Serious games for sex education of adolescents and youth: integrative literature review

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Abstract *This study aims to map educational games related to the sexuality of adolescents/ young people, based on publications that occurred over the last decade (2011 to 2020). An integrative review was performed in the Web of Science, SCOPUS, MEDLINE/PubMed, and LILACS databases in September 2020, with the final inclusion of 16 studies. Games developed on four continents were identified, predominantly in high-income countries, with the United States of America and Brazil being those that published the most. The tools consisted mostly of videogames and digital games, with the adoption of simulated scenarios and plots. Regarding development, there was a preference for the participatory construction mode, while some also underwent a validation process. The tools addressed several areas of human sexuality and demonstrated a positive potential for use, with educational gains and changes in habits, but their results need to be carefully considered. Only the effects of three games were evaluated by randomized controlled trials.*

Key words *Sexuality, Adolescent, Health education, Play and playthings*

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Introduction

Sexuality is a multifactorial phenomenon observed not only in sexual behavior and practices, but also in feelings, desires, and affectionate bonds. Despite being expressed from birth, it is during adolescence and youth, a transitional phase that extends from 10 to 24 years of age, that it becomes evident[1].

Motivated by desires, passions, and curiosity, experiences specific to this phase put boys and girls in vulnerable conditions that are capable of having repercussions throughout their lives. Violence, teenage pregnancy, and diseases are some examples of these experiences. Therefore, it is necessary to make room for discussion to promote sexual and reproductive health, focusing on recognizing one's own body, providing guidance on protective and risky behaviors, breaking through prejudices, and talking about realities[2].

Although relevant, discussions about sexuality with the adolescent population are surrounded by taboos that interfere, directly or indirectly, in the healthy experience and exercise of sexuality. Within the nuclear family, these discussions are often not discussed between parents and children, are seen as a source of discomfort, and are almost never treated as naturally as they should be. At school, the subject is approached superficially and shows low transformative potential in promoting health[3].

Thus, there is an clear need to expand opportunities to discuss sexuality with young people, favoring innovative and attractive approaches to ensure greater adherence and effectiveness of actions. As an option, educational-care technologies are intended to take advantage of the technological potential to engage individuals in their own health care[4].

Among the technologies applied to health, educational games with content and purpose, also known as serious games, play an important role. Conceptually, they represent games that go beyond entertainment, promoting health, contributing to the discussion of sensitive topics, as well as educating, guiding, and encouraging healthy habits and behaviors[5].

Evidence shows that games about sexuality help to better understand the subject, encourage attitude change, and promote safe sexual practices[6,7]. In addition, they foster critical thinking and guide decision-making and problem-solving, while creating a sense of responsibility[8].

It should be noted that, until 2013, based on an analysis of the literature, there were very few games on sexual health, as opposed to what was observed in other health-promoting contexts. Furthermore, studies were concentrated in high-income countries, with no record in low- and middle-income countries[5]. In this light, there is an identifiable need to analyze the spatial and theoretical-methodological behavior of the study of this topic in recent literature, recommending current options of games to be used by educators to approach the subject with young people.

Based on the foregoing information, considering the adolescent/young population as being adept at using technologies, recognizing the importance of sexuality in their lives, and identifying the need to situate the current state of knowledge on the subject, especially with regard to Brazilian data, this study aimed to map educational games related to sexuality in adolescence and youth from publications over the last ten years (2011-2020).

Method

This is an integrative literature review involving six steps: 1st – the identification of the topic and formulation of the research question; 2nd – the establishment of the inclusion and exclusion criteria and literature search; 3rd – the definition of the information to be extracted and its categorization; 4th – the evaluation of the articles included; 5th – the interpretation of results; and 6th – the synthesis of knowledge[9].

To construct the core question of the study and set up the search strategy, the terms were organized according to the PICOT strategy (P – problem, I – interest, CO – context, T– time)[10]. Educational games represented the study problem; the interest was sexuality in the context of adolescence/youth, and the reference time was the last ten years (2011-2020). It was then possible to formulate the research question: "What is the current state of the art on educational games related to sexuality in adolescence and youth produced between 2011 and 2020?"

