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Review Article

Methodologies of sexual health education intervention for high school students' knowledge and attitudes: A systematic review

Germano Rodrigues Couto[1]*, Isabel de Jesus Oliveira[2], Carla Sílvia Fernandes[3], Kristen Mark[4]

[1]Faculty of Health Sciences, University Fernando Pessoa, Porto, Portugal
[2]Portuguese Red Cross Northern Health School, Oliveira de Azeméis, Portugal
[3]School of Health, University Fernando Pessoa, Porto, Portugal
[4]Institute for Sexual and Gender Health, University of Minnesota, Minneapolis, United States

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***Corresponding Author:**
Germano Rodrigues Couto, Faculty of Health Sciences, University Fernando Pessoa, Porto, Portugal.
E-mail: gcouto@ufp.edu.pt

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ABSTRACT

Background & Aim: Providing adolescents with information to understand their sexual health is critical to promote healthy sexual development, reducing the negative consequences of risky sexual behaviors, and creating a foundation for healthy adulthood. This study aimed to identify the recent empirical evidence on new methodologies for improved sexual health outcomes among adolescents.
Methods & Materials: A systematic review of randomized controlled trials guided the PICO question, "What knowledge and attitudes do high school students obtain when confronted with new methodologies for teaching sexuality compared to traditional teaching?" regardless of geographic location, race/ethnicity, or gender criteria, concerning adolescents, was conducted. The databases CINAHL, MEDLINE, PsycINFO, SCOPUS, and Cochrane Central Register of Controlled Trials, were searched in December 2022. The Joanna Briggs Institute Critical Appraisal tools for use in JBI Systematic Reviews were used to assess methodological quality. Data were synthesized across studies and presented narratively.
Results: Thirteen articles were included for review, involving 11.262 participants. The duration of the interventions with new methodologies ranged from a few hours to three months. New methodologies on sexual health education to improve high school student's knowledge and attitudes were divided into four types: digital and Internet-based intervention, curriculum-based intervention, training-based intervention, and peer group bonding-based intervention.
Conclusion: These results provide healthcare professionals with additional strategies that may be integrated into school health programs regarding sex education.

Introduction

Adolescence is associated with specific health needs and challenges; it is a sensitive period in the trend toward higher-risk sexual behaviors (1). Providing information on sexual health, including healthy interpersonal relationships and positive body image (2), is regarded as one of the main strategies for controlling higher-risk behaviors in sexual and reproductive health (SRH) training (3). Providing adolescents with information to understand their sexual health is critical to promote healthy sexual development, reducing the negative consequences of risky sexual behaviors, and creating a foundation for healthy adulthood. In the USA, national standards have been developed to guide school districts on the minimum essential content and skills that students should receive from kindergarten through to the later stages of high school, emphasizing an approach that is comprehensive in scope and sequential in execution across grade levels (4). However, much of the USA does not implement these guidelines (5). In the European Union (EU)

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countries, sex education is a Member State competence, resulting in considerable differences in content, delivery, and organization between countries. As a result, children across the EU are likely to receive very different messages and information from each other about these crucial topics, depending on how different Member States interpret and implement these international targets and standards (6).

School-based sex education programs are well documented to reduce risky sexual behavior in young people as they transition to adulthood (7). While commonly used as a setting for interventions to promote sexual health, observational studies indicate that the school environment is likely to be a social determinant of young people's sexual health (8). Students with secure attachment (9,10), involvement (11), pro-school attitude (12), and relationships in school (13) report reduced sexual risk behaviors and outcomes in terms of earlier sexual debut, failure to use contraception and an increased risk of unintended pregnancy and STIs. Further, school-level studies suggest that students who attend schools with higher aggregate levels of a positive attitude towards school (14), expectations of higher education (15), and attendance (16) report delayed sexual debut. These patterns extend to other risk behaviors (17), suggesting that modifying school environments might be an effective public health strategy (18).

The popularity of new technologies, such as digital media interventions for sexuality education, offers a promising avenue, both via the internet (eHealth) and cell phones (mHealth - a specific way of promoting eHealth), given the convenience, privacy, and anonymity they provide, especially for young people. Digital interventions in school - both in and out of the classroom - offer exciting possibilities because of their greater flexibility for a variety of learning needs and benefits compared to traditional, face-to-face interventions and because they provide ample opportunities for personalization, interactivity, as well as a safe, controlled, and familiar environment for imparting sexual health knowledge and skills (19).

For this systematic review, new methodologies were considered to be those that introduced new curricular approaches and strategies that go beyond the traditional expository classroom methodologies, such as using new technologies (e.g., cell phone applications and games). Previously published reviews (10) have not focused only on randomized controlled trials confronting new methodologies to traditional sex education. This systematic review aimed to identify the recent empirical evidence on new methodologies for improved sexual health outcomes among adolescents. These results will allow us to identify strategies that can be implemented in school health nursing programs.

Methods

The initial protocol of this systematic review was registered in the Open Science Framework (OSF) with the code (osf.io/jb2yg). The writing was structured according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow (20) (Figure 1).

This systematic review was guided based on the Population, Intervention, Comparison, Outcome (PICO) strategy (21), highlighting the important parts of a well-built clinical question and helping formulate the search strategy by identifying the key concepts that need to be in the article that can answer the research question (22). For the current paper, the PICO question was: What knowledge and attitudes (O) do high school students (P) obtain when confronted with new methodologies (I) for teaching sexuality compared to traditional teaching (C)?

