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Literature review

## The impact of Internet pornography on children and adolescents: A systematic review



### *L'impact de la pornographie sur Internet sur les enfants et les adolescents : une revue systématique*

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#### ABSTRACT

**Objectives.** – Young people's exposure to online pornographic material has increased in the past years. Its impact is a complex topic but an important issue due to growing concerns. Therefore, we reviewed the literature on Internet pornography consumption and its impact on children and adolescents. Furthermore, we examined young people's thoughts about pornography and their reasons for consumption.

**Method.** – We performed a systematic literature search in the online databases ERIC, PsycARTICLES, PsycINFO, and PSYNDEX for peer-reviewed articles in English, published between 2000 and 2022 and additionally identified secondary references.

**Results.** – We could determine associations between pornography consumption and demographic variables (e.g., age, gender), personal characteristics (e.g., [sexual] sensation seeking, sexual interest and experience, general risk behavior), environmental variables (e.g., peers, family), attitudes (e.g., gender role attitudes, permissive sexual attitudes), behavior (e.g. sexual risk behaviour, sexting) and sexual aggression (e.g., sexual cybervictimization, grooming). Moreover, we found that girls have a more negative attitude towards pornography than boys who have an ambivalent opinion on the subject. Most adolescents are aware that the majority of pornographic material is exaggerated and unrealistic. Furthermore, pornography is not only watched out of curiosity and for sexual arousal but also used as a source of sexual information, especially by minority groups.

**Discussion.** – Many effects that impair children's development have been documented. The results found in this review are often contradictory. Therefore, further replication studies are needed. In addition, we propose several preventive measures, e.g., sexual health education at schools for both heterosexuals and LGBT (Lesbian, Gay, Bisexual, and Transgender) people.

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#### R É S U M É

**Objectifs.** – Ces dernières années, les enfants et les adolescents ont été de plus en plus exposés au matériel pornographique sur Internet. Cela suscite de grandes inquiétudes quant à l'impact de la pornographie sur l'attitude et le comportement des jeunes. C'est pourquoi nous décrivons l'état actuel de la consommation de pornographie sur Internet et ses effets sur les enfants et les adolescents. En outre, nous discutons l'attitude et les sentiments des enfants et des adolescents à l'égard de la pornographie et les raisons de son utilisation.

**Méthodes.** – Une recherche systématique a été menée dans les bases de données de littérature en ligne ERIC, PsycARTICLES, PsycINFO, et PSYNDEX pour des articles anglais corévisés par la communauté et publiés entre 2000 et 2022. Après avoir soustrait les doublons et les articles inappropriés, la recherche a permis d'extraire un total de 86 articles issus de littérature primaire et 100 articles de littérature secondaire.

##### Mots clés :

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**Résultats.** – Nous avons trouvé des corrélations entre la consommation de pornographie sur Internet et diverses variables démographiques (par ex., âge, sexe) et des caractéristiques personnelles (par ex., la recherche de sensations sexuelles, l'intérêt et les expériences sexuelles et un comportement général à risque). La consommation de pornographie est aussi associée à plusieurs variables environnementales (par ex., le contact aux jeunes du même âge, le niveau d'attachement émotionnel au sein de la famille), ainsi qu'à l'attitude à l'égard des rôles de genre ou envers des attitudes sexuelles permissives (y compris les relations sexuelles occasionnelles, sans attachement émotionnel ou le fait de considérer ces relations comme étant principalement centrées sur le corps), ou encore aux comportements sexuels (par ex., nombre plus élevé de partenaires sexuels, davantage de *sexting*) ainsi qu'à l'agression sexuelle (victimes et acteurs de l'agression sexuelle, la cybervictimisation sexuelle, le *grooming*). L'attitude négative à l'égard de la pornographie est plus répandue chez les filles que chez les garçons, qui ont tendance à avoir des opinions plus ambivalentes. La majorité des enfants et des adolescents savent que la plupart du matériel pornographique sont irréalistes et exagérés. Cependant, la pornographie n'est pas seulement consommée par curiosité ou pour l'excitation sexuelle, mais aussi comme source d'information sur la sexualité et les relations, notamment pour les minorités telles que les personnes LGBT (lesbiennes, gays, bisexuels, et transgenres).