All terms belonging to the same element of the PICOT strategy were combined with the Boolean operator "OR", and the expressions for each element were combined with the "AND" connector. The organization of controlled and uncontrolled descriptors generated the following general search expression: *("Play and Playthings" OR Technology OR "Game" OR "Pedagogical Device") AND (Sexuality OR "Sex Education" OR "Sexual Development" OR "Reproductive Health" OR "Sexual Health" OR "Sexual Behavior" OR "Pregnancy*

in Adolescence") AND (Adolescent OR "Adolescent Health" OR Youth). Organizing the terms and formulating the search strategy followed the specific recommendations for each database.

The search was conducted in September 2020 in the following databases: Web of Science – Main Collection (Thomson Reuters Scientific), SCOPUS (Elsevier), MEDLINE/PubMed (via National Library of Medicine), and LILACS (via Biblioteca Virtual em Saúde – BVS). The primary findings were filtered by time period (2011-2020) and type of publication (excluding book chapters, theses, and dissertations; texts published in conference proceedings; editorials; and letters/notes).

The time frame is justified by the lack of consolidated data on recent literature on the subject. It is important to note that, despite the existence of a review of the literature on games published until July 2013, this study does not include research bases from Latin America[5]. For that reason, the present review chose to extend the coverage period to the last decade.

Original articles (methodological and interventional) that presented a serious game on sexuality, aimed at the adolescent/young population, were included. The following exclusion criteria were adopted: studies that presented other educational interventions (curricular programs, mobile applications, and multimedia interventions), articles that did not include enough details to characterize the educational game (type, focus, and dynamics), and those that presented repeated games that were already included in the review.

The studies were selected by two researchers from the health area in order to reduce the risk of bias. A third evaluator was consulted in case of disagreement. Initially, titles and abstracts were analyzed. The texts included in the second stage were read in full to define the final sample (16 articles). The search flowchart is shown in Figure 1.

The final sample was characterized by having the researchers fill out a form extracting the following variables: title, authors, year, country, target audience, game characterization (type, name, and focus), methodology, results, conclusions, and limitations.

Results

This review resulted in the identification of 16 serious games that focused on the sexuality of adolescents and young people and were published between 2011 and 2020. The characteristics of the studies will be described in Chart 1

and the methodological paths and main findings in Chart 2. The limitations and implications for future studies are also highlighted.

Serious games for sex education over the last decade (2011-2020): study characterization

The development of educational games focused on the sex education of adolescents were predominantly developed in high-income countries, such as the United States of America[6,11-16], England[17], and Hong Kong[18]. Interestingly, studies were also identified in low- and middle-income countries, such as Brazil[19-22], India[3], Kenya[8], and Tanzania[7].

Regarding the types of games, there was a predominance of video games and digital games. Only three games broke the rule, two card games (*Contando bem que mal tem?*[21] and *InFection Four*[16]) and a board game (*A aventura do adolescente com TEA: descobrindo a sexualidade*[19]). Most authors chose to restrict the age group of the technology's target audience, with games recommended for the early[7,8,15,17] or later years of youth[3,11,12,22].

In terms of focus, serious games encompass several areas of human sexuality. Among them, it is possible to mention: *Making Smart Choices*[18], focusing on knowledge and attitudes about sex among adolescents; *Contando bem que mal tem?*[21], about sexually transmitted infections and preventive methods; and *Lucidity*[14] and *PREPARE*[17], dealing with violence and sexual coercion. In addition, some specific population groups were prioritized, such as adolescents with autism (*A aventura do adolescente com TEA: descobrindo a sexualidade*[19]), females (*DRAMA-RAMA*[15]), Latin Americans (*Sexpert High School*[6]), and residents of low-tech areas in sub-Saharan Africa (*My Future Begins Today*[7]).

Sex education through games: what do the studies say?

Most serious games were developed in a participatory way by multidisciplinary groups[3,7,13,14,16-18], while some underwent a systematic validation process[11,18,20] or were evaluated by means of intervention studies to measure the tool's effect on the target population[2,3,6,8,15,16,17]. Chart 2 presents the methodological paths and main results of the studies included in this review./

As mentioned, there was a predominance of digital games, with most of them using simulated

scenarios, including plots, characters, and interactive dialogues through which adolescents are encouraged to build relationships, make choices, and experience their consequences. Nine of the identified games were designed from this perspective[6-8,11-13,15,18,22].

