

Pornography Use and Sexual Risk Behaviors in Adolescents: A Systematic Review

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Abstract: The objective of this systematic review was to determine whether there is an association between pornography use and sexual risk behaviors in adolescents. A search for scientific articles was carried out in the PsycINFO, PubMed, Scopus and Web of Science databases, obtaining a total of 706 studies. After the selection process, 20 studies were included. In general, the results of the included studies show that pornography use in adolescents is associated with sexual risk behaviors such as early sexual debut, a greater number of sexual partners, condomless sex, having sex under the influence of alcohol/drugs, among others. However, these associations should be interpreted taking into account conceptual and methodological aspects, such as the absence of conceptualization, identification and evaluation of third variables that could better explain this association; as well as the low methodological quality of the included studies, in terms of external and internal validity, making it difficult to generalize and compare the results obtained. Therefore, it is suggested the need to investigate the association between pornography use and sexual risk behaviors in adolescents, taking into account possible third variables and using representative samples, as well as valid and reliable instruments to assess pornography use.

Keyword: Pornography

Uso de Pornografía y Comportamientos sexuales de Riesgo en Adolescentes: Una Revisión Sistemática

Resumen: El objetivo de esta revisión sistemática fue determinar si existe una asociación entre el consumo de pornografía y las conductas sexuales de riesgo en adolescentes. Se realizó una búsqueda de artículos científicos en las bases de datos PsycINFO, PubMed, Scopus y Web of Science, obteniéndose un total de 706 estudios. Tras el proceso de selección, se incluyeron 20 estudios. En general, los resultados de los estudios incluidos muestran que el consumo de pornografía en adolescentes se asocia con conductas sexuales de riesgo como el inicio precoz de las relaciones sexuales, un mayor número de parejas sexuales, relaciones sexuales sin preservativo, mantener relaciones sexuales bajo los efectos del alcohol/drogas, entre otras. Sin embargo, estas asociaciones deben ser interpretadas teniendo en cuenta aspectos conceptuales y metodológicos, como la ausencia de conceptualización, identificación y evaluación de terceras variables que puedan explicar mejor esta asociación; así como la baja calidad metodológica de los estudios incluidos, en términos de validez externa e interna, dificultando la generalización y comparación de los resultados obtenidos. Por tanto, se sugiere la necesidad de investigar la asociación entre el uso de pornografía y las conductas sexuales de riesgo en adolescentes, teniendo en cuenta posibles terceras variables y utilizando muestras representativas, así como instrumentos válidos y fiables para evaluar el uso de pornografía.

Palabra clave: Pornografía

Introduction

Adolescence is understood as the broad stage that goes from 10 to 19 years of age, becoming, in general, a fundamental period in the development of human beings, such as the formation of their identity and personality, and being a period of vital importance in the beginning of their first affective-sexual experiences (Furman & Rose, 2015; Ramiro-Sánchez et al., 2018; UNICEF, 2011). The biological and psychosocial transformations that often take place during adolescence will be accompanied by new and different ways of experiencing sexuality and affective relationships with others. Thus,

the pursuit, initiation, and exploration of sexuality and relational intimacy will follow very different trajectories, but, in any case, they will become central aspects in many developments for adolescents (Collins et al., 2009; Furman & Rose, 2015; Shulman & Connolly, 2015). In this period, when sexual interest is usually aroused, pornography could become particularly relevant, specifically in a substantial minority of adolescents who are initiated in its use (Andrie et al., 2021; Chen et al., 2013; Peter & Valkenburg, 2016).

Pornography can be defined as professionally produced or consumer-generated images or videos intended to sexually arouse the viewer (Peter & Valkenburg, 2011b). On the one hand, traditional pornography is based on mass media such as movies, television, and magazines. On the other hand, Internet pornography use is the online viewing or downloading of images and videos where genitals are exposed and/or people are having sex with the intention of stimulating a sexual reaction in the viewer (Peter & Valkenburg, 2011b, 2016).

Prevalence rates of intentional pornography use in adolescents vary widely. Thus, for example, Ybarra et al. (2011) reported that 15% of the United States aged 12 to 17 years had viewed pornography in the past year. While Wolak et al. (2007) found that 34% of US aged 10 to 17 years had intentionally viewed pornography in the past year, although younger adolescents aged 10 to 12 years viewed less pornography intentionally (only 2% to 5% in boys and 1% of girls). On the other hand, Chen et al. (2013) reported that 59% of 10th- to 12th-grade Taiwanese students had viewed Internet pornography in the past year. A recent study with a sample of 10,930 adolescents from six European countries (Greece, Spain, Poland, Romania, the Netherlands and Iceland) revealed that the prevalence of online exposure to pornography was 59% in the past year (Andrie et al., 2021). While it is true that the exact prevalence of pornography use globally by adolescents is difficult to wield (due to methodological differences, changes in technology, and variability in the sociocultural context of different studies), it can be stated that a substantial minority of all adolescents use pornography (Peter & Valkenburg, 2016). On the other hand, there is greater agreement that intentional exposure to pornography by adolescents is greater with increasing age and varies with gender (Mitchell & Wells, 2007; Tsaliki, 2011). With respect to gender, different studies have shown higher pornography use by boys compared to girls in different samples of adolescents (Andrie et al., 2021; Bleakley et al., 2011; Luder et al., 2011; Ševčíková et al., 2014). However, a study of adolescents from different European countries showed that gender differences in intentional pornography use, where boys viewed more pornography than girls, were attenuated in countries with a more liberal culture (Ševčíková et al., 2014).

Some authors claim that the taboo of sexuality in adolescents and young adults favors the use of pornography as an important source of sex education, especially when other sources of information are absent or limited (Harkness et al., 2015; Lehmilller, 2018; Roldán, 2019, 2022). This has promoted concern and worry about what adolescents may learn when viewing pornography (Doornwaard et al., 2015; Flood, 2009; Strasburger & Hogan, 2013), with a focus on some pornography content, such as frequent non-use of condoms (Miller & McBain, 2021) and concern that adolescents may not be able to discern between the fiction depicted in pornography and real sexual relationships (Baams et al., 2015; Brown & L'Engle, 2009; Wrigth & Štulhofer, 2019). However, there is limited consensus on what consumers of pornography learn from it (Albury, 2014). A systematic review of research on the use of pornography for sexual learning (Litsou et al., 2020) concluded that none of the articles reviewed measured or even discussed whether pornography consumers have better or worse skills and knowledge about sex and sexual health compared to non-consumers. Furthermore, that review concluded that pornography use can provide useful information about the mechanics of sex, particularly

in young homosexuals and, that many articles reveal that young people are often aware of the inadequacies of pornography as a source of information and guidance (Litsou et al., 2020).

