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DIGITAL SUPPORT EDUCATION ON RISKY ADOLESCENT REPRODUCTIVE HEALTH BEHAVIORS: A SYSTEMATIC REVIEW

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ABSTRACT
Adolescents are a group vulnerable to reproductive health issues. One contributing factor is a lack of literacy and limited access to sexual and reproductive health services. Educational interventions supported by digital technology, such as mobile applications, websites, and social media, aim to provide information related to sexual and reproductive health. These interventions are expected to reduce risky behaviors, including preventing sexually transmitted infections, unwanted pregnancies, and making appropriate reproductive health decisions. However, the effectiveness of digital-supported educational interventions remains variable. Objective: examined the effectiveness of health education using digital support from various journal articles. Method: systematic review approach was used to analyze and evaluate several research results through literature searches with Proquest, Wiley, Science Direct and Spinger Link databases with experimental and RCT research types. Results: The results of a review of thirteen articles can be concluded that interventions with digital support can significantly (□<0.05) increase adolescents' knowledge about reproductive health, improve attitudes towards preventing adolescent health risk behaviors, improve behavior in maintaining reproductive health disease prevention, increase self-efficacy and reduce the incidence of physical violence and sexual violence. Recommendations: It is recommended that interventions involve both adolescents and their parents, as parental roles are crucial in providing support to adolescents.

Keywords: adolescent reproductive health; digital support; education; risky behavior

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INTRODUCTION

The adolescent group is very vulnerable to various problems related to sexual and reproductive health such as the risk of contracting sexually transmitted infections including HIV/AIDS, unwanted pregnancies, unsafe abortions, early marriage, sexual violence and rape, and promiscuity (Phongluxa et al., 2020). UNICEF revealed that the number of adolescents and young adults infected with HIV worldwide is always increasing. It was recorded that in 2023 there were new cases of HIV in adolescents aged 15-24 years amounting to 360 thousand people, while 140 thousand others infected adolescents aged 15-19 years (UNICEF, 2024).The various health risks faced by adolescents are caused by a lack of information and limited access to adolescent reproductive health services (Janighorban et al., 2022). Issues related to sexual and reproductive health are also often considered taboo in many cultures including in Indonesia, so that even though adolescents have access to the information they need, their rights to health information are limited. This may be due to cultural sensitivity and taboos related to reproductive health topics (Djuwitaningsih & Setyowati, 2017).

Digital technology is one of the interventions that can be developed in providing education and information to adolescents. Digital technology can provide opportunities in promoting and advancing reproductive health services with the advantage of gaining access to broad information that is easy for adolescents to access, and can maintain the privacy of its users (Brayboy et al., 2018). Various information and education with a digital basis such as mobile applications, websites, and social media provide information related to reproductive health including preventing unwanted pregnancies, protection from sexually transmitted infections and making the right decisions regarding sexual behavior (Bacchus et al., 2019).The effectiveness of digital-based education programs in reducing risky reproductive health behaviors in adolescents still varies greatly in results when implemented. Therefore, a systematic review is needed to evaluate the extent to which digital education support can have a positive impact on reducing risky reproductive health behaviors in adolescents. This systematic review aims to analyze several research results related to the effectiveness of digital-based health education as an effort to support adolescents in maintaining and safeguarding and making safe reproductive health decisions.