**Bilan.** – La recherche sur les effets de la pornographie sur Internet sur la vie et l'épanouissement des enfants et des jeunes est limitée et les résultats sont souvent contradictoires. Ainsi, d'autres recherches et surtout d'autres études de réplication sont nécessaires. En conclusion, nous proposons plusieurs actions de prévention, parce que les initiatives visant à réglementer et à restreindre l'exposition des adolescents à la pornographie ont une efficacité limitée compte tenu de la normalisation généralisée de la pornographie et de l'accessibilité qu'offrent les nouvelles technologies. D'une manière générale, il existe un besoin éducatif à la santé sexuelle, y compris dans les écoles. Elle devrait toutefois inclure des informations sur la sexualité hétérosexuelle et des personnes LGBT afin de remplacer la pornographie comme source d'éducation.

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## 1. Introduction

Adolescents' increasing access to sexually explicit media has led to growing concerns about its impact on their attitudes and behavior. Internet-enabled devices have allowed people of all ages to consume sexual content such as pornography at an availability that has affected and changed the attitudes, knowledge and behavior of adolescents. The Internet is considered a more highly sexualized environment than other media, and research has shown that the number of youths who intentionally or accidentally encounter pornographic material online has risen significantly. The impact of viewing pornography at a young age on sexual health is a complex and sensitive topic and an important public health issue [1].

In the following, we summarize the state of knowledge about Internet pornography and broaden the focus by including other sexual risk behaviors on the Internet like sexting, sexual solicitation, and grooming. Furthermore, we explore adolescents' thoughts, feelings, and worries about their own pornography consumption. To conclude, we will make some suggestions on how to deal with pornography consumption among adolescents.

Table 1 summarizes the main findings of the available reviews with the topic Internet pornography. The results show that contemporary pornography portrays more intensity, explicitness, and extreme acts compared to previous forms of sexually explicit content. Consumers are mostly male, pubertal advanced, have more liberated attitudes towards sex and more interest in sex. Moreover, they tend to be high sensation seekers from deprived families with lower levels of life satisfaction. The main negative impact of pornography consumption lies in increased emotional and conduct problems, as well as in unrealistic and harmful attitudes, beliefs or values about sexuality and sexual intercourse [2–4]. For example, consumers show increased sexual preoccupation, earlier sexual experimentation and higher levels of sexual risk activities, which result in permissive sex behavior, female sexual objectification and sexual aggression [5,6]. Nevertheless, pornography is also used as an educational source, especially by sexual minorities [7]. Recent studies provide preventive and protective measures, such as the

identification of risk factors, sexual education and technological tools limiting access to inappropriate materials [2,8,9].

## 2. Terminology/definition

The terminology of pornography varies greatly in its essential elements, so that several definitions can be found in the literature. Differences in conceptualization include the media source and degree of explicitness. However, as there is no official consensus, terms such as pornography, sexually explicit material and X-rated material are often used as synonyms by the authors [5]. In one of the earlier definitions of pornography, it is commonly referred to as traditional pornography. Due to social and technological changes in recent history, contemporary pornography is augmented by modern media, e.g., the Internet or television that are also associated with new content aspects, such as the visualization of different sex techniques and practices, homosexuality and sex crimes. Peter and Valkenburg [10] define Internet pornography as “professionally produced or user generated (audio)visual material on or from the Internet” which shows unconcealed and close-up depictions of sexual activities with focus on oral, anal or vaginal penetration to cause sexual arousal [2].

## 3. Method

We searched the literature databases ERIC, PsycARTICLES, PsycINFO, and PSYINDEX for articles published from January 2000 until October 2022 (deadline October 31, 2022) using the following search terms: (porn\* AND internet\*) OR (porn\* AND online\*). We searched for these terms in the article abstracts. After limiting our search to children (6–12) and adolescents (13–17), peer-reviewed journal articles published in English and full text, we obtained 154 articles. After removing duplicates 139 records remained. Checking titles, abstracts, and if necessary the full text, we excluded:

- articles referring to child sexual abuse ( $n = 18$ );
- articles focusing on sex and/or Internet child pornography offenders ( $n = 7$ );