Regarding the explanation of the relationship in the use of pornography and the learning of sexual behaviors, including sexual risk behaviors, some of the theories used, such as the Sexual Script Theory (Simon & Gagnon, 1986) and Bandura's Social Cognitive Theory (1986), are not exempt from criticism (Fisher & Kohut, 2020). Thus, for example, according to Sexual Scripts Theory (Simon & Gagnon, 1986), sexual scripts are internalized cognitive schemas that represent social messages, which guide sexual decision-making, desires, expectations and behavior in sexual relationships. Therefore, pornography could be an important source through which sexual scripts related, for example, to condom use are acquired, modified, or acted upon (Weinberg et al., 2010; Wright, 2011). Another theory explaining the relationship between pornography consumption and sexual behaviors is Bandura's (1986) Social Cognitive Theory, which suggested that, from modeling, sexual risk behaviors can be acquired. Specifically, the association of positive rewards (e.g., male orgasm) with unsafe sexual behaviors depicted in pornography, in the absence of negative consequences, could increase desirability and the likelihood of enacting this unsafe behavior (Seto et al., 2001). However, authors such as Fisher and Kohut (2020) caution that such theories only take into account the pornographic stimulus without paying attention to the individual characteristics of the pornography consumer, such as learning history, and the complexity of situational and contextual factors (Fisher & Barak, 2001), such as measures of consensual and non-consensual activity that result (or covary) from pornography consumption. The use of other theoretical models such as the ACE (Antecedents - Context -Effects) Model proposed by Campbell et al. (2017) could compensate for these shortcomings by taking into account that pornography consumption could be driven by a number of antecedents (e.g., individual differences, gender, culture, life experiences), which also determine the specific contexts of use (e.g., frequency of use, solitary or joint use, content of use); and which in turn result in innumerable possible consequences (e.g., positive, negative, or neutral).

The possible relationship between pornography use and sexual risk behaviors have been investigated in adolescents, emerging youth and adults, with unclear results on the existence (or not) of a relationship (or association) between the two variables and the variables that mediate, moderate or confound that relationship (see, e.g., Amare et al., 2019; Harkness et al., 2015; Koletić, Kohut et al., 2019; Peter & Valkenburg, 2016; Sinkovic et al., 2013; Smith et al., 2016; Tokunaga et al., 2020; Wright et al., 2016; Wright et al., 2019). Despite this, pornography literacy is recommended and implemented from different agencies (Department for Education UK, 2019; Maas et al., 2022; Rothman et al., 2018). Therefore, as recommended by several authors (Crabbe & Flood, 2021; Davis et al., 2020; Dawson et al., 2020; Rothman et al., 2020) it is necessary to know the effects (or not) of pornography reliably as well as the types of sexual risk behaviors that will be disinhibited by viewing pornography (or not) and which individuals may be most affected in order to develop a solid conceptual framework upon which pornography literacy intervention can be based and effective, in case it is necessary to implement it.

In the last decade, several systematic reviews and meta-analyses have been conducted on aspects related to adolescent pornography use (Alexandraki et al., 2018; Peter & Valkenburg, 2016; Smith et al., 2016). Thus, Peter and Valkenburg (2016), in a systematic review spanning the period from 1995 to 2015, concluded that pornography use was associated with permissive sexual attitudes, and gender stereotyped sexual beliefs, casual sex, and increased sexual aggression. However, with respect to sexual risk behaviors only three studies were identified that presented mixed results (Luder et al., 2011; Peter & Valkenburg, 2011a; van Ouytsel et al., 2014). Furthermore, in one of

the studies the age range of the sample was above 19 years (Luder et al., 2011), or in another study sexting was mentioned as a sexual risk practice (van Ouytsel et al., 2014). In the systematic review and meta-analysis by Smith et al. (2016) on exposure to sexually explicit websites or Internet pornography use the sample spanned the period from 10 to 24 years, and they concluded that Internet pornography use correlated in two studies with condomless sex (Braun-Courville & Rojas, 2009; Luder et al., 2011). On the other hand, in the systematic review by Alexandraki et al. (2018) in adolescents aged 12 to 18 years, a classification of studies in individual, contextual and activity factors related to pornography use is made, but sexual risk behavior is not deeply analyzed. With all this, the boom in reviews on adolescent pornography use is evident, however, the age range covered in each of the reviews differs and does not specifically include the 10 to 19 years period delimited by the World Health Organization (1998) or UNICEF (2011). In addition, there is no specific and comprehensive analysis of the studies with respect to adolescent sexual risk behavior, as has been done in other youth and adult populations (Amare et al., 2019; Harkness et al., 2015; Tokunaga et al., 2020).

Objective

Given the above and the rapid increase in publications on pornography use in recent years, the overall objective of this systematic review is to determine whether or not an association exists between pornography use and sexual risk behaviors among adolescents aged 10-19 years.

Method

First, the Preferred Reporting Items for Systematic Reviews (PRISMA, Moher et al., 2009), recently updated 2020 (Page et al., 2021) guidelines were followed to contribute to the quality assurance of the review process and its replicability.

Inclusion and Exclusion Criteria

Studies that met the following criteria were selected: (a) Studies that investigated the association between pornography use and sexual risk behaviors (coital sexual initiation, early age of sexual debut, condomless sex, number of sexual partners, and unsafe sexual practices); (b) The sample was composed of adolescents with an age range between 10 and 19 years following the United Nations definition of adolescence (UNICEF, 2011); (c) They were research articles published in peer-reviewed scientific journals; (d) They were not theoretical studies or reviews; and (e) The language was English, Spanish or French.

Search Strategy and Information Sources

The literature search was conducted until May 2022 in the following databases: PsycINFO, PubMed, Scopus and Web of Science. The search strategy used was: <<(Risk* sexual behav*) AND (Adolesce* OR Teen* OR Youth) AND (Porn*)>>. This search strategy was inserted in the search fields corresponding to the title, abstract and keywords. Subsequently, taking into account the inclusion criteria, the type of document/publication source was limited to scientific article/scientific journal, as allowed by the database. A secondary search was also performed by reviewing the bibliographic references of the articles resulting from the search strategy.

