETHICAL CONSIDERATIONS

This study does not use ethical clearance because this study is a review from several previous research articles.

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Conflict of Interest Statement

The authors declare that there is no conflict of interest.

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