We chose to include Portuguese, English, and Spanish studies, as these are the languages mastered by the researchers, allowing a good quality of evidence selection and respective data extraction. Given the focus on new methodologies, it was considered that there should be a restriction on the publication date to the last five years once we looked for recent evidence. Inclusion criteria considered articles reporting randomized controlled trials comparing new teaching methodologies with traditional methodologies. All literature was included regardless of geographic location, without specific race/ethnicity or gender criteria. This systematic review included all studies concerning adolescents (adolescents between 12 and 18 years) attending high school.

Research terms were initially identified using Medical Subject Headings (MeSH). The allocation of all possible descriptors (entry terms) integrating sexuality, adolescents, knowledge, and attitudes for an extensive search, to which the inclusion criteria would later be applied, safeguarded the maximum breadth of the search records found. The search was conducted on 12/10/2022 in the following databases: CINAHL, MEDLINE, PsycINFO, SCOPUS, and Cochrane Central Register of Controlled Trials. Full research strategy for Medline was: AB (((MH "Students") OR (MH "Adolescent") OR ("teenagers") OR ("ninth grade") OR ("tenth grade") OR ("high school") OR ("secondary education") OR ("eleventh grade") OR ("twelfth grade")) AND ((MH "Sex Education") OR (MH "Sexuality") OR (MH "Sexual Behavior") OR ("Sexual") OR ("sexuality") OR ("sexual education") OR ("sexuality education")) AND ((MH "Knowledge") OR (MH "Attitude") OR (MH "Behavior") OR ("behavior") OR ("behaviour") OR ("behavioural") OR ("behavioral") OR ("skills") OR ("competence") OR ("knowledge") OR ("abilities") OR ("attitudes") OR ("perceptions") OR ("opinions") OR ("thoughts") OR ("beliefs") OR ("feelings")) AND (("RCT") OR ("randomized control trial") OR ("randomized controlled trial") OR ("controlled trial") OR ("cohort") OR ("case control"))) 2017-2022.

Additional studies were searched for in the reference lists of all publications included through backward citation searching. The reference list was exported to Rayyan® software which assisted in the screening and identification of relevant references for this review.

Two independent reviewers (GC and CF) assessed retrieved articles for relevance according to title and abstract. Articles selected by title and abstract were then evaluated for eligibility by two independent reviewers (GC and CF) for full-text analysis. Possible disagreements were resolved by consensus with a third reviewer (IJO) to confirm the eligibility of publications. A total of 1028 articles were initially retrieved in a database search. After this identification, duplicates were removed. Articles that did not include specific results from assessing new methodologies in sex education (n=20) were excluded. Articles referring to interventions outside the school context (n=5) were also excluded, as were articles whose participants were only teachers or guardians/parents (n=7), as well as university students (n=1) (Figure 1).

The manuscripts' methodological quality was assessed on all included articles, according to the Checklist for Randomized Controlled Trials from The Joanna Briggs Institute Critical Appraisal tools for use in JBI Systematic Reviews. A table was developed based on the model recommended by the Joanna Briggs Institute for extracting details, characteristics, and results from the articles (23). It contains information regarding the title, authors, year of publication, objectives, methodology, participants, intervention type, and results. Two independent reviewers (GC and IJO) extracted data from the articles.