Selection Process for Included Studies

All the abstracts of the studies resulting from the search were analyzed to check whether they met the inclusion/exclusion criteria by two investigators independently. When the abstract did not provide all the required information, the full text was accessed. When there were differences among the investigators or doubts as to whether the criteria for inclusion/exclusion in a registry were met, they were discussed jointly and a consensus was reached. The management of the references of all the results for checking the inclusion criteria and analysis of the included studies was carried out manually using Microsoft Office Excel.

Data Analysis and Synthesis

Once the articles that met the inclusion criteria were selected, the following information was extracted from each of them:

- Author(s) and year of publication.
- Study design: Cross-sectional or longitudinal.
- Sample characteristics: number, origin, gender and age range of participants.
- Instrument used to assess pornography use: The instrument used (or if it was developed ad hoc), as well as the reliability of this, if it was reported.
- Variable "use of pornography": The definition and/or mode of evaluation of the indicated variable is collected.
- Sexual risk behaviors: The types of sexual risk behaviors assessed (e.g., initiation of coital sex, early coital sexual initiation, number of sexual partners, condomless sex, and unsafe sexual practices such as sex under the influence of alcohol/drugs) are indicated.
- Main results. The main findings regarding the association between pornography use and sexual risk behaviors were highlighted.
- Methodological quality of the studies: the total score obtained after application of the version adapted for non-intervention studies of the Quality Index Scale (Ferro & Speechley, 2009).

Methodological Quality of Included Studies

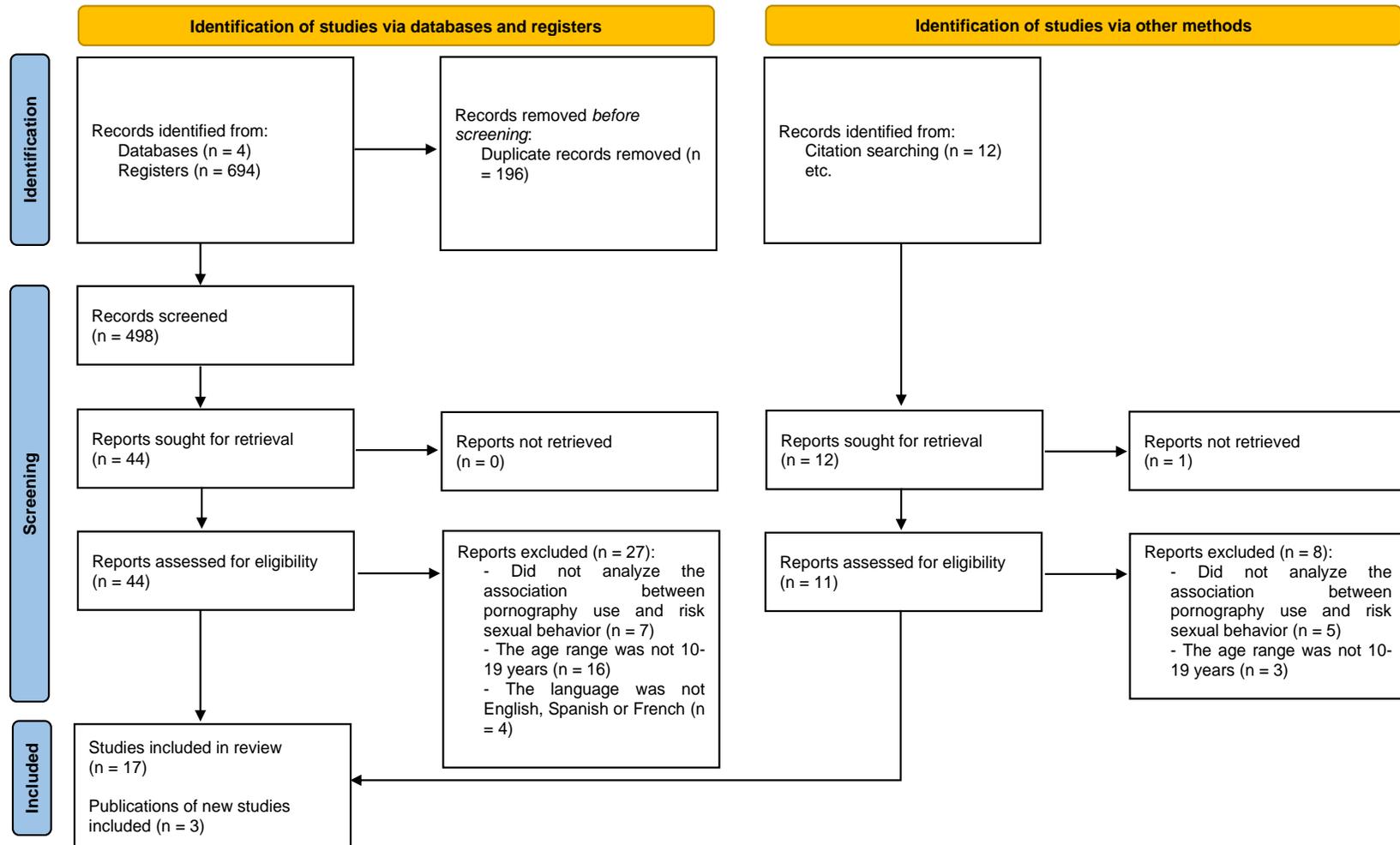
The methodological quality of the studies was assessed using an adapted version of the Quality Index Scale (Down & Black, 1998) that allows the evaluation of non-intervention studies (Ferro & Speechley, 2009). The scale consists of 15 items with two response options (0 = no/cannot be determined or 1 = yes) in which four aspects are evaluated with respect to study standards: (a) Reporting (range 0 to 7); (b) External Validity (range 0 to 3); (c) Internal Validity (range 0 to 4); and (d) Power (range 0 to 1). The maximum score is 15 points, with high scores indicating higher methodological quality.

Results

Studies Included

A total of 706 studies were obtained, of which 694 were identified from searches of the four databases and 12 by manual citation searches. After elimination of 196 duplicate studies and 490 studies for not meeting the inclusion/exclusion criteria, 20 studies were finally included in the review. Figure 1 shows the PRISMA flow chart of the search and selection process.