**Table 1**  
Summary of the main findings of the available reviews on Internet pornography.

Study	n studies Period Age group	Topic	Results
Alexandraki, Stavropoulos, Anderson, Latifi, and Gomez (2018)	57 2000–2017 12–18 years old	Individual, contextual and activity factors related to pornography use (PU) in adolescence	<ul style="list-style-type: none"> <li>● Individual related factors: higher PU during adolescence tends to be related to males, more liberated attitudes towards sex, early maturation and older age, interpersonal victimization and harassment, poorer mental health and sensation seeking tendencies</li> <li>● Activity related factors:               <ul style="list-style-type: none"> <li>– higher levels of online game use, internet addictive behaviors, cyberbullying manifestations and voluntary self-sexual exposure online are linked to PU;</li> <li>– adolescents with compulsive sexual behaviors, earlier and more experienced sexual life tend to be more vulnerable to PU</li> </ul> </li> <li>● Context related factors:               <ul style="list-style-type: none"> <li>– parental independence, poorer relationships with parents, less parental care and lower family communication tend to be higher among adolescents with higher PU</li> <li>– peer culture aspects involving gender role attitudes, sexual norms, the perception of peer approval and adolescents' sexual behavior are associated with PU</li> </ul> </li> <li>● Strong tendency towards researching individual characteristics and a significantly lower research focus on activity related and contextual factors</li> </ul>
Bloom and Hagedorn (2015)	Not indicated	Adolescents impacted by pornography use: implications for family counselors	<ul style="list-style-type: none"> <li>● Contemporary pornography: portraying more intensity, explicitness and more extreme acts, e.g., male domination, female degradation, sexual violence against women</li> <li>● Characteristics of consumers:               <ul style="list-style-type: none"> <li>– 59% intentionally exposed to pornography, 41% accidentally exposed</li> <li>– contemporary pornography is used by males in an advanced pubertal status that are more likely to be high sensation seekers, have more interest in sex, express lower levels of life satisfaction and openly discuss this topic in their peer group</li> <li>– consumers have correlations with lower degrees of social integration, decreased emotional bonding with caregivers, increases in conduct problems, higher levels of delinquent behavior, higher incidence of depressive symptoms</li> </ul> </li> <li>● Negative impact on attitudes and behaviors, e.g., acceptance of dangerous practices, violent attitudes towards women, confusion of one's sexual values and preferences</li> </ul>
Böthe, Vaillancourt-Morel, Bergeron, and Demetrovics (2019)	11 2014–2019 10–17 years old or with a mean age between 10 and 18 years	LGBTQ adolescents' pornography use (PU) patterns and comparison with those of heterosexual adolescents	<ul style="list-style-type: none"> <li>● The PU of LGBTQ (lesbian, gay, bisexual, transgender, and queer) adolescents is an understudied research topic</li> <li>● PU is more prevalent and more frequent among LGBTQ adolescents and is viewed at a younger age for LGBTQ girls compared to their heterosexual counterparts</li> <li>● LGBTQ adolescents use pornography to experience sexual pleasure, to learn about sexual activities and as a part of their sexual identity development process</li> <li>● Based on their reported primary motivations for PU, LGBTQ adolescents may not be more prone to develop problematic PU</li> <li>● Compared to heterosexual adolescents, LGBTQ adolescents' PU does not appear to be linked to more negative outcomes</li> </ul>

Table 1 (Continued)