Digital games also made use of other plots. *DECIDIX*[20] simulates the interface of an instant messaging application, while *PREPARE*[17] uses the backdrop of a game show. Furthermore, two games chose to present a narrative about the different developmental milestones (*My Future Family*[3]) or phases of the characters' lives (*Lucidity*[14]).

Other methodologies were used in addition to digital games. *A Aventura do Adolescente com TEA: Descobrindo a Sexualidade* is a board game that contains 17 illustrated houses, three pawns, a single die, an illustrated book, and a puzzle whose main plot takes place in a camp[19]. Two card games were identified as well. *Contando bem que mal tem?* consists of the shared construction of a story based on picture cards that are intentionally or randomly presented by the facilitator[21]. *Infection Four* is a collaborative, multiplayer card game that features a fictional storyline about heroes and villains[16].

The way the games are presented and their degree of interactivity have much to say about their acceptance by the target audience. Strategies that promote engagement, such as the possibility of being customized[11], the unlocking of new functions[12], and reward systems that reward correct answers and positive actions[8], make them more entertaining and stimulating. Moreover, these criteria favor their effectiveness through the development of social skills[15,19].

An analysis of the studies affirmed that sexuality in adolescence is still treated as a social taboo, and the use of games to approach the subject reveals an innovative potential since, through playfulness and the interactive approach, it results in educational benefits. In addition to facilitating the acquisition of information[3,6,7], these games boost self-efficacy and risk perception[12,15], encourage behavioral change, and promote conscious decision-making[17]. In this sense, educational technologies demonstrate high acceptability, utility, and usability, while promoting the sharing of ideas, experiences, reflections, and discussions[7,20].

The following limitations and challenges were observed: the complexity of the games makes
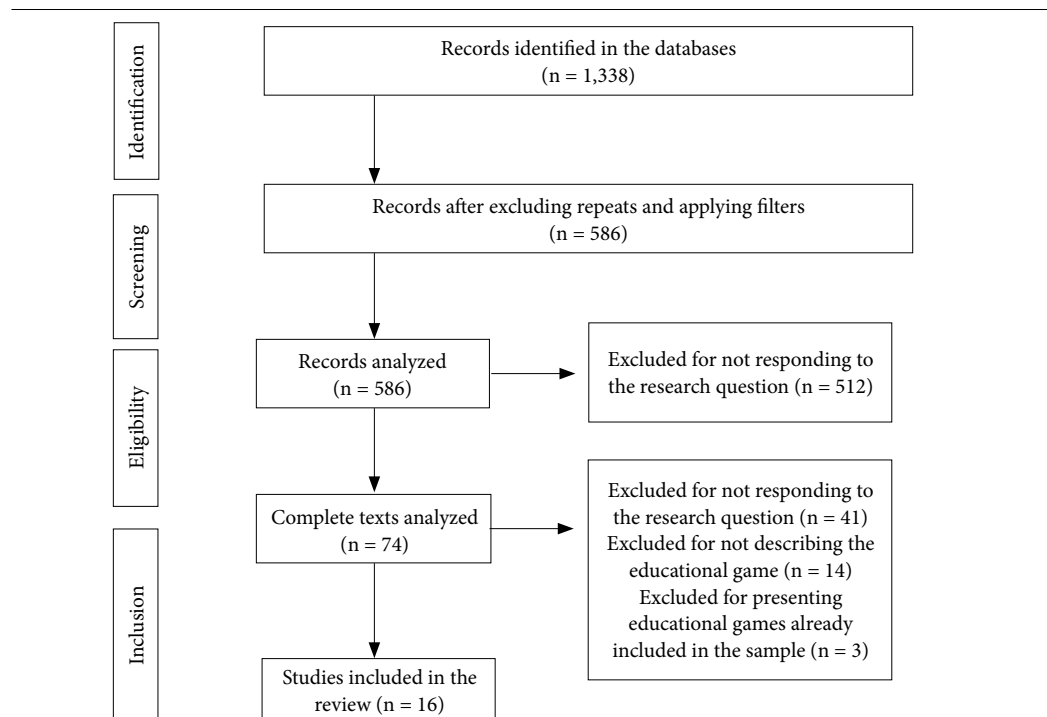
Figure 1. Representative flowchart of the database search.