Figure 1. PRISMA flow chart of the search and selection process



Characteristics of the Included Studies

The main characteristics of the studies included in this theoretical study are shown in Table 1.

According to the study design, 17 studies are cross-sectional and 3 are longitudinal. Regarding the country of origin of the adolescent sample, in 4 studies they were from the United States; in 2 studies they were from Belgium, Sweden and India; and in one study they were from Thailand, Peru, Korea, Spain, Ethiopia, Uganda, Malaysia, Holland, Indonesia and Singapore.

On the other hand, 19 studies use different ad hoc versions for the assessment of pornography use, while one study uses an adaptation of the Youth Pornography Addiction Screening Test Indonesia (YPAST-Ia, Yunengsih & Setiawan, 2021). As for reliability, it was only reported in 5 studies (Atwood et al., 2012; Brown & L'Engle, 2009; Peter & Valkenburg, 2011a; Wright et al., 2019; Yunengsih & Setiawan, 2021) with Cronbach's alpha between .68 and .95. Regarding response type, 11 studies assessed pornography use with dichotomous response (yes/no), 7 studies assessed frequency of pornography use with Likert-type scales (e.g., 7-point scale where 1 = never to 7 = several times a day) and 2 studies assessed pornography use using multiple choice responses (e.g., selection of sources/media used to view pornography "Source/media, printed media, Internet sites, social media, electronic media or never"). Relative to the sources/media used to view pornography, 6 studies do not specify the mode, 11 studies specify multiple media/modalities (e.g., "movies, TV, pictures, magazines, Internet or videos"), 2 studies specify "Internet", and one study specifies "movies". Finally, with respect to pornography content, in 5 studies the type of content is defined (e.g., "viewing condomless anal sex" or "exposure to nine types of pornography with high risk of not using a condom") and in 15 studies no specific type of content is defined.

Regarding the types of sexual risk behaviors associated with pornography use, 8 studies include coital sexual initiation; 5 studies early coital sexual debut; 2 studies number of sexual partners; 6 studies condomless sex; 2 studies sex under the influence of alcohol and/or drugs; and in 2 studies sexual risk behavior is assessed as defined by at least one of the following sexual risk behaviors without specifying which: sexual debut before age 15 years, inconsistent condom use or never using condoms in the past 6 months, and multiple sexual partners. The number of studies by type of sexual risk behavior assessed exceeds the total of the 20 included studies because 4 studies (Cho, 2016; Farré et al., 2020; Puglia & Glowacz, 2015; Wingood et al., 2001) assess more than one type of sexual risk behavior.

Finally, with respect to the methodological quality assessed through the adaptation of the Quality Index Scale (Ferro & Speechley, 2009) for non-intervention studies, the total scores of the studies included in the review ranged between 8 and 12 points ($M = 9.1$; $SD = 1.25$), the possible range being between 0 and 15 points. Regarding the Reporting subscale the scores ranged from 5 to 7 points ($M = 6.75$; $SD = 0.55$) with the possible range being 0 to 7; regarding the External Validity subscale the range of scores was between 0 and 2 points ($M = 0.5$; $SD = 0.89$), the possible range being 0 to 3; in the Internal Validity subscale the scores of the included studies ranged between 1 and 3 points ($M = 1.65$; $SD = 0.67$), the possible range being 0 to 4; and, finally, with regard to the Power subscale the scores ranged between 0 and 1 points ($M = 0.05$; $SD = 0.22$), the possible range being the same (0 to 1).

Table 1. Characteristics and Main Results of Studies that Analyze the Association Between Pornography Use and Sexual Risk Behaviors in Adolescent Population

Authors (year)	Study Design	Sample	Instrument/ "pornography use" variable	Risk sexual behavior variable(s)	Main results	QIS
Atwood et al. (2012)	Cross-sectional	N = 420 adolescents from Bangkok (Thailand) Range = 13-14 years	Ad hoc. Frequency of pornography use on the Internet and television (2 items with scale 1 = not at all, to 4= a lot/all the time). $\alpha = .71$	Early coital sexual debut (<14 years) (yes/no)	Greater exposure to pornographic media was associated with earlier coital sexual debut (before age 14).	9
Brown & L'Engle (2009)	Longitudinal. Two waves (T0 and T1) separated by 2 years	N = 967 (T0) adolescents of 14 public middle schools in the Southeastern United States Range = 12-14 years (T0)	Ad hoc. Pornography use of magazines, movies, and the Internet in the past 12 months (1 = no use of all three media; 3 = use of all three media). $\alpha: .68$	Coital sexual initiation (yes/no)	Pornography use at T0 for both males and females predicted coital sexual initiation at T1. Adolescents who used all three media for pornography use at T0 were more likely to have coital sexual experience at T1 than adolescents not exposed to pornography (3 times for males and 1.5 times for females).	10
Chirinos et al. (2000)	Cross-sectional	N = 922 male students from 4 secondary schools in Lima (Peru) Range = 12-19 years	Ad hoc. Use of pornography in magazines or videos (Never / Daily-Once a month).	Coital sexual initiation (yes/no)	Pornography use was positively associated with coital sexual initiation.	8
Cho (2016)	Cross-sectional	N = 45,783 students from 800 high schools in Korea; n _{frequent users of internet pornography} = 1833 Range = 12-18 years	Ad hoc. Frequent user of Internet pornography = Adolescents who selected Internet pornography as one of their top three Internet activities (out of 13 possible activities).	Condomless sex Sex under the influence of alcohol	Adolescent frequent users of Internet pornography had more sexual intercourse under the influence of alcohol (2.56 times more) and condomless sex (2.20 times more) than the reference group (non-frequent users of pornography).	11
Farré et al. (2020)	Cross-sectional	N = 1,500 students from 14 schools in Catalonia (Spain) Range = 14-18 years	Ad hoc. Use of pornography (yes/no)	Condomless sex Sex under the influence of alcohol/drugs	Positive association between pornography use and condomless sex and sex under the influence of alcohol/drugs.	11
Kastbom et al. (2014)	Cross-sectional	N = 3,432 Swedish high school students; n _{adolescents with sexual experience} = 2,469 Range = 18 years	Ad hoc. Use of pornography = have you ever seen images or movies in which one or more people have sex with themselves or with each other? (yes/no)	Early coital sexual debut (<14 years) (yes/no)	Adolescents with coital sexual experience who had ever viewed pornography were more likely to have had an early sexual debut (<14 years) compared with adolescents who had not viewed pornography.	8
Mekonnen et al. (2020)	Cross-sectional	N = 1,125 unmarried adolescents (n ₁ = 545 from SPJ program zone and n ₂ = 580 from non-program zone) from West Gojjam (Ethiopia). Range = 15-19 years	Ad hoc. Use of pornography (yes/no)	Sexual risk behaviors (at least one of the following: sexual debut before age 15, inconsistent condom use or never using condoms in the last 6 months and multiple sexual partners)	Pornography use was positively associated with sexual risk behaviors (at least one of the following: sexual debut before age 15, inconsistent condom use or never using condoms in the past 6 months, and multiple sexual partners).	9
Muhammad et al. (2021)	Cross-sectional	N = 15,388 males and females from Uttar Pradesh and Bihar (India) Range = 10-19 years	Ad hoc. Exposure to pornographic material (yes/no)	Early sexual debut (<18 years)	Early sexual debut in boys and girls was significantly higher in males and females exposed to pornography compared with those not exposed. The probability of early sexual debut (<18 years) was 3.01 and 1.87 times significantly higher among adolescent boys and girls who were exposed to pornography, respectively, compared with those who were not exposed.	10
Nelson et al. (2019)	Cross-sectional	N = 206 adolescent sexual minority males (cisgender and homosexual/bisexual) from the U.S. Range = 14-17 years	Ad hoc. Prevalence of viewing condomless anal sex (CAS) in sexually explicit online media (SEOM): 7-point scale (none [0%]; all [100%]).	Condomless Anal Sex (CAS)	Increasing CAS exposure in SEOM (0-24 %, 25-49 %, 50-74 %, 75-100 %) was not linearly associated with CAS participation. However, participants who reported that ≥ 50 % of the SEOM they viewed represented CAS were 2.4 times more likely to participate in CAS compared to those who reported < 50 % exposure.	9