METHOD

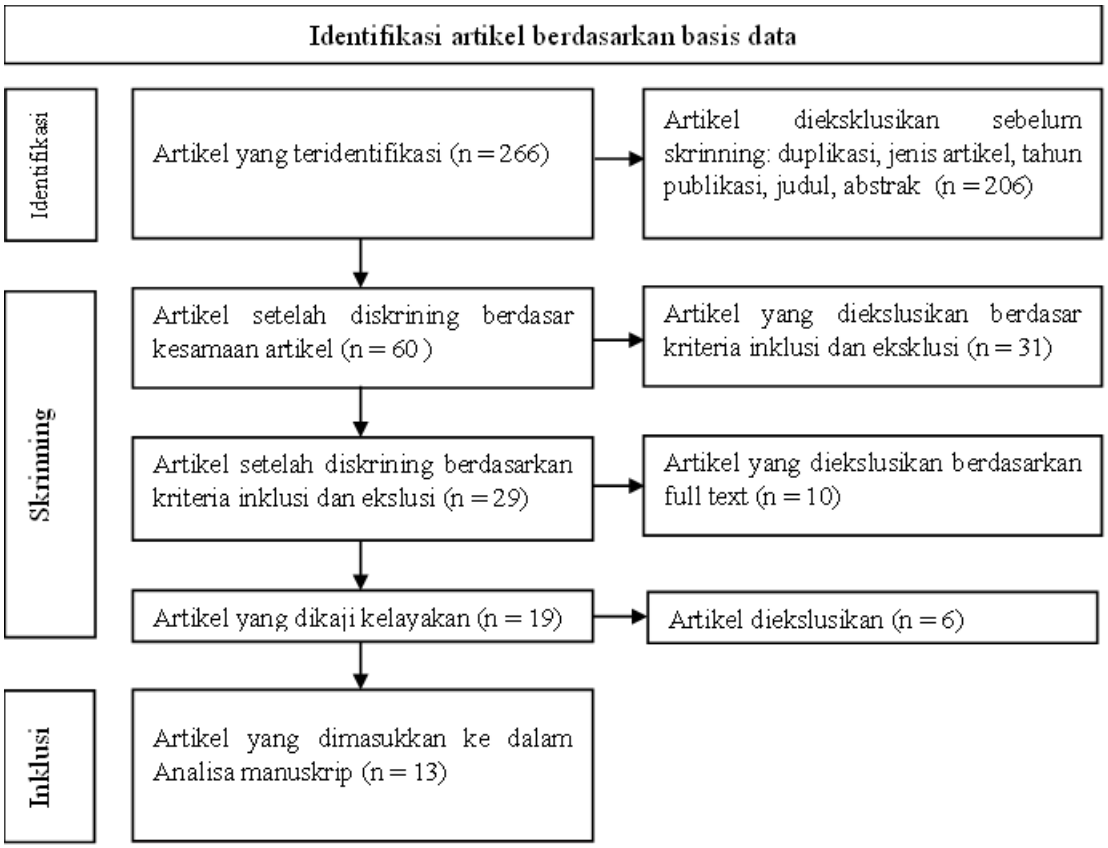
The method used in this study is a systematic review. The process includes several stages: defining the study question using the PICO format (Population, Intervention, Comparison, Outcome), conducting a literature search, identifying relevant studies, and mapping data using the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. Articles are then assessed for feasibility before data extraction, which involves compiling, summarizing, and reporting the findings along with their discussion. The study aims to evaluate the effectiveness of various digital reproductive health education methods and their impact on adolescents in maintaining their reproductive health. A literature search was conducted using the PICO format across databases such as ProQuest, Wiley, ScienceDirect, and Springer Link, identifying 266 articles using keywords specified in Table 2.1.

Table 1.
List of Article Identification with PICO

Population	*Intervention*	*Comparison*	*Outcomes*
- *Adolescent*	- *Digital education*		- *Risky behavior*
- *Adolescence*	- *Mobile app*		- *reproductive health*
- *Youth*	- *Mobile Application*		- *risky sexual behavior*
- *Teen*	- *Social media*		- *HIV/AIDS*
	- *Internet based*		- *sexually transmitted diseases*
			- *Sexual reproductive health*

Identifying relevant studies

The data is filtered according to the criteria of articles published within a ten-year period (2015-2024), using English text, full text , quantitative research with Experimental and RCT research designs, and adolescent respondents aged 10-24 years. The data filtering process uses the PRISMA Flowchart.



Article feasibility test

Articles selected according to the criteria desired by the author will undergo a Critical Appraisal based on the JBI Critical assessment. Appraisal Checklist For Quasi-Experimental and RCT Studies left thirteen articles which were then extracted for inclusion and systematic analysis on topics such as study location, population, methodology, intervention, outcomes, and results.

Compile, summarize and report results and discussions

The author takes an approach by compiling, summarizing, and reporting the results. The final phase at this stage is to review the implications of the findings in relation to future research, practice, and policy.

RESULT

Author (year)	Country	Design	Sample				Intervention	Results
			Age		Amount			
			KI	KK	KI	KK		
(Doubova et al., 2017a)	Mexico	Experiment	14 and 15 years old	14 and 15 years old	246 people Lk=47.2 % Pr=52.8 %	210 people Lk=43.3% Pr=57.6 %	Internet-based education over a 4-week period, follow-up after 3 months.	The intervention group was shown to have a positive effect on increasing knowledge about STIs, attitudes and self-efficacy towards consistent condom use. The main effect was seen in adolescent knowledge about STIs (Diff-in-Diff 30.34 points, P<0.0001)
(Mustanski et al., 2023)	USA	Experiment	13-18 years	N/A	983 people	N/A	SMART Sex Ed internet-based sexual health	Sexual health education program with SMART Sex Ed is effective in HIV prevention program (HIV