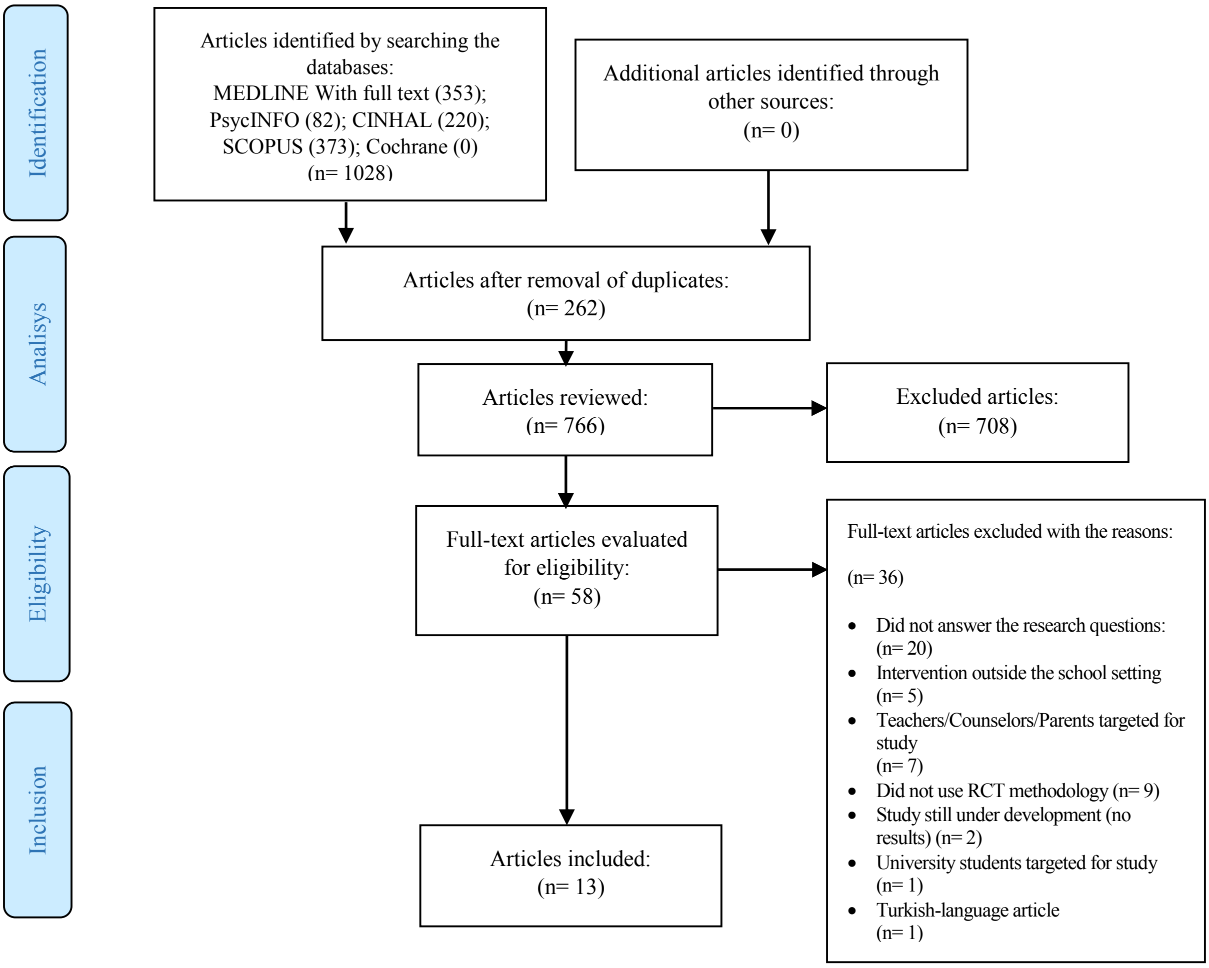

Figure 1. Preferred reporting items for systematic reviews and meta-analyses flow

Results

This study aimed to systematically summarize the recent empirical evidence on new methodologies for improved sexual health outcomes among adolescents. A total of 13 articles were included for quality appraisal (19,24–35). A methodological quality assessment revealed moderate to high-quality reports. Most of them did not meet the blindness of participants to treatment assignment and delivery (Table 1).

Table 1. Studies included

Article	Evaluation items												
	1	2	3	4	5	6	7	8	9	10	11	12	13
Alberto Chong (2019)	✓	•	✓	✗	✗	•	✓	✓	✓	✓	✓	✓	✓
Karib Coyle (2021)	✓	✓	✓	✗	✗	✗	✓	✓	✓	✓	✓	✓	✓
Fatemeh Darabi (2017)	✓	✓	✓	✗	✗	•	✓	✓	✓	✓	✓	✓	✓
Hussein Haruna (2018)	✓	✓	✓	✗	✗	•	✓	✓	✓	✓	✓	✓	✓
Holly Manaseri (2019)	✓	•	✓	✗	✗	•	✓	✓	✓	✓	✓	✓	✓
Alexandra Morales (2017)	✓	•	✓	✗	✗	•	✓	✓	✓	✓	✓	✓	✓
Tracy Scull (2019)	✓	•	✓	✗	✗	•	✓	✓	✓	✓	✓	✓	✓
Tracy Scull (2021)	•	•	✓	✗	✗	•	✓	✓	✓	✓	✓	✓	✓
Tracy Scull (2022)	•	•	✓	✗	✗	•	✓	✓	✓	✓	✓	✓	✓

Sarah Walsh (2022)	✓	•	✓	X	X	•	✓	✓	✓	✓	✓	✓	✓
Laura Widman (2018)	✓	•	✓	X	X	•	✓	✓	✓	✓	✓	✓	✓
Laura Widman (2020)	✓	•	✓	X	X	•	✓	✓	✓	✓	✓	✓	✓
Ibrahim Yakubu (2019)	✓	•	✓	X	X	•	✓	✓	✓	✓	✓	✓	✓

✓ = Yes; • = Unclear; X = No

There was diversity in the publication years of the studies that were scattered between 2017 and 2022, the range of time stipulated, and 2019 was the year with the greatest number of published articles (n=4). Most of the studies were conducted in the USA (n=8); the remaining studies were from Colombia, Ghana, Iran, Spain, and Tanzania. The total number of participants in the analyzed studies was 11,262 (6,178 in study groups and 5,085 in control groups), ranging from a minimum of 76 to a maximum of 3,036.

The adolescents' ages ranged from 12 to 18 years; the average age across all studies was 14.64 years. Of the 13 included studies, eight evidenced statistically significant differences in knowledge and attitudes favoring new technologies, two of them increased knowledge but with no effect on attitudes, and three showed no statistically significant differences between groups. The interventions were divided into four types: 1) digital and Internet-based intervention (five studies), 2) curriculum-based intervention (three studies), 3) training-based intervention (four studies), and 4) peer group bonding-based intervention (one study). The duration of the interventions in the retrieved studies ranged from a few hours to three months. Full details on objectives, methodology, participants, intervention type, and results are presented in Table 2.

Below, we detail the main results regarding knowledge and attitude improvement for high school students who were exposed to each of these types of interventions.