Study	n studies Period Age group	Topic	Results
Dombrowski, Gischlar, and Durst (2007)	Not indicated	Safeguarding and education of children about online sexual solicitation and pornography	<ul style="list-style-type: none"> <li>● Protective measures are necessary for a combination of psycho-educative and technological protective considerations limiting access to inappropriate materials</li> </ul>
Koletić (2017)	20 2001–2013 18 years or under	Effects of sexually explicit material on adolescents' attitudes, beliefs and behaviors	<ul style="list-style-type: none"> <li>● Exposure to sexually explicit material is associated with an increase in sexual intercourse, peer norms (e.g., engaging in and approval of sexual behavior), increases in recreational and permissive sex attitudes, increase in female sexual objectification, higher sexual aggression (e.g., unwanted kissing, touching, etc.), decrease in sexual satisfaction, increase in sexual uncertainty (unclear about sexual beliefs and values) and strong sexual preoccupation (cognitive engagement in sexual issues)</li> </ul>
Livingstone and Smith (2014)	n studies not indicated 2008–2013 Under 18 years	Risks of online content, contact or conduct	<ul style="list-style-type: none"> <li>● Risks of cyberbullying, contact with strangers, sexting and pornography generally affect fewer than one in five adolescents</li> <li>● Prevalence estimates do not appear to be rising substantially with increasing access to mobile and online technologies</li> <li>● Online risks result in a range of adverse emotional and psychosocial consequences</li> <li>● Factors for risks of harm resulting: <ul style="list-style-type: none"> <li>– personality factors (sensation-seeking, low self-esteem, psychological difficulties)</li> <li>– social factors (lack of parental support, peer norms)</li> <li>– digital factors (online practices, digital skills, specific online sites)</li> </ul> </li> </ul>
Owens, Behun, Manning, and Reid (2012)	n studies not indicated Period not indicated 13–18 years old	The impact of internet pornography on sexual attitudes, beliefs, behaviors, and sexual aggression	<ul style="list-style-type: none"> <li>● Consumers may develop unrealistic sexual values and beliefs</li> <li>● Higher levels of permissive sexual attitudes, increase in sexual preoccupation and earlier sexual experimentation correlated with more frequent consumption of pornography</li> <li>● Use of pornography depicting violence is linked with increased degrees of sexually aggressive behavior</li> <li>● Correlation between adolescents' use of pornography and self-concept: <ul style="list-style-type: none"> <li>– females feeling physically inferior to the portrayed women</li> <li>– males feeling less virile than the portrayed men</li> </ul> </li> <li>● Use of pornography decreases as self-confidence and social development increase</li> </ul>
Peter and Valkenburg (2016)	75 1995–2015 10–17 years old or with a mean age between 10 and 18 years	Prevalence, predictors, and implications of adolescents' use of pornography	<ul style="list-style-type: none"> <li>● Prevalence rates of adolescents' use of pornography differ greatly</li> <li>● Typical adolescent pornography user is male, pubertal more advanced, sensation-seeker, with weak or troubled family relations</li> <li>● Pornography use is related to sexual attitudes (stronger permissive sexual attitudes, stronger gender-stereotypical sexual beliefs) and some sexual behaviors (greater sexual preoccupation, greater sexual uncertainty and greater sexual dissatisfaction, higher likelihood to have sexual intercourse, sexual aggression), but causality unclear</li> </ul>
Springate and Omar (2013)	Not indicated	The influence of internet pornography on sexual behaviors and attitudes	<ul style="list-style-type: none"> <li>● Adolescents viewing online pornography have less progressive gender role attitudes, condone extramarital sex, exhibit sexually permissive attitudes, participate in more high-risk sexual activities and are not concerned with social consequences</li> <li>● Internet used as a source for sexual partners which can lead to greater risk for sexually transmitted diseases, early first sexual intercourse, more partners, more anal sex</li> </ul>

Note :Table 1 summarizes the main findings of the available reviews with the topic Internet pornography.

- articles focusing on adults (nevertheless retrospective studies and studies combining adults with children and adolescents were included) ( $n = 14$ );
- articles referring to social networking services and cyberbullying ( $n = 5$ );
- articles referring to Internet addiction or Gaming Disorder ( $n = 6$ );
- articles without reference to online pornography consumption ( $n = 13$ ).

This reduced the number of articles to 76. Within the references of these articles, we found 90 other relevant articles. Fig. 1 illustrates the search process.

## 4. Results

### 4.1. Descriptive data

#### 4.1.1. Prevalence numbers

As Peter and Valkenburg [3] noted, the prevalence numbers of pornography consumption vary strongly. In their review, they distinguished between unintentional and intentional exposure to pornography. Mitchell, Wolak, and Finkelhor reported that 19% among the 10- to 12-year-old children in the United States are exposed to unintentionally porn [11]. These numbers are higher among the 16- to 17-year-old Australian girls (60%) and boys (84%) [3, p. 514, 12]. For intentional consumption, a range of 7% [13] among children and adolescents in the US up to 59% among Taiwanese 10th to 11th grade students was found [14]. In a more recent Spanish study (age range = 13–17 years) up to 60% of the boys and 11% of the girls use the Internet for sexual activities [15]. In a German study (age range = 14–24 years), around 18% consume pornography occasionally whereas 22.5% consume pornography more intensively [16]. In summary, different studies show different but always significant prevalence rates of pornography use among minors depending on different variables (e.g. method used, unintentional versus intentional exposure, country and age group studied).