							education program	and STI testing acceptance and HIV knowledge) in adolescent boys who have sex with men.
(Akande et al., 2024a)	Nigeria	RCT	10-19 years	10-19 years	640 people	640 people	Comprehensive sexual health education with internet-based m-health	M-health comprehensive sexual health education can improve knowledge and attitudes about reproductive health of school adolescents.
(Brody et al., 2022)	Cambodia	RCT	18-24 years	18-24 years	218 people	170 people	Mobile link based health education	No significant differences were found between the control group and the intervention group.
(Scull et al., 2021a)	USA	RCT	13-17 years	N/A	153 people Lk=56.9 % Pr=43.1 %	152 people Lk=53. 3% Pr=46.7 %	Comprehensive web-based sexual health education (Media Aware)	There was an increase in cognitive, more realistic perceptions of adolescent sexual norms and risky sexual norms.
(Mansor et al., 2023a)	Malaysia	RCT	19 years old	19 years old	150 people	150 people	Theory-based digital animation video	1. After the intervention for 3 months, there was a decrease in intention (β=-0.12; ρ=0.002) and willingness ((β=-0.16; ρ=0.001) to do sexting. 2. There has been an increase in knowledge, attitudes and norms towards sexting behavior.
(Shafii et al., 2019a)	USA	RCT	21 (16-24)	21 (15-24)	130 people Lk=33.1 % Pr=66.9 %	142 people Lk=37. 3% Pr=62. 7%	Computer based e-kiss	1. The intervention group reported a 33% reduction in the frequency of unprotected sex compared to the control group (IRR=0.67;CI:0.44-1.02) after 3 months, but did not reach statistical significance. 2. The intervention group experienced a 29% reduction in the number of sexual partners (IRR=0.171;CI:0.50-1.03) but this also did not reach statistical significance. Exploratory analysis in the intervention group reported fewer unprotected vaginal

								intercourse (IRR=0.50; I;0.30-0.85) which was statistically significant.
(Nicolla et al., 2023)	USA	Experiment	15-19 years	N/A	580 people	N/A	TikTok personal narrative video about sexual violence	Adolescent boys who were given an intervention that involved viewing TikTok personal narrative videos about sexual violence had higher knowledge and higher levels of sexual violence severity than the control group.
(Wirsiy et al., 2022)	Cameroon	RCT	10-19 years	10-19 years	199 people	199 people	Mobile-based adolescent sexo-reproductive health scheme (MASHS)	The average score of knowledge, attitudes and practices of reproductive health in adolescent girls who received intervention increased.
(Martínez-García et al., 2023a)	Georgia	RCT	14-18 years	14-18 years	389 people	387 people	Teenage sexual and reproductive health education called Crush mobile health application	1. After 3 months, Crush users had high odds of being confident in accessing sexual and reproductive health services and believing that using contraception consistently was a good thing. 2. After 6 months Crush users had a higher chance than the control group of using contraception every time they had sex.
(Rohrbach et al., 2019a)	USA	Quasi-experiment	15 ± 0.38	15.1 ± 0.37	2,261 people	2.301 person	IYG (it's your game) is a learning program for HIV/STI/pregnancy prevention in adolescents. The program is computer and classroom based.	1. Students in the intervention group were less likely to report engaging in sexual activity (odds ratio 0.77 95% IC 0.66-0.99). 2. The intervention group was significantly less likely to engage in premarital behavior. 3. The intervention group had better outcomes on 11 of 19 psychosocial variables including knowledge, beliefs about abstinence, self-efficacy.

(Nik Farid et al., 2018a)	Malaysia	Experiment	12 years old	12 years old	101 people Lk=49.5% Pr=50.5%	108 people Lk=57.4% Pr=42.6%	Internet-based health promotion (MyCAP)	There was an increase in the average knowledge score of 3.88 after the intervention.
(Glass et al., 2024a)	USA	RCT	15-17 years	N/A	609 people	N/A	Education to address the problem of violence in relationships among teenagers using the "myplan Teen" application	1. myPlan Teen can significantly increase contraceptive use and improve perceptions of utilizing safety behaviors. 2. There was a significant reduction in the incidence of physical and sexual violence among app users compared to the control group.