Table 2. Studies included

Authors	Country	Aim(s) / Hypothesis	Participants	Intervention type	Time of intervention	Instruments	Results
Chong A, Gonzalez-Navarro M, Karlan D, Valdivia M (2019)	Colombia	To test whether, in a predominantly Catholic, middle-income country, information technologies in a school setting can help overcome sexual education–related informational barriers faced by teenagers	**Study Group:** 1518 9th-grade students in 46 schools **Control Group:** 1518 9th-grade students in 23 schools	Educational thought Internet platform	11 weeks	Aggregate Knowledge Index, General Attitudes Index	**Knowledge:** 0,378 SD improvement at 6 months **Attitudes:** 0,172 SD improvement at 6 months and a 55% increase in the likelihood of redeeming vouchers for condoms
Coyle K, Anderson P, Laris B, Barrett M, Unti T, Baumler E (2021)	USA	To evaluate the effectiveness of a school-based comprehensive sexual health curriculum (FLASH) on high-school students' sexual behavior and related outcomes	**Study Group:** 903 9th and 10th-grade students in 10 schools **Control Group:** 831 9th and 10th-grade students in 10 schools	High School-based comprehensive sexual health curriculum (FLASH) 15-session comprehensive sexual health curriculum	15 days	15-session comprehensive sexual health curriculum designed for classroom settings in grades 9th to 12th	There were no statistically significant differences between conditions. Sub-group analyses at 3 months: p=.001 in **knowledge** and **attitudes** regarding STD testing

Darabi F, Kaveh M, Farahani F, Yaseri M, Majlessi F, Shojaeizadeh D (2017)	Iran	To assess the effect of a theory of planned behavior (TPB)-based educational intervention on attitude, norms, parental control, behavioral control, and intention in high school girls in Tehran, Iran	**Study Group:** 278 students in 6 schools **Control Group:** 278 students in 6 schools	Two-part school-based approach, training sessions with a booklet for adolescents, a two-hour workshop about high-risk behaviors, and sexual as well as reproductive health-related issues for parents	Not reported	WHO Questionnaire for Interview-Surveys with Young People (45)	**Knowledge:** *p*=.001 at 3 months **Attitudes:** *p*=.001 at 3 months
Haruna H, Hu X, Chu S, Mellecker R, Gabriel G, Ndekao P (2018)	Tanzania	To investigate the extent to which game-based learning (GBL) and gamification could improve the sexual health education of adolescent students	**Study Group:** 40 7th-grade students in 1 school **Control Group:** 40 7th-grade lower school students in 1 school	Game-Based Learning and gamification	Five weeks	Adolescent Sexual Health Literacy Test (ASHLT)	**Knowledge:** *p*=.001 at post-test **Attitudes:** *p*=.001 at post-test
Manaseri H, Roberts K, Barker L, Tom T (2019)	USA	To test the effectiveness of the Pono Choices curriculum in a middle school setting as part of regular health instruction for seventh- and eighth-graders	**Study Group:**1158 7th and 8th-grade students in 17 schools **Control Group:** 625 7th and 8th-grade students in 17 schools	Pono Choices curriculum	10 sequential modules	Program Students Rating Items	**Knowledge:** 72,8% against 57,2% in the control group **Attitudes:** 92,7% against 87,9% in the control group
Morales A, Carratalá E, Orgilés M, Espada J (2017)	Spain	To evaluate the effectiveness of Competencies for adolescents with healthy sexuality (COMPAS) in a sample of Spanish adolescents with divorced parents	**Study Group:** 53 students in 15 schools **Control Group:** 23 students in 15 schools	Competencies for adolescents with healthy sexuality (COMPAS)	5 hours	HIV/AIDS Knowledge Scale for Spanish Adolescents, HIV/AIDS Attitude Scale for Spanish Adolescents, HIV/AIDS Attitude Scale for Adolescents	**Knowledge:** *p*=.0001 at post-test **Attitudes:** *p*=.003 at post-test
Scull T, Kupersmidt J, Malik C, Morgan-Lopez A (2018)	USA	To examine the short-term efficacy of Media Aware, a classroom-based media literacy education (MLE) program for improving adolescents' sexual health outcomes	**Study Group:** 622 7th and 8th-grade students in 5 schools **Control Group:** 301 7th and 8th-grade students in 4 schools	Media Aware teacher-led comprehensive sexual health and Media Literacy Education (MLE) program	10 lessons	Media-Related Outcomes and Primary Sexual Health Outcomes, Secondary Sexual Health Outcomes, Media-Related Outcomes, and Consumer Satisfaction	**Knowledge:** *P*<.001 at post-test **Attitudes:** *p*=.005 at post-test on communication with parents *p*=.004 at post-test on communication with partner
Scull T, Malik C, Morrison A, Keefe E (2021)	USA	H2: Compared to students in the delayed-intervention group, students in the intervention group (Media Aware) will have more positive, self-reported predictors of sexual health outcomes at post-test, including (1) healthier normative beliefs about the frequency of teen sexual activity and teen risky sexual activity, (2) healthier normative beliefs regarding the acceptance of rape, dating violence, and gender role stereotypes, (3) more self-efficacy and more intentions to communicate about sexual health, refuse sexual	**Study Group:** 212 9th-grade students in 1 school **Control Group:** 212 9th-grade students in 1 school	Media Aware High School web-based program and a comprehensive program for high school students that uses a Media Literacy Education (MLE) approach	4 interactive lessons	The pretest questionnaire assessed demographic characteristics, past sexual behavior, and current dating status. The pretest and post-test included media-related and sexual health outcomes	**Knowledge:** *P*<.001 at post-test **Attitudes:** *p*=.01 at post-test