Source: Authors.

Chart 1. Chracterization of selected studies. Pedreiras/MA, 2020.

Authors, year	Name of game	Target-public (age)	Type of game	Focus of game
Patchen et al., 2020	*SAAFE*	African-American youth (15 to 21)	Videogame	Sexuality
Pensak *et al*., 2020	*Sexpert High School*	Hispanic teens	Videogame	Sexuality
Haruna *et al*., 2019	*My Future Begins Today*	Students (11 to 15) from Sub-Saharan Africa	Gamified learning platform	Sexual health
Winskell; Sabben; Obong'o, 2019	*Tumaini*	African preteens (11 a 14)	Smartphone game	HIV prevention
Conceição *et al*., 2019	A aventura do adolescente com TEA: descobrindo a sexualidade	Teens with mild ASD (12 to 18)	Board game	Sex education
Monteiro *et al*., 2018	DECIDIX	Teenagers (11 to 19)	Digital game	Sexual and affectional relationships
Sousa *et al*., 2018	Contando bem que mal tem?	Teenagers	Card game	Corporeality, relationships, STD, and contraceptive methods
Bertozzi *et al*., 2018	*My Future Family*	Teenagers (14 to 19)	Digital game	Puberty, sexual and reproductive health, and contraception
Gariepy *et al*.,2018	-	Black and Hispanic teens (15 to 17)	Digital game	Risky sexual behaviors
Souza *et al*., 2017	Papo Reto	Teenagers (15 to 18)	N-line game	Sexuality and gender relations
Fiellin *et al*., 2016	*PlayForward: Elm City Stories*	Teenage minorities	iPad video game	Risky behaviors, including those associated with HIV
Gilliam *et al*., 2015	*Lucidity*	Teenage high school students	Videogame	Sexual violence
Norris *et al*., 2015	*DRAMA-RAMA™*	Hispanic female preteens	Virtual reality game	Peer pressure and risky sexual behavior
Chu *et al*., 2015	*Making SmartChoices*	Teenagers (12 to 16)	Online game	Knowledge and attitudes towards sex
Gilliam *et al*., 2014	*InFection Four*	Teenagers	Card game	STD
Arnab *et al*., 2013	*PREPARE*	Teenagers (13 to 14)	"Game show" videogame	Sexual coercion in relationships

HIV – human immunodeficiency virus; ASD – autistic spectrum disorder; STD – sexually transmitted disease; (-) – data not reported.

Source: Authors.

them hard to understand[14], the use of a fictional plot generates low engagement, technical language interferes with understanding, and playing them in large groups generates confusion[16]. Furthermore, it is important to point out the lack of low-cost technologies capable of integrating educational practices in unfavorable socioeconomic contexts[7].

As such, some basic criteria need to be observed when developing educational technologies for the adolescent population, namely: using simple and direct language, clear rules and low

Chart 2. Methodological characteristics and main results of the selected studies. Pedreiras/MA, 2020.