Characteristics of research

The initial search resulted in 266 articles, then a selection was made based on the title, abstract, year of publication, type of article and duplication, leaving 60 articles. After a detailed assessment of the full text and a feasibility test was carried out based on the JBI Critical Assessment. Appraisal Checklist For Quasi-Experimental and RCT Studies , and 13 articles were obtained that were suitable for analysis (Figure 1).Details of the study characteristics are presented in table 3.1. There were a total of thirteen articles screened, all published in the last ten years with almost half of the studies conducted in the USA (46.2%) and some from Malaysia (15.4%), Georgia (7.8%), Cameroon (7.8%), Nigeria (7.8%), Cambodia (7.8%) and Mexico (7.8%). Based on the research design used, 8 articles used the RCT design (61.5%) and 5 articles used the experimental design (38.5%). All articles provided digital interventions with the aim of preventing risky behavior in adolescents by increasing knowledge about sexual and reproductive health through health education for adolescents. Ten articles (76.9%) divided participants into intervention groups (KI) and control groups (KK), while three articles (23.1%) did not use a control group. The number of samples in the selected articles ranged from 209 to 4,562 with an age range of 10 to 24 years. The intervention period ranged from 3 months with long-term observation of up to 2 years. Based on the research output, ten articles (76.9%) focused on increasing knowledge that impacts on risky behavior of sexual and reproductive health in adolescents in general, one article (7.7%) focused on young women who work as entertainers, one article (7.7%) focused on preventing sexual violence in adolescent boys, one article (7.7%) focused on preventing problems of violence in relationships among adolescents.

Effects of digital intervention

According to table 3.1, there are ten articles discussing the effects of providing education with digital media support on knowledge about adolescent sexual and reproductive health. With a total number of participants of 5,702, the eleven articles have a significant effect on the level of knowledge of sexual and reproductive health in adolescents, including knowledge about premarital sex, use of contraception, transmission of sexually transmitted infections including HIV, sexual violence, and other sexual and reproductive health issues (Akande et al., 2024a; Doubova et al., 2017a; Mansor et al., 2023a; Martínez-García et al., 2023a; Mustanski et al., 2023; Nicolla et al., 2023; Nik Farid et al., 2018b; Rohrbach et al., 2019a; Scull et al., 2021b; Wirsiy et al., 2022). One article discussing the effects of providing education with digital media showed that there was no significant difference between the intervention group and the

control group (Brody et al., 2022). Three articles stated that interventions with digital support can change sexual behavior in the use of contraception (Glass et al., 2024b; Martínez-García et al., 2023b; Shafii et al., 2019b). Three other articles explained that interventions with digital support have also been shown to prevent risky sexual behavior and effects on social norms (Mansor et al., 2023b; Rohrbach et al., 2019b; Scull et al., 2021a). One article reviewed that digital interventions can significantly reduce the incidence of physical violence and sexual violence in adolescent relationships (Glass et al., 2024b).

DISCUSSION

Limited knowledge among adolescents about reproductive health will affect adolescent behavior which will have an impact on reproductive health problems (Aina et al., 2020; Pratomo et al., 2022), this is in line with the results of a study conducted by Djuwitaningsih & Setyowati (2017)that the lack of information among adolescent girls about male and female reproductive organs, pregnancy prevention and condom use will affect attitudes towards risky behavior such as smoking, drinking alcohol, drugs and premarital sex (Djuwitaningsih & Setyowati, 2017).Efforts to prevent risky reproductive health behavior in adolescents can be done, one of which is by providing education to increase knowledge about sexual and reproductive health. Health education can be provided at school or at home by involving parents in supporting adolescents in maintaining their reproductive health (Widiyastuti & Nurcahyani, 2019). In order to expand access to information so that it is easily accessible to adolescents, comprehensive health education can be developed through digital technology that is friendly to adolescents, still considering socio-cultural aspects, can facilitate between users and health workers, and can be used by adolescents in monitoring reproductive health (Djuwitaningsih & Setyowati, 2017).

systematic review summarizes digitally supported educational interventions in reducing risky reproductive health behaviors in adolescents. Several digitally supported educational interventions have been shown to improve adolescent knowledge about reproductive health (Akande et al., 2024a; Doubova et al., 2017a; Mustanski et al., 2023; Nik Farid et al., 2018b; Wirsiy et al., 2022). These results indicate that technology can be used to reach adolescent groups in delivering information according to adolescent needs and contribute to improving adolescent understanding of reproductive health (Nik Farid et al., 2018a). This is because digitally supported educational interventions are a means or media that is easily accessible and can provide appropriate and accurate information for adolescents (Brayboy et al., 2018).Other articles This systematic review explains that interventions with digital support can significantly improve adolescent attitudes towards preventing adolescent health risk behaviors (Akande et al., 2024a; Doubova et al., 2017a; Mustanski et al., 2023; Nik Farid et al., 2018b; Wirsiy et al., 2022). By having a positive attitude, it will encourage adolescents to make wise decisions related to their health. help adolescents in making the right decisions (Akande et al., 2024b). This is in line with research Brayboy et al. (2018)that internet-based sexual education programs will be more effective in improving positive attitudes in adolescents compared to conventional methods because adolescents will feel more comfortable in accessing information with guaranteed privacy.