Ngabirano et al. (2020)	Cross-sectional		N = 145 adolescents from 4 fishing communities in Uganda Range = 13-19 years	Ad hoc. Use of pornography in magazines, photos and videos (yes/no).	Coital sexual initiation (yes/no)	Positive association between viewing pornography and having had coital sexual experience: more than half of the adolescents who had viewed pornography reported ever having had sexual intercourse compared to fewer adolescents who had not viewed pornography.	8
Nik et al. (2013)	Cross-sectional		N = 1,082 incarcerated adolescents in 22 social welfare institutions in Malaysia Range = 12-19 years	Ad hoc. Use of pornography (yes/no)	Coital sexual initiation	Pornography use was significantly associated with coital sexual initiation and is also one of the significant predictors of coital sexual initiation.	10
Peter & Valkenburg (2011a)	Longitudinal.	Two waves separated by 6 months	N _{T0} = 1765 Dutch adolescents; N _{T1} = 1445 Dutch adolescents Range = 12-17 years (T0)	Ad hoc. Frequency of use of sexually explicit material and pornography in the 6 months intentionally: (a) images with clearly exposed genitals; (b) video (clips) with clearly exposed genitals; (c) images in which people are having sex; (d) video (clips) in which people are having sex. 7-point scale: 1 = never to 7 = several times a day. α = at least .95 at different waves.	Condomless sex with unknown person in the last 6 months	Exposure to sexually explicit material at T0 was not associated with condomless sex with a unknown person in the last 6 months at T1. There was also no moderating effect of age and gender.	12
Puglia & Glowacz (2015)	Cross-sectional		N = 319 adolescents from different schools and a training center in Belgium. Range = 15-19 years	Ad hoc. Pornography use (images or videos) in the last 6 months (Yes = consumers / No = non-consumers)	Age at first sexual intercourse Number of sexual partners during the last 6 months Having coital sex (yes/no) and anal sex (yes/no).	Adolescent pornography consumers and non-consumers do not differ in age of sexual debut or coital sex, although they do have a greater number of sexual partners during the last 6 months than non-pornography consumers.	8
Sahay et al. (2013)	Cross-sectional		N = 205 students of five schools and one junior college in Maharashtra (India); n _{cases} = 41 with sexual experience; n _{controls} = 164 without sexual experience. Range = 12-19 years	Ad hoc. Use of pornography in magazines, movies or internet (yes/no).	Coital sexual initiation	Adolescents who viewed pornography were more likely to have been sexually initiated than those not exposed to pornography.	8
Svedin et al. (2011)	Cross-sectional		N = 1861 male senior high school students from schools in Stockholm, Malmö, Luleå, Haparanda and Falköpingde (Sweden). N _{infrequent users} = 1661 boys; N _{frequent users} = 200 boys. Range = 18 years	Ad hoc. Frequency of pornography use in magazines, movies, and on the Internet (infrequent/frequent). Infrequent = once, once or twice a year, sometime every month, sometime every week. Frequent = more or less daily).	Early sexual debut (<15 years)	The group of frequent male pornography users reported significantly more frequent earlier sexual debut (before the age of 15 years) compared to the reference group (infrequent pornography users).	8
Vandenbosch & Eggermont (2012)	Longitudinal.	Two waves (T0 and T1) separated by 6 months	N = 639 adolescents from Belgium Range = 12-16 years (T0)	Ad hoc. Frequency of use of sexually explicit material and pornography in the 6 months intentionally: (a) images with clearly exposed genitals; (b) video (clips) with clearly exposed genitals; (c) images in which people are having sex; (d) video (clips) in which people are having sex. Scale 0-3: non-users (=0), users who visit sexually explicit websites less than once a month (=1), users who visit sexually explicit websites monthly (=2) and users who visit sexually explicit websites weekly or several times a day (=3).	Coital sexual initiation (yes/no)	Frequent users of sexually explicit websites at T0 were five times more likely to initiate coital sex than non-users at T1. Pubertal status moderated this relationship: a higher likelihood of initiating sex was found among early pubertal adolescents who frequently visited sexually explicit websites. However, a lower likelihood of initiating sex was found among late pubertal adolescents.	10