		activity, use contraception, and act as a bystander to prevent sexual assault and (4) less willingness to hook up and less willingness to engage in unprotected sexual activity					
Scull T, Dodson C, Geller J, Reeder L, Stump K (2022)	USA	Not reported	**Study Group:** 360 9th and 10th-grade students in 1 school **Control Group:** 196 9th and 10th-grade students in 1 school	Media Aware web-based program	3 months	Inventory of Objective Sexual Health Knowledge, Sexual Behaviors, and Contraception/Protection Behaviors.	**Knowledge:** *P*=.001 at post-test
Walsh S, Jenner E, Qaragholi N, Henley C, Demby H, Leger R, Burgess K (2022)	USA	To examine the efficacy of Peer Group Connection (PGC-HS), a school-based PYD program, in improving sexual health outcomes for high school participants	**Study Group:** 635 9th-grade students in 18 schools **Control Group:** 666 9th-grade students in 18 schools	Peer Group Connection-High School school-based Positive Youth Development (PYD) program	Not supplied	The instrument constructed by research staff and reviewed by health and educational professionals. In addition, cognitive interviews and pilot-testing of the instrument were conducted with youth similar to the study target population.	**Knowledge:** *P*=.009 at post-test **Attitudes:** *p*=.062 at post-test
Widman L, Golin C, Kamke K, Burnette J, Prinstein M (2018)	USA	To evaluate the efficacy of an interactive, Web-based sexual health program (Health Education and Relationship Training [HEART]) for developing sexual assertiveness skills and enhancing sexual decision-making in adolescent girls. The final sample included 222 girls who received parental consent and assented to participate in the study who completed the pretest assessment and were randomized to study conditions	**Study Group:** 107 9th-grade girls in 4 schools **Control Group:** 114 9th-grade girls in 4 schools	HEART interactive, skills-focused intervention	6 weeks	Participant characteristics, BMultidimensional Sexual Self-Concept Scale, AIDS Risk Behaviour Assessment, Self-Efficacy for HIV Prevention Scale, Sexual Risk Behaviour Beliefs and Self-Efficacy Scale	**Knowledge:** *P*=.35 at post-test **Attitudes:** *p*=.43 at post-test
Widman L, Kamkea K, Evansa R, Stewarta J, Choukas-Bradleyb S, Golinc C (2020)	USA	To evaluate the feasibility, acceptability, and preliminary efficacy of a 45-minute interactive, online sexual health program for adolescents, called Health Education and Relationship Training (HEART)	**Study Group:** 107 10th and 11th-grade students in 1 school **Control Group:** 100 10th and 11th-grade students in 1 school	HEART interactive, skills-focused intervention	1 week	AIDS Risk Behaviour Survey, Sexual Health Knowledge Questionnaires, The Self-Efficacy for HIV Prevention Scale, Sexual Risk Behaviour Beliefs and Self-Efficacy Scale, Multidimensional Sexual Self-Concept Scale	**Knowledge:** *P*=.66 at post-test **Attitudes:** *p*=.16 at post-test
Yakubu I, Garmaroudi G, Sadeghi R, Tol A, Yekaninejad M, Yidana A (2019)	Ghana	To assess an educational intervention program on sexual abstinence based on the Health Belief Model (HBM) among adolescent girls in Northern Ghana	**Study Group:** 185 students in 6 Schools **Control Group:** 180 students in 6 Schools	Comprehensive Sex Education program	6 sessions	Standard questionnaire designed by the researchers	**Knowledge:** *P*<.001 at post-test **Attitudes:** *P*<.001 at post-test

Digital and Internet-based intervention

The term' digital tools' refers to various educational tools using information and communication technologies, including interactive websites, mobile phone applications, virtual classroom platforms, and social media platforms.

Regarding knowledge obtained through a digital and internet-based sexuality intervention methodology, there was an increase in overall knowledge after the intervention compared to students not assigned to the course (34). These methodologies improved sexual health knowledge, corrected inaccurate normative beliefs about the frequency of risky teen sex, and improved critical thinking about media messages with demonstrated improvements in the ability to deconstruct media messages and decrease the perceived realism of media messages. It reduced girls' normative beliefs about teenage sex in general and increased their communication about sexual health with their parents, as well as reduced boys' acceptance of dating violence. Students gave positive feedback about these new formats, especially related to the program's online format (31).

Regarding the attitudes held through a digital and Internet-based sexual intervention methodology, results from included studies in this review demonstrate significant improvements in attitudes after the intervention (24). Additionally, these methods demonstrated better sexual assertiveness skills measured with a behavioral task immediately after the intervention (34) and higher sexual communication intentions; condom uses intentions, HIV/STI knowledge, condom attitudes, condom norms, safer sexual self-efficacy, and sexual assertiveness compared to control participants (19). The program was equally appreciated and worked equally well in changing safer sex knowledge, beliefs, and intentions for both boys and girls, but also for heterosexual and sexual minority youth (36). Students demonstrated higher self-ratings of affective attitude toward gamification and similar cognitive attitude (27).

Curriculum-based intervention

Some schools require a period during which teachers and parents can review a sexual health education curriculum prior to it being taught in the classroom. This allows us to adapt it to the student population to be taught.

Regarding knowledge gained through a curriculum-based sexuality intervention methodology, after the intervention, knowledge regarding STI was more significant among students in the intervention group relative to students in the comparison group; this was no longer significant at the 12-month follow-up (25). Students also showed significant knowledge gains on all ten questions after participating in the new sex education model. Although there was a decrease in knowledge gained in the program over time, for eight of the ten items, students' knowledge one year later was still significantly higher than before participating in the program (28). It was found that there were no significant differences between the experimental group and the control group in the level of knowledge about HIV and attitudes toward HIV-related issues (29). Compared to the control group, the adolescents who received the program demonstrated a more favorable attitude toward condom use (29). Although there was a decrease in attitude gains, students' attitudes 1 year later still improved significantly compared to before participating in the program (28).