#### 4.1.2. Development of consumption over time

Moreover, several researchers report that the consumption of pornography changes over time. Shek and Ma [17,18] could show with a two-wave study that pornography use increases with age among early adolescents. The results of a study by Lofgren-Mårtensson and Månsson [19] illustrate that the cultural script concerning pornography seems to have changed from being regarded as shameful and morally reprehensible to being socially accepted. One reason for this change could be that pornography has become an integral part of daily life, especially for young people, due to easy access through the Internet [19]. Additionally, most of the participants in this study had developed the necessary skills to deal with the consumption of pornography in a reasonable way and were critical of the body ideals portrayed in pornography, especially those of the women portrayed.

#### 4.1.3. Sources and forms of pornography consumption

Most of the studies did not distinguish between different sources (e.g. magazines, TV, Internet) of the pornographic material [3]. However, adolescents mainly search for pornographic contents in movies, television and Internet sites [20] whereas more recent studies identify the Internet as the most common source [17,21]. In the following, we will not differentiate between different sources of pornographic material, unless the respective study reports any differences. Nevertheless, it is important to note that different sources can lead to different results [e.g., 13, 22].

Specific forms of pornography consumption are for example unwanted exposure [14,23,24], violent pornography [25,26] and

compulsive pornography consumption, which are often neglected [27].

#### 4.1.4. Age, pubertal timing and gender

Concerning the role of age, the findings remain inconclusive [3]. Whereas some studies found an increasing consumption with increasing age [13,21,28], other studies did not confirm this association [29–31]. For maturation and pubertal timing, many studies found a positive correlation: those who are further in their maturation consume pornography more often [31–33]. However, this is contrary to the findings of Brown and L'Engle [34]. Baker [35] reports that the onset of first viewing pornography is 14 years or younger. Another study found the median age of first intentional exposure to pornography to be 13 years among men and 16 years among women. Eighty-one percent of young men and 28% of young women aged between 15 and 29 seem to watch pornography at least weekly [36]. Among adolescent sexual minority males, the engagement with sexually explicit online material was frequent, as 86% reported viewing once a week or more, and lengthy, as 70% reported viewing for 15 minutes per session or longer [37]. However, the study sample was rather small, so further research is needed to confirm these numbers.

In contrast, the role of gender seems to be quite clear: boys use the Internet more often than girls for sexual activities [20] as well as for pornography consumption [35,38–41]. Also, unwanted exposure seemed to be more likely among boys than among girls [42]. However, when middle school students were asked, if they were exposed to any inappropriate images on the Internet, there were no significant gender differences between boys and girls responding affirmatively [43].

### 4.2. Personal characteristics and pornography consumption

A frequently studied personal characteristic was sensation seeking. Sexual sensation seeking, described as “looking for sexual excitement, physical pleasure, and sexual exploration” [21, p. 2989] was correlated with more pornography consumption [21]. This association also applies to general sensation seeking for both boys and girls [28,31,44], which was supported by longitudinal studies, too [32,45]. Moreover, sexual experience and greater interest in sex was positively correlated with pornography consumption [28,46,47].

Another point is general risk behavior. Within a sample of Swedish girls, riskier lifestyle (e.g., drinking alcohol or smoking cigarettes) was associated with greater pornography consumption [46]. Delinquent behavior and substance use were more common among those who actively sought pornography [13]. Interestingly, within this sample, those who used the Internet for pornography consumption showed more symptoms of depression than those who used offline media like magazines. Focusing on adolescents' psychological well-being and their Internet use behavior, it was found that depression and loneliness were positively related to more frequent use of the Internet for pornography [48]. Furthermore, pornography and online gaming were predictors of Internet addiction and youths with conduct problems were more likely to watch pornography [44]. Another study investigating Internet risk behaviors showed that middle school students who post their pictures online were more likely to seek out pornographic sites [43].