Wingood et al. (2001)	Cross-sectional	N = 5,522 Black females from adolescent medicine clinics, health departments, and school health clinics of United States Range = 14-18 years	Ad hoc. Exposure to X movies (video or movie theaters) during the last 3 months = (yes/no).	Multiple partners in the last 6 months Contraceptive use last coital intercourse and contraceptive use in the last 6 months	Exposure to X-rated films was associated with having 9 multiple sexual partners, not having used contraception at last intercourse, and not having used contraception in the past 6 months.
Wong et al. (2009)	Cross-sectional	N = 1,044; n _{cases} = 544 sexually experienced adolescents from a Singapore STI control clinic; n _{controls} = 500 sexually inexperienced from a Singapore primary care public health clinic. Range = 14-19 years	Ad hoc. Use of pornography (yes/no)	Coital sexual initiation (yes/no)	In both males and females, pornography use was positively 8 and significantly associated with having had vaginal and anal sexual experience (in males the association was stronger, males who viewed pornography were 6 times more likely to have had sexual intercourse than those who had not).
Wright et al. (2019)	Cross-sectional	N = 614 U.S. adolescents Range = 14-18 years	Ad hoc; Pornography exposure index = calculated from responses (yes/no) to exposure to nine types of pornography with high risk of not using a condom. $\alpha = .83$.	Condomless sex	Pornography exposure was associated with an increased 8 probability of condomless sex only when parents had low or no communication about sexual health with their children. When communication about sexual health between parents and adolescents was high, pornography use was not related to adolescent involvement in condomless sex.
Yunengsih & Setiawan (2021)	Cross-sectional	N = 394 secondary school students from 5 schools in Karawang Regency (Indonesia) Range = 14-19 years	An adaptation of Youth Pornography Addiction Screening Test Indonesia (YPAST-I _{na}). $\alpha = .915$. History of exposure to pornography (age, materials, reasons, sources/media, location and peers) and degree of addiction to pornography	Sexual risk behaviors (number of sexual partners, sex without condoms, etc.)	Positive association between early age of first exposure to 8 pornography (<12 years), pornographic materials (photography and video) accessed and motives (curiosity) for viewing pornography and sexual risk behaviors in adolescents (number of sexual partners, sex without condoms, etc.). A greater degree of addiction to pornography is associated with more sexual risk behaviors in students.

Note. QIS = Quality Index Scale.

Main Findings on Pornography Use and Sexual Risk Behaviors Coital Sexual Initiation

The results of seven of the eight studies included in the review investigating the association between pornography use and coital sexual initiation showed a positive association between the two variables (Brown & L'Engle, 2009; Chirinos et al., 2000; Ngabirano et al., 2020; Nik et al., 2013; Sahay et al., 2013, Vandenbosch & Eggermont, 2012; Wong et al., 2009). Thus, for example, in a longitudinal study conducted by Brown and L'Engle (2009) in a sample of American adolescents aged 12 to 14 years, it was found that pornography use in the first wave, both in females and males, predicted coital sexual experience in the second wave, two years later. In the same vein, Vandenbosch and Eggermont (2012) in another longitudinal study conducted with adolescents in Belgium aged 12 to 16 years, it showed that frequent users of pornography were five times more likely to initiate coital sexual intercourse than non-users. However, in that study the pubertal status of the adolescents moderated this association, as a higher probability of initiating sexual intercourse was found among adolescents at an early pubertal stage who frequently visited sexually explicit websites; however, a lower probability of initiating sexual intercourse was found among adolescents at an advanced pubertal stage. In other studies, such as that of Chirinos et al. (2000) in a sample of Peruvian adolescents or that of Wong et al. (2009) with Singaporean adolescents, they found a positive association between pornography use and coital sexual initiation. Similarly, Ngabirano et al. (2020) and Sahay et al. (2013) found that adolescents who viewed pornography were more likely to have been sexually initiated than those not exposed to pornography, in samples from Uganda and India, respectively. Nik et al. (2013) in a specific sample of incarcerated Malaysian adolescents aged 12 to 19 years, reported that pornography use was positively associated with coital sexual initiation. In contrast, the study by Puglia and Glowacz (2015) with a sample of 319 adolescents in Belgium no differences were found in the practice of coital sex between adolescent pornography consumers and non-consumers, although pornography consumers did engage in more anal sex than non-consumers.

Early Sexual Debut

Regarding pornography use and age at early sexual debut, all except one (Puglia & Glowacz, 2015) of the studies included in the review assessing this association (Atwood et al., 2012; Kastbom et al., 2014; Muhammad et al., 2021; Svedin et al., 2011) reported a positive association between pornography use and early coital sexual debut. In a sample of Thai adolescents, greater exposure to pornographic media was associated with early coital sexual debut, before age 14 (Atwood et al., 2012). Meanwhile, Kastbom et al. (2014) found that 18-year-old Swedish adolescents with coital sexual experience who had ever viewed pornography were more likely to have had an early sexual debut (before age 14) compared with adolescents who had not viewed pornography. In a similar vein, in the study by Svedin et al. (2011) with a sample of 18-year-old Swedish adolescents, the group of frequent pornography-using males reported that they had an earlier sexual debut (before age 15 years) than the group of infrequent pornography users. Furthermore, Muhammad et al. (2021) in a sample of adolescents from India reported that the probability of early sexual debut (before age 18) was significantly higher among male and female adolescents who were exposed to pornography, compared with those adolescents who were not exposed to pornography. Finally, in contrast to previous studies, Puglia and Glowacz (2015) in their research with Belgian adolescents revealed that adolescent pornography consumers and non-consumers did not differ in age of coital sexual debut.

Number of Sexual Partners

With respect to pornography use and its association with the number of sexual partners, the studies included in the review that analyzed this association showed a positive association between the two variables. Thus, Wingood et al. (2001) in a sample of Black females from adolescent medicine clinics, health departments, and school health clinics of United States with an age range between 14 and 18 years, showed that exposure to X-rated films was associated with having multiple sexual partners. Similarly, Puglia and Glowacz (2015) in a sample of 319 adolescents from different schools and a training centre in Belgium with an age range between 15 and 19 years reported that adolescent pornography users had a higher number of partners during the past 6 months compared to non-pornography using adolescents.