Training-based intervention

Regarding knowledge gained through a training-based sexual intervention methodology, where a teacher-led comprehensive sexual health and media literacy education program was designed to improve sexual health outcomes by reaching students prior to the onset of sexual activity, students had more intentions to use contraception and increased intentions to communicate with a doctor or other medical professional and a romantic partner if they decided to have sex compared to the control group (32). They also reported many positive outcomes related to sexual health on the post-test compared to students in the delayed intervention group. Students in the intervention group were significantly less likely to believe that adolescent sexual activity and adolescent risky sexual activity were normative and had greater efficacy and intention to intervene if they were to witness a potential sexual assault. They also scored higher on sexual health knowledge and reported greater efficacy in using protection if they decided to be sexually active. These students reported more intention to communicate about sexual health with parents, partners, and medical professionals. Finally, they reported being less willing to hook up when they did not want to and, specifically for men, reported less willingness to have unprotected sex (30).

Regarding attitudes held through a training-based sexual intervention methodology, the model structure analysis indicated significantly more improvement in attitude, subjective norms, perceived behavioral control, perceived parental control, behavioral intention, and behavior in the experimental group compared to the control group (based on the interaction between groups and time in a multi-level analysis) (26). The attitudes that were influenced by the program included more positive attitudes towards communicating with a romantic partner, parents, or other trusted adult (32). At baseline, the mean Knowledge score was 58.17 and 62.28 for the control and the intervention group, respectively. Three months after the intervention, the mean knowledge score was 60.49 and 87.58 for the control and the intervention group, respectively. Adolescents' mean attitude score toward pregnancy prevention at baseline was 139.42 and 141.36 for the control and the intervention group, respectively. At the endpoint, the mean attitude score was 145.10 and 194.12 for the control and the intervention group, respectively (35).

Peer group bonding-based intervention

Informal peer group interventions offer a useful alternative to traditional teaching, where students interact with each other to promote educational goals.

At the beginning of 10th grade, Peer Group Connection-High School (PGC-HS) appears to be positively affecting several behavioral antecedents that are integral to the program's theory of change. The results also suggest that in early 10th grade, PGC-HS appears to have positively influenced students' social and emotional skills and on building peer bonding (33).

Discussion

In this systematic review of the literature, 13 studies met the inclusion criteria and provided us with insight into the knowledge and attitudes developed by adolescents from new methodologies in sex education.

From the analysis of the articles, we conclude that five studies (19,24,27,31,34) used the digital and Internet-based sexuality intervention methodology, three studies (25,28,29) used the new curriculum-based sexuality intervention methodology, four studies (26,30,32,35) used the training-based methodology of sexuality intervention and one study (33) used the peer group bonding-based sexuality intervention methodology. All studies were integrated into school curricula during the intervention period, and all were evaluated against a control group.

This systematic review showed that new teaching methodologies on sexuality significantly increased the overall knowledge and attitudes of the adolescents studied when compared with more conventional approaches, which was similar to the results obtained by Lameiras-Fernández (37). The use of comprehensive sex education is one of the main factors for this success, reflected in student satisfaction, as stated by Cinhelli et al. (38). However, our study went further to include only randomized controlled trials, which allowed to diminish eventual bias on the interpretation taken on.

Concerning the knowledge obtained by new teaching methodologies, there was an increase in overall knowledge after the intervention compared to students not assigned to the course, as also to correct inaccurate normative beliefs about the frequency of riskier teen sex, improved critical thinking about media messages with demonstrated improvements in the abilities to deconstruct media messages and decreased perceived realism of media messages, increased their communication about sexual health with their parents, as well as reduced boys' acceptance of dating violence. Students receiving digital and internet-based sexuality interventions were found to have stronger knowledge about sexual health than those in the traditional teaching condition. These findings are in line with other researchers' findings in new approaches to sex education (39,40).

Results of these studies also concluded that immediately after the intervention, participants demonstrated better sexual assertiveness skills and higher sexual communication intentions, condom use intentions, HIV/STI knowledge, condom attitudes, condom norms, safer sexual self-efficacy, and sexual assertiveness compared to control participants. The overall average of students was higher for self-ratings of affective attitude toward new methodologies than for traditional teaching students and was similar for the cognitive attitude. Results suggest that the use of new methodologies increases positive attitudes concerning communication with partners, parents, or another trusted adults. These findings corroborate Pichon et al., emphasizing communication as a power dynamic to reduce fear surrounding parent-child communication (41).

Even while identifying the advantages of using new methodologies in sex education, such as mobile health tools, by empowering adolescents to access health information (42), educators (parents, teachers, and school health professionals) must be aware of the current challenges on internet and digital resources use. A significant portion of adolescents use the internet as a primary source of health-related information, and evidence suggests that the circulation of false information is high on social media (43). New methodologies in sex education provide the opportunity to empower adolescents. Adolescents are alert to the variety of online health information quality. Internet and digital information may be appropriate for teenagers with improved media literacy (44), and sex education can play a key role in this domain.

Limitation

This study systematically reviewed results from 13 international studies. Generalizability is limited, but the aggregate results present an overall image of the impact of new methodologies of sexuality intervention on high school student's knowledge and attitudes. Given the exclusion criteria, additional research is required to identify barriers and enablers of new methodologies of sexuality intervention on high school student's knowledge and attitudes. This review has limitations due to selection bias.