The next finding is that educational interventions with digital support can significantly increase self-efficacy in preventing reproductive health risk behavior (Doubova et al., 2017b). Higher self-efficacy is related to the individual's belief that they are adolescents who have the ability to control and regulate behavior including in terms of preventing risky behavior such as unprotected sex, sexting and so on, this is in line with Wong's research that digital-based approaches can be accessed flexibly, providing interactive learning experiences so that they can provide the right knowledge and can equip adolescents to make safe decisions in

preventing reproductive health risk behavior (Wong et al., 2020).Several other articles mention that education with digital support can change behavior in maintaining reproductive health, namely in the use of contraception (Glass et al., 2024b; Martínez-García et al., 2023b; Shafii et al., 2019b). These findings are in line with Widman et al. (2018), in his research showing that digital education interventions are effective in increasing awareness of sexual health, encouraging adolescents to use contraception so that they can reduce risky sexual behavior (Widman et al., 2018).

Another finding is that educational interventions with digital support have also been shown to prevent risky sexual behavior and effects on social norms (Mansor et al., 2023b; Rohrbach et al., 2019b; Scull et al., 2021a). These findings explain that education with digital support can prevent risky behavior by changing adolescents' perceptions of social norms about sex (Mansor et al., 2023b), thereby reducing the tendency to engage in risky sexual activity. So that educational interventions with digital support not only have an impact on individuals but also form more positive social norms related to adolescent sexuality (Scull et al., 2021a).Another article in this Systematic review reviews that digital education interventions can significantly reduce the incidence of physical violence and sexual violence in adolescent relationships and can prevent sexual violence (Glass et al., 2024b). According to (Glass et al., 2024b)the intervention, it helps adolescents recognize signs of violence in relationships and provides strategies for making decisions to leave unhealthy relationships. This is in line with research (Setyawan & Sari, 2024)that digital media such as animated videos can increase school-age children's understanding of sexual harassment and strategies for preventing it. Digital literacy education through online media is also an important effort in preventing sexual violence in adolescents, because the incidence of sexual violence can also occur through digital media.(Tiara Maulia et al., 2024)

Several interventions in the articles analyzed showed that comprehensive sexual health education was provided to adolescents through schools as an additional curriculum. Schools have a role in influencing adolescent development and are a place for adolescents to interact with teachers and friends. In each interaction, there is socialization of values and norms (Purnama & Raharjo, 2018). Schools can also create an environment that has good discipline, provides emotional learning and educates and guides so that risky behavior in adolescents can be prevented (Purnama & Raharjo, 2018).Another important finding in the literature analyzed is that the evaluation of the effect of the intervention is carried out periodically to see the long-term effects, follow-up is carried out repeatedly within 3 months, 6 months, and 12 months after the intervention. The intervention was able to provide a positive effect within 3 months and 6 months but after 12 months the evaluation showed no significant differences based on the group in reducing physical and sexual violence behavior (Glass et al., 2024a). However, in general, compliance with the intervention showed a positive effect, this shows that interventions with digital support can be well received by adolescents because they are more attractive and can guarantee confidentiality and can be accessed anytime and anywhere when needed (Brayboy et al., 2018).

The strength of the Systematic review is that this systematic review uses five data based in helping to find relevant references. The literature in this review is focused on research with RCT and quasi-experimental designs to improve the quality of research results. The articles analyzed were taken from articles that met the eligibility test with an assessment Critical Appraisal with assessment results ranging from high (good) to moderate. The weakness in this systematic review is that some of the interventions given in the study were financially compensated and carried out in places known to participants so that it could potentially increase compliance. There are certain time differences because each intervention has

different follow-up tests (eg 1 month, 6 months, 1 year), so the author criteria the impact in a period of less than 6 months or more than 6 months.

CONCLUSION

systematic review suggests that providing interventions with digital support can significantly improve adolescent knowledge, attitudes and behaviors in maintaining reproductive health. Although the effects cannot be maintained over time, it is necessary to provide a strengthening strategy component to ensure long-term effectiveness. This comprehensive education with digital support should not only be aimed at adolescents but also at parents. Parents play a very important role, the support given by parents can influence adolescent behavior. Interventions involving adolescents and parents can show positive results in improving adolescent reproductive health.

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