Internet usage and online skills are another important factor. Those with better online skills consumed pornography more frequently [28]. Nevertheless, pure computer skills were not associated with pornography consumption [29]. In addition, those who visited the Internet for sexual education were more likely to consume pornography [44]. For boys, time spent online was weakly associated with pornography consumption in a two-wave panel study with 6 months between the waves [32].

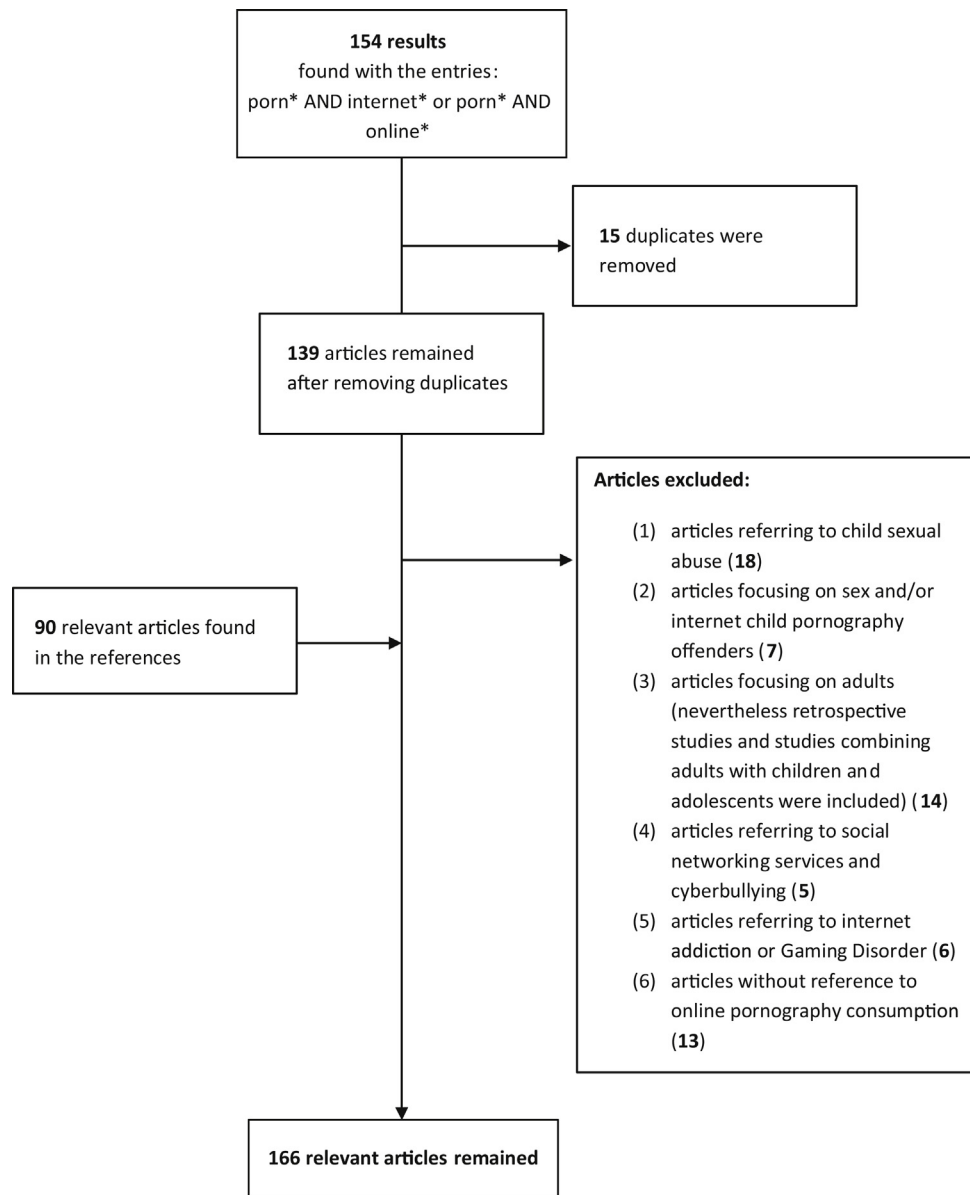


Fig. 1. Flow chart visualizing the searching process. The flow chart visualizes the search process and how many articles met the criteria in the end.