Condomless Sex

The studies included in the review regarding the association between pornography use and condomless sex are contradictory. On the one hand, three cross-sectional studies highlight a positive association between pornography use and condomless sex (Cho, 2016; Farré et al., 2020; Wingood et al., 2001). Thus, for example, Cho (2016) in a sample of students from 800 high schools in Korea revealed that teenagers who were frequent users of Internet pornography were more likely to have unprotected sex than the group of teenagers who were not frequent users of pornography. Along the same lines, Farré et al. (2020) and Wingood et al. (2001) found a positive association between pornography use and condomless sex in their respective samples of adolescents from Catalonia (Spain) and the United States. On the other hand, two cross-sectional studies included in the review (Nelson et al., 2019; Wright et al., 2019) partially support the association between pornography use and condomless sex. Nelson et al. (2019) with a sample of 206 U.S. sexual minority (cisgender and gay/bisexual) adolescent males aged 14 to 17 years found that increasing exposure to condomless anal sex on sexually explicit online media (0-24 %, 25-49 %, 50-74 %, 75-100 %) was not linearly associated with engagement in condomless anal sex. However, participants who reported that ≥ 50 % of the sexually explicit online media they viewed represented condomless anal sex were 2.40 times more likely to engage in condomless anal sex compared to those adolescents who reported < 50 % exposure. Meanwhile, Wright et al. (2019) in a sample of 614 US adolescents (Range = 14-18 years) reported that exposure to pornography was associated with an increased likelihood of condomless sex only when parents had low or no sexual health communication with their children. When communication about sexual health between parents and adolescents was high, pornography use was not related to adolescent involvement in condomless sex. Finally, one of the longitudinal studies included in the review (Peter & Valkenburg, 2011a) in a sample of 1,765 Dutch adolescents aged 12 to 17 years found that exposure to sexually explicit material in the first wave was not associated with condomless sex with an unknown partner in the past 6 months in the second wave, six months later.

Other Unsafe Sexual Practices

On the one hand, another of the unsafe sexual practices analyzed in the studies included in the review was having sex under the influence of alcohol and/or drugs. In both studies, a positive association is found between pornography use and having sex under the influence of alcohol and/or drugs (Cho, 2016; Farré et al., 2020). For example, in Cho's (2016) study with Korean students, adolescent frequent users of Internet pornography were more likely to have sex under the influence of alcohol compared with adolescent non-frequent users of pornography.

On the other hand, two of the studies included in the review used the term "sexual risk behaviors" without specifying what type of behavior (e.g., "at least one of the following: sexual debut before age 15, inconsistent condom use or never using condoms in the past 6 months, and multiple sexual partners") to assess unsafe sexual practices (Mekonnen et al., 2020; Yunengsih & Setiawan, 2021). Both studies find positive associations between pornography use and the engagement in sexual risk behaviors. Thus, in the study by Mekonnen et al. (2020) with a sample of 1,125 unmarried adolescents from West Gojjam (Ethiopia) reported that viewing pornography was positively associated with sexual risk behaviors (at least one of the following: sexual debut before age 15, inconsistent condom use or never using condoms in the past 6 months, and multiple sexual partners). In turn, Yunengsih and Setiawan (2021) in a sample of 394 students from Karawang Regency (Indonesia) found a positive association between early age of first exposure to pornography (<12 years), pornographic materials (photography and video) accessed and motives (out of curiosity) for viewing pornography and sexual risk behaviors in adolescents (number of sexual partners, condomless sex, etc.). They also found that the higher the degree of addiction to pornography, the higher the risky sexual behavior in students.

Discussion

The aim of this review was to analyze whether there is an association between pornography use and sexual risk behaviors in adolescents aged 10 to 19 years. First, regarding the number of studies included in the review, a total of 20, it should be highlighted that it could be small considering the proliferation of studies on the topic in the last decade (Alexandraki et al., 2018; Amare et al., 2019; Camilleri et al., 2021; Harkness et al., 2015; Peter & Valkenburg, 2016; Tokunaga et al., 2020; Smith et al., 2016) and the growing concern about what adolescents may learn when viewing pornography, including sexual risk behaviors (Doornwaard et al., 2015; Flood, 2009; Lehmillier, 2018; Roldán, 2019, 2022; Strasburger & Hogan, 2013). However, one of the main reasons for the small number of studies included in this review is the age of the adolescent samples, as numerous studies on the topic have been excluded because they exceed the range of 10 to 19 years, (see, for example, Koletić, Kohut et al., 2019; Koletić, Štulhofer et al., 2019; Luder et al., 2011; Matkovic et al., 2018; Mattebo et al., 2016; Rasmussen & Bierman, 2018). This fact could be evidencing the difficulties researchers encounter in assessing pornography use and sexual behaviors at early ages. Therefore, it would be desirable to implement social policies that highlight the importance and the need to investigate both sexual behavior and pornography use from an early age with the aim of establishing a solid conceptual framework on the relationship between pornography use and sexual risk behaviors in order to know whether it is necessary to intervene on such variables and, if so, how to include them in the design of pornographic literacy interventions to be effective, as suggested by some authors (Crabbe & Flood, 2021; Davis et al., 2020; Dawson et al. 2020; Department for Education UK, 2019; Maas et al., 2022; Rothman et al., 2018; Rothman et al., 2020).

Most of the studies included in this review evidence a positive association between pornography use and adolescent sexual risk behaviors, such as coital sexual experience (Brown & L'Engle, 2009; Chirinos et al., 2000; Ngabirano et al., 2020; Nik et al., 2013; Sahay et al., 2013; Vandenbosch & Eggermont, 2012; Wong et al., 2009) and early coital sexual debut (Atwood et al., 2012; Kastbom et al., 2014; Muhammad et al., 2021; Svedin et al., 2011); a high number of sexual partners (Puglia & Glowacz, 2015; Wingood et al., 2001); condomless sex (Cho, 2016; Farré et al., 2020; Wingood et al., 2001); sex under the influence of alcohol and/or other drugs (Cho, 2016; Farré et al., 2020); as well as other unsafe sexual practices (Farré et al., 2020; Mekonnen et al., 2020; Yunengsih & Setiawan, 2021). However, 85% of the included studies are cross-sectional and all these studies use non-experimental methodology, so that the causal relationship between