Conclusion

The provision of new methodologies on sexual education in schools is highly variable and characterized by different methods and interventions. New methodologies for good quality sex education provision include digital and internet use, new curriculum and peer training environments, and the promotion of a greater understanding of the importance of sex education within schools and in the broader environment. Evidence suggests that the use of new methodologies has better results on knowledge and attitudes than traditional ones. Continued innovation in methodologies for the delivery of sex education should be encouraged as one component necessary to improve sexual health outcomes reliably. Further research should aim to strengthen the evidence on the benefits of the use of new methodologies, considering the widespread use of digital and media technologies by youngsters and the need for innovative and up-to-date approaches that can enhance their engagement with a healthy sexual life. These results provide healthcare professionals with additional strategies that may be integrated into school health programs regarding sex education.

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Not applicable.

Conflict of interest

The authors declare no conflict of interest.

References

1. United Nations Population Fund. Adolescent sexual and reproductive health toolkit for humanitarian settings. Available from: https://www.unfpa.org/sites/default/files/pub-pdf/UNFPA_ASRHtoolkit_english.pdf. 2009.
2. Do L, Boonmongkon P, Paek S, Guadamuz T.' Hu Hong' (bad thing): Parental perceptions of teenagers' sexuality in urban Vietnam. BMC Public Health. 2017;17:226–36.
3. United Nations Population Fund. Education on sexual and reproductive health, building partnerships with and for youth. Available from: https://www.un.org/esa/socdev/unyin/documents/UNFPASexualReproductiveHealth.pdf. 2012.
4. Future of Sex Education Initiative. National Sex Education Standards: Core Content and Skills, K-12 [Internet]. 2020 [cited 2022 Oct 16]. Available from: https://advocatesforyouth.org/wp-content/uploads/2020/03/NSES-2020-web.pdf
5. Guttmacher Institute. US Adolescents' Receipt of Formal Sex Education. 2022.
6. European Commission DG for ESA and I and NP. Sexuality education across the European Union: An overview. 2021.
7. Kirby D. Sex and HIV education in schools. BMJ. 1994;311(4):349–64.
8. Patton G, Sawyer S, Santelli J, Ross D, Afifi R, Allen N, et al. Our future: A Lancet commission on adolescent health and wellbeing. The Lancet. 2016 Jun;387(10036):2423–78.
9. Greene K, Eitle D, Eitle T. Developmental Assets and Risky Sexual Behaviors Among American Indian Youth. J Early Adolesc. 2018 Jan 30;38(1):50–73.
10. Steiner R, Michael S, Hall J, Barrios L, Robin L. Youth Violence and Connectedness in Adolescence: What Are the Implications for Later Sexually Transmitted Infections? Journal of Adolescent Health. 2014 Mar;54(3):312-318.e1.
11. Lauritsen J. Explaining Race and Gender Differences in Adolescent Sexual Behavior. Social Forces. 1994 Mar;72(3):859.
12. Henderson M, Butcher I, Wight D, Williamson L, Raab G. What explains between-school differences in rates of sexual experience? BMC Public Health. 2008 Dec 8;8(1):53.
13. McNeely C, Falci C. School Connectedness and the Transition Into and Out of Health-Risk Behavior Among Adolescents: A Comparison of Social Belonging and Teacher Support. Journal of School Health. 2004 Sep;74(7):284–92.
14. Kim J. School Socioeconomic Composition and Adolescent Sexual Initiation in Malawi. Stud Fam Plann. 2015 Sep;46(3):263–79.