Authors, year	Methodology	Results
Patchen *et al.*, 2020	Methodological study in three stages (advisory board for the development of the game prototype, usability testing, and focus groups).	Preference for simulation games that are customizable, modern, competitive, fun, and educational. The SAAFE game was developed and presented satisfactory usability.
Pensak *et al.*, 2020	Methodological study (participatory construction) and intervention, time series type, with a group.	The Sexpert High School game was designed, demonstrated high feasibility and acceptability. Increased knowledge about condoms.
Haruna *et al.*, 2019	Methodological study (participatory construction) and intervention study (semi-experimental, pre- and post-test).	My Future Begins Today was designed, generated knowledge about sexual health, and spurred a change in attitude.
Winskell, Sabben, Obong'o, 2019	Methodological study (participatory construction).	Development of the Tumaini game, which allows interactive construction of narratives, offers mini games with themed challenges, and a connection between the game and the player's personal life.
Conceição *et al.*, 2019	Methodological study - previous integrative review.	The review showed a scarcity of materials on the subject. The "A aventura do adolescente com TEA: descobrindo a sexualidade" game was then developed.
Monteiro *et al.*, 2018	Methodological validation study by experts and target audience	The DECIDIX game allowed debate, stimulated autonomy, knowledge sharing, and promoted important experiences.
Sousa *et al.*, 2018	Methodological validation study by experts.	"Contando bem que mal tem?" was validated in terms of appearance and content and proved to be useful for educational practices.
Bertozzi *et al.*, 2018	Methodological study (participatory construction) and intervention study (semi-experimental, pre- and post-test).	My Future Family featured high gameplay and educational benefits.
Gariepy *et al.*, 2018	Methodological and intervention study (quasi-experimental, time series, with one group).	The game increased knowledge, self-efficacy, and risk perception but had no effect on adolescents' intentions.
Souza *et al.*, 2017	Methodological study (validation by experts and qualitative assessment of the game).	Papo Reto was constructed, validated, and demonstrated better knowledge about sexuality by sharing experiences and reflections.
Fiellin *et al.*, 2016	Methodological study (participatory construction) and intervention (randomized controlled trial with two groups, time series type).	PlayForward was built, and the results of the intervention study are still under construction.
Gilliam *et al.*, 2015	Methodological study (participatory construction) and intervention (qualitative evaluation of the game).	Lucidity was designed and perceived as an attractive, interactive game, but hard to understand. It has helped to acquire knowledge and promote awareness of sexual health and violence.
Norris *et al.*, 2015	Intervention study (controlled and randomized trial) with two groups, time series type.	DRAMA-RAMA™ proved capable of increasing self-efficacy to resist peer pressure.
Chu *et al.*, 2015	Methodological study (participatory construction) and intervention, with a group, pre- and post- test.	Making Smart Choices was classified as fun/interesting, and increased participants' knowledge, influencing their attitudes/decisions.
Gilliam *et al.*, 2014	Methodological study (participatory construction) and intervention (game incorporated into the sex education curriculum), with a group, post-test.	Only 27% of teenagers said they learned with the game InFection Four, with symptoms, treatment, and prevention being the topics with the greatest impact.
Arnab *et al.*, 2013	Methodological study (participatory construction) and intervention (controlled and randomized trial, with two groups, pre- and post-test).	PREPARE facilitated the recognition of coercive situations, risk factors and behaviors, in addition to helping in decision-making.

Source: Source.

complexity, free from judgment/embarrassment and respect for privacy; demonstrating an approximation with reality, adapted to age group and sociocultural characteristics; inserting a professional mediator to direct the application of the game; and adopting the participatory design method.

Finally, it should be noted that, although most of the studies acknowledge positive signs of using games for sex education, measuring the effect is still limited. Only three of the sixteen studies presented a randomized controlled trial[13,15,17], the gold standard for assessing intervention effects, involving 45 to 505 participants. There was a predominance of pilot tests without randomization of the participants and the control group, as well as an insufficient number of participants and a lack of sample diversity.

Discussion

This study presents sixteen educational games focusing on the sexuality of adolescents and young people, published over the last decade (2011-2020). Regarding geographic distribution, studies published in America (North and South), Africa, Europe, and Asia were identified. There was a predominance of digital games. The games discussed various topics within the scope of sexuality, such as corporeality and relationships, diseases, contraceptive methods, and sexual violence. The results are promising; however, there is a methodological deficiency, namely the small number of controlled and randomized intervention studies.

There is a growing trend in the use of serious games for health education purposes. A scope review conducted in the PubMed and Science Direct databases identified studies published between 1985 and 2018, with considerable growth since 2011 and a peak from 2015. A total of 161 studies were identified, focusing on health professionals (26.1%), patients (23.6%), and the general population (46.6%). The topics varied considerably, and only eight of the games focused on sexuality[23].

Contrary to what has been observed in other contexts, the use of serious games in sex education is still limited. A systematic review with meta-analysis developed in PubMed, Web of Science, CINAHL, and PsycINFO identified only seven studies published on the subject until July 2013.