pornography use and sexual risk behaviors cannot be affirmed. The association between both behaviors could be explained as pornography use leading to sexual risk behaviors, but also in the opposite way, or there could be a bidirectional relationship, and mediated by other variables such as sexual health communication with parents or pubertal stage, mentioned in some studies included in the present review (Vandenbosch & Eggermont, 2012; Wright et al., 2019). Three studies included in this review are longitudinal and the results regarding pornography use and subsequent sexual risk behaviors are mixed (Brown & L'Engle, 2009; Peter & Valkenburg, 2011a; Vandenbosch & Eggermont, 2012). On the one hand, Brown and L'Engle (2009) showed that pornography use at the first measurement predicted coital sexual experience at the second measurement, two years later. The same results were obtained in the study by Vandenbosch and Eggermont (2012), although the relationship between initial pornography use and coital sexual debut, six months later, was mediated by pubertal stage, occurring only in those adolescents who were at an early pubertal stage. On the other hand, Peter and Valkenburg (2011a) reported that exposure to sexually explicit material at the first measurement was not associated with condomless sex with unknown person in the last six months at the second measurement, six months later. Therefore, from the analysis of the reviewed studies, a causal relationship between pornography use and sexual risk behaviors cannot be established and the associations between pornography use and sexual risk behaviors reported in the different studies should be interpreted taking into account conceptual and methodological aspects, which are discussed below.

First, there is a lack of identification, conceptualization, and evaluation of third variables that can often serve as viable alternative explanations for observed associations between pornography use and sexual risk behaviors in both cross-sectional and longitudinal studies (Fisher & Kohut, 2020). Thus, for example, some possible third variables have been identified that could explain associations between pornography use and sexual risk behaviors such as sexual sensation seeking (Tokunaga et al., 2020; Koletić, Kohut et al., 2019; Sinkovic et al., 2013), sexual health communication with parents (Wright et al., 2019), or peer group norms (Wright et al., 2016). Thus, it would be advisable that future research on pornography use and adolescent sexual risk behaviors take into account the conceptualization, identification, and evaluation of third variables that may improve the explanation of the association between the two variables, as has been done with the association between pornography use and sexual assault (Baer et al., 2015), as well as help determine whether there is a causal relationship between pornography use and sexual risk behaviors, if competing third variable explanations are ruled out.

Secondly, the methodological quality of the studies is relatively low, especially the external validity and internal validity scores, so there are several aspects that should be taken into account when interpreting the results of the studies included in this review. Regarding external validity, the use of samples that are not representative of the target population (e.g., Atwood et al., 2012; Ngabirano et al., 2020; Puglia & Glowacz, 2015; Sahay et al., 2013; Wright et al., 2019; Yunengsih & Setiawan, 2021); the use of specific populations, for example, sexual minority males (Nelson et al., 2019) or incarcerated adolescents (Nik et al., 2013); or sociocultural differences regarding sexual freedom in the different samples included in the review (e.g., Atwood et al., 2012; Cho, 2016; Kastbom et al., 2014; Muhammad et al., 2021; Svedin et al., 2011; Wong et al., 2009), makes it difficult to generalize the results obtained to the adolescent population. Specifically, with respect to sociocultural differences in relation to sexuality, gender ideology and pornography in the samples of the different studies included in the review (e.g., Kastbom et al., 2014; Peter & Valkenburg, 2011a; Svedin et al., 2011; Yunengsih & Setiawan, 2021; Wong et al., 2009), a cross-country comparative study reports higher pornography consumption and smaller gender differences in pornography consumption in countries with greater sexual liberalism as opposed to more conservative countries

(Ševčíková et al., 2014). Also, regarding the internal validity of the studies, the use of ad hoc instruments developed by 95% of the studies, the variability and heterogeneity in the assessment of pornography use (Cho, 2016; Muhammad et al., 2021; Peter & Valkenburg, 2011a; Yunengsih & Setiawan, 2021) also makes it difficult to compare the results across studies. Thus, for example, in Cho's (2016) study, an adolescent is considered a frequent user of pornography if Internet pornography is selected as one of the top three of 13 possible activities. However, in the study by Vandenbosch and Eggermont (2012) a scale from 0 to 3 is established differentiating between non-users of pornography if they have never seen it (0), users who visit sexually explicit websites less than once a month (1), monthly (2) and weekly or several times a day (3). Whereas other studies choose to ask only whether adolescents have ever viewed pornography with dichotomous (yes/no) questions, (e.g., Kastbom et al., 2014; Mekonnen et al., 2020; Sahay et al., 2013). Therefore, it is recommended that, in order to increase methodological rigor, consistency, and comparability of results obtained in the field of adolescent pornography use research, future investigations should use random sampling and representative populations of adolescents, as well as valid and reliable pornography use assessment instruments, as recommended by Marshall and Miller (2019).

In short, after analyzing the studies included in this review, it is recommended for future research in the field of adolescent pornography use and sexual risk behaviors, first, the conceptualization, identification and evaluation of third variables that could explain the association between both variables, as has been done with other variables such as sexual aggression (Baer et al., 2015), as well as helping to determine whether there is a causal relationship between pornography use and sexual risk behaviors, if competing third variable explanations are ruled out. Second, the use of random samples and representative populations of adolescents, as well as valid and reliable pornography use assessment instruments, as recommended by Marshall and Miller (2019). It is expected that advances in this field of research will allow decisions to be made about the relevance or not of implementing pornographic literacy interventions in relation to sexual risk behaviors and, if so, to design such an intervention based on scientific evidence and with a solid conceptual model, which will help to improve affective-sexual education (Mañas & González, 2022).

In the present systematic review, there are some limitations that are important to mention. On the one hand, although the PRISMA 2020 Statement (Page et al., 2021) recommends not changing the inclusion criteria for studies once the systematic review protocol has been performed, the fact of narrowing the age range from 10 to 19 years (without taking into account, for example, the mean age of the sample or a high percentage of participants between 10 and 19 years of age even if the range was exceeded), has led to many important studies in the field not having been included in this review (e.g., Koletić, Kohut et al., 2019; Koletić, Štulhofer et al., 2019; Luder et al., 2011; Matkovic et al., 2018; Mattebo et al., 2016; Rasmussen & Bierman, 2018) and thus may have decreased the quality of the conclusions drawn in the review. On the other hand, with the aim of better understanding sexual risk behaviors, not only behaviors, but also attitudes and beliefs that predispose to sexual risk behaviors, such as attitudes toward condom use (Koletić & Mehulić, 2021), sexist beliefs (Carpio et al., 2021), or attitudes toward casual sex (van Oosten et al., 2016), among others, could also have been included in this review. Both appreciations would be important to take into account in future reviews on the subject.

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