15. White C, Warner L. Influence of Family and School-Level Factors on Age of Sexual Initiation. Journal of Adolescent Health. 2015 Feb;56(2):231–7.
16. Resnick M. Protecting adolescents from harm. Findings from the National Longitudinal Study on Adolescent Health. JAMA: The Journal of the American Medical Association. 1997 Sep 10;278(10):823-32.
17. Bonell C, Parry W, Wells H, Jamal F, Fletcher A, Harden A, et al. The effects of the school environment on student health: A systematic review of multi-level studies. Health Place. 2013 May;21:180–91.
18. Tobler A, Komro K, Dabroski A, Aveyard P, Markham W. Preventing the Link Between SES and High-Risk Behaviors: "Value-Added" Education, Drug Use and Delinquency in High-Risk, Urban Schools. Prevention Science. 2011 Jun 1;12(2):211–21.
19. Widman L, Kamke K, Evans R, Stewart J, Choukas-Bradley S, Golin C. Feasibility, Acceptability, and Preliminary Efficacy of a Brief Online Sexual Health Program for Adolescents. The Journal of Sex Research. 2020 Feb 12;57(2):145–54.
20. Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, Shamseer L, Tetzlaff JM, Akl EA, Brennan SE, Chou R. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. International Journal of Surgery. 2021 Apr 1;88:105906.
21. Higgins J, Thomas J. Cochrane Handbook for Systematic Reviews of Interventions. 2021.
22. Richardson W, Wilson M, Nishikawa J, Hayward R. The well-built clinical question: A key to evidence-based decisions. ACP J Club. 1995;123:A-12-A-13.
23. The Joanna Briggs Institute. Checklist for Systematic Reviews and Research Syntheses. 2017.
24. Chong A, Gonzalez-Navarro M, Karlan D, Valdivia M. Do Information Technologies Improve Teenagers' Sexual Education? Evidence from a Randomized Evaluation in Colombia. World Bank Econ Rev. 2020 Jun 1;34(2):371–92.
25. Coyle K, Anderson P, Laris B, Barrett M, Unti T, Baumler E. A Group Randomized Trial Evaluating High School FLASH, a Comprehensive Sexual Health Curriculum. Journal of Adolescent Health. 2021 Apr;68(4):686–95.
26. Darabi F, Kaveh M, Farahani F, Yaseri M, Majlessi F, Davoud Shojaeizadeh D. The Effect of a Theory of Planned Behavior-based Educational Intervention on Sexual and Reproductive Health in Iranian Adolescent Girls: A Randomized Controlled Trial. Journal of Research in Health Sciences. 2017;17(4):400.
27. Haruna H, Hu X, Chu SK, Mellecker RR, Gabriel G, Ndekao PS. Improving sexual health education programs for adolescent students through game-based learning and gamification. International journal of environmental research and public health. 2018 Sep;15(9):2027.
28. Manaseri H, Roberts K, Barker L, Tom T. Pono Choices: Lessons for School Leaders From the Evaluation of a Teen Pregnancy Prevention Program. Journal of School Health. 2019 Apr;89(4):246–56.
29. Morales A, Carratalá E, Orgilés M, Espada JP. A preliminary study of the effectiveness of a program to promote sexual health among adolescents with divorced parents. Salud y drogas. 2017;17(1):37-44.
30. Scull T, Malik C, Morrison A, Keefe E. Promoting sexual health in high school: A feasibility study of a web-based media literacy education program. Journal of Health Communication. 2021 Mar 4;26(3):147-60.
31. Scull TM, Dodson CV, Geller JG, Reeder LC, Stump KN. A media literacy education approach to high school sexual health education: immediate effects of media aware on adolescents' media, sexual health, and communication outcomes. Journal of Youth and Adolescence. 2022 Apr;51(4):708-23.
32. Scull TM, Kupersmidt JB, Malik CV, Morgan-Lopez AA. Using media literacy education for adolescent sexual health promotion in middle school: Randomized control trial of Media Aware. Journal of Health Communication. 2018 Dec 2;23(12):1051-63.
33. Walsh S, Jenner E, Qaragholi N, Henley C, Demby H, Leger R, Burgess K. The Impact of a High School-Based Positive Youth Development Program on Sexual Health Outcomes: Results from a Randomized Controlled Trial. Journal of School Health. 2022 Dec;92(12):1155-64.
34. Widman L, Golin C, Kamke K, Burnette J, Prinstein M. Sexual Assertiveness Skills and

Sexual Decision-Making in Adolescent Girls: Randomized Controlled Trial of an Online Program. American Journal of Public Health. 2018 Jan;108(1):96–102.

35. Yakubu I, Garmaroudi G, Sadeghi R, Tol A, Yekaninejad M, Yidana A. Assessing the impact of an educational intervention program on sexual abstinence based on the health belief model amongst adolescent girls in Northern Ghana, a cluster randomised control trial. Reprod Health. 2019 Dec 15;16(1):124.

36. Widman L, Kamke K, Evans R, Stewart J, Choukas-Bradley S, Golin C. Feasibility, Acceptability, and Preliminary Efficacy of a Brief Online Sexual Health Program for Adolescents. The Journal of Sex Research. 2020 Feb 12;57(2):145–54.

37. Lameiras-Fernández M, Martínez-Román R, Carrera-Fernández M, Rodríguez-Castro Y. Sex Education in the Spotlight: What Is Working? Systematic Review. Int J Environ Res Public Health. 2021 Mar 4;18(5):2555.

38. Chinelli A, Salfa M, Cellini A, Ceccarelli L, Farinella M, Rancilio L, et al. Sexuality education in Italy 2016-2020: a national survey investigating coverage, content and evaluation of school-based educational activities. Sex Education. 2022 Oct 25;1–13.

39. Haruna H, Okoye K, Zainuddin Z, Hu X, Chu S, Hosseini S. Gamifying Sexual Education for Adolescents in a Low-Tech Setting: Quasi-Experimental Design Study. JMIR Serious Games. 2021 Oct 12;9(4):e19614.

40. McGregor A, Chin E, Rojek M, Digre K, Lopez A, Jenkins K, et al. Sex and Gender Health Education Summit: Advancing Curricula Through a Multidisciplinary Lens. Journal of Womens Health. 2019 Dec 1;28(12):1728–36.

41. Pichon M, Howard-Merrill L, Wamoyi J, Buller AM, Kyegombe N. A qualitative study exploring parent–daughter approaches for communicating about sex and transactional sex in Central Uganda: Implications for comprehensive sexuality education interventions. Journal of Adolescence. 2022 Aug;94(6):880-91.

42. Meherali S, Rahim KA, Campbell S, Lassi ZS. Does digital literacy empower adolescent girls in low-and middle-income countries: a systematic review. Frontiers in Public Health. 2021:2053.

43. Zanatta ET, Wanderley GP, Branco IK, Pereira D, Kato LH, Maluf EM. Fake news: The impact of the internet on population health. Revista da Associação Médica Brasileira. 2021 Oct 22;67:926-30.

44. Freeman JL, Caldwell PH, Bennett PA, Scott KM. How adolescents search for and appraise online health information: A systematic review. The Journal of Pediatrics. 2018 Apr 1;195:244-55.

45. Cleland J, Ingham R, Stone N. Topics for in-depth interviews and focus group discussions: partner selection, sexual behaviour and risk-taking [internet]. 2014 [cited 2023 May 12]. Available from: https://www.who.int/news/item/08-05-2014-asking-young-people-about-sexual-and-reproductive-behaviours