In addition to being scarce, especially in middle/low-income countries, there was a lack of rigor in assessing the effectiveness of these games, especially in relation to measuring their long-term effects[5].

The development of games has shown significant importance in promoting educational and health actions. Traditional pedagogical models are gradually losing ground, and the use of games as a pedagogical tool is increasingly present in the context of health. In that respect, serious games use playfulness to teach while entertaining, facilitating adherence and the effectiveness of these actions[24].

Faced with the trend of change in pedagogical posture, the use of new methodologies also raises concerns and requires caution in the educational setting. Immersion in playful fantasies, especially in relation to digital formats, can lead to dependence/addiction, interfering with sleep quality, nutritional and hygiene standards, and social interaction, setting the stage for anxious, aggressive, and compulsive situations among young people. Therefore, the support network needs to be attentive to any changes in behavior, and educators are encouraged to use games rationally so that the risks do not outweigh the expected benefits[25].

It is recommended that educational games be adapted to the reality of the target audience to ensure a balance between education and entertainment and as a way to boost engagement[11]. The young population shows greater adherence to low-complexity and easy-to-understand games[6], which should be appropriate for the age group[11] and the sociocultural characteristics[7] of the target audience. Strategies involving competition and cooperation are other ways to bolster young people's engagement[16], as well as the use of gamification, using rewards and penalties[11].

In addition to promoting communication about sexuality with young people, these games encourage discussions on topics considered taboo, especially when they are played in groups[14]. From this perspective, using group games benefits from the presence of an instructor (health or education professional) who mediates discussions and raises the quality of the players' experiences. It should be noted that smaller groups perform better[16] and favor the exchange of opinions[17].

It is important to prioritize interactivity during discussions. Making room for pauses for further discussion of situations and issues that have arisen encourages active reflection, including the possibility of changing attitudes[17]. This is because the kind of interaction that occurs

during the game intensifies learning and reflections about the situations, fortifying the development and maturation that make up the psychological basis of adolescents[21].

The reflections mediated by games reveal a protective role, encourage the acquisition of life skills, and present high acceptability. Teenagers classify them as fun and interesting because of their innovation and interactivity, while acknowledging their pedagogical benefits[18]. In addition to being widely accepted by the target audience, the authors call attention to the parents' positive evaluation on the use of educational games as a way for their preteen and teenage children to learn about sexuality[3].

Educational games prove to be beneficial to adolescent sex education as they promote information, knowledge, and behaviorial change[6]. By reflecting on real-life situations, games sharpen critical thinking skills, encourage decision-making and problem-solving, and instill a sense of responsibility[8].

Despite the benefits suggested by the studies, the real effects of games on the target population deserve further investigation. Future studies should invest in methodological designs that contribute to a better assessment of the effect of the intervention in the short, medium, and long term[3]. There is also an interest in expanding the number of participants and adopting diversified samples in terms of socioeconomic and cultural characteristics[21].

Despite the limitations and the impossibility of making generalizations, the results indicate that public health policies aimed at the adolescent population should involve playful, innovative, and attractive strategies, especially when mediating sensitive issues that are difficult to approach. Within this framework, serious games emerge as valid and promising options that provide rich, engaging experiences for young people[17].

Final considerations

The development of serious games aimed at the sexuality of adolescents and young people is an expanding area of knowledge, which has undergone a greater geographic distribution over the last decade (2011-2020). However, the number of investigations on the subject is still limited.

The public's preference for digital games was observed, covering a spectrum of different approaches and topics. Most of the studies involved participatory construction methods and/or systematic validation processes. Although the results are promising, there is a methodological deficiency in the evaluation of the impact of these games on the knowledge and attitudes of adolescents and young people with few controlled and randomized studies.

This study maps and disseminates game options about sexuality to the academic and professional communities, and identifies trends observed over the last decade (2011-2020). The limited number of investigations justifies the need for further development, especially in the design of more robust studies that investigate the real effect of games on the sexual health of adolescents and young people.

Collaborations

NES Alencar worked on the conception, design, data collection, analysis and interpretation. MAO Pinto e NT Leite worked on the data collection, analysis and interpretation. CMV Silva worked on the data analysis and interpretation. All authors contributed and approved the final version.

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