A factor predicting less pornography consumption is positive youth development [17], which includes cognitive competence, moral competence, self-efficacy and beliefs in the future. Additionally, those who felt less autonomous consumed pornography more frequently [49].

#### 4.3. Environmental variables and pornography consumption

Several studies showed that having peers who consume pornography themselves and peers with deviant activities can predict pornography consumption [29,50]. Another study found that people with younger peers consumed pornography more often [31]. In addition, girls who assumed that their female peers watch pornography [49] and adolescents who were less socially integrated consumed pornography more frequently [30].

In addition, the bonding-system within families and the family climate are associated with pornography consumption. Poor family attachment and lower levels of emotional bonding within the family are correlated with a higher consumption of pornography [13,17]. Additionally, family conflicts and communication

predicted pornography consumption within a longitudinal study [17].

Another environmental factor was culture: within one study, liberalism was associated with greater pornography consumption. Moreover, the gender-gap between boys' and girls' consumption became smaller within more liberal countries [28]. Interestingly, Srivastava, Chauhan, Patel, Marbaniag, Kumar, Dhillon et al. found that religion was not significantly associated with lower exposure to pornography among their sample of Indian adolescents and young adults in general [51].

#### 4.4. Attitudes

##### 4.4.1. Gender-role attitudes

Several studies investigated gender-stereotypical sexual beliefs (e.g., women as sex objects) and their connection to pornography consumption [e.g. 52, 53]. Peter and Valkenburg found a positive association within a cross-sectional [54] and a longitudinal study [52]. Within their longitudinal study, they showed that pornography consumption led to more gender-stereotypical sexual beliefs

and that the latter led to greater pornography consumption. In contrast, another longitudinal study revealed that pornography consumption predicted less progressive gender role attitudes only among girls – among boys only the baseline association was significant [34]. Within an additional longitudinal study [55] as well as within another cross-sectional study [53], pornography consumption did not predict gender-stereotypical sexual beliefs among adolescents.

#### 4.4.2. Permissive sexual attitudes

Many studies found a positive correlation between pornography consumption and permissive sexual attitudes [e.g. 56, 57, 58, 59], including longitudinal studies [34,60]. Unfortunately, these studies use different definitions of permissive sexual attitudes. Importantly, by using a cross-lagged panel design, Doornwaard, Bickham, Rich, ter Bogt and van den Eijnden [61] showed that the consumption of pornography led to permissive sexual attitudes not the other way round.

Especially Internet pornography (compared to pornography within other media) predicted permissive sexual attitudes in both a correlative and a longitudinal study [58,61,62].

#### 4.4.3. Pornography consumption, satisfaction and psychological well-being

Within a longitudinal, three-wave panel study, pornography consumption was negatively associated with sexual satisfaction with the association being stronger for adolescents with less sexual experiences [63]. Contrary to this finding Milas, Wright and Štulhofer [64] did not find an association between the consumption of pornography and sexual satisfaction in their longitudinal study within Croatian high school students.

Furthermore, life satisfaction predicted the consumption of pornography use [31,45]. Following upon this, a three-wave longitudinal study on Chinese adolescents showed that the exposure to online pornography was associated with depressive symptoms [65]. Therefore, the authors suggest that early intentional exposure to online pornography might lead to later depressive symptoms. Additionally, there was a negative relationship between life satisfaction and exposure to online porn.

### 4.5. Behavior

#### 4.5.1. Academic performance

Several studies investigated the correlation between pornography consumption and academic performance, yet the findings in the available literature are inconsistent. Research indicates that the educational level acts as a protective factor against risk behavior [66,67]. Risk behavior includes for example “an earlier onset of sexual intercourse [68], poorer social skills [69], and engagement in aggressive and/or delinquent behavior [70]” [32, p. 1050], but also a harmful use of media [71,72]. Similar to the impact of excessive media use, the consumption of pornography can be regarded as a time-displacement effect. Instead of spending time with cognitively stimulating activities, such as doing homework and studying, adolescents invest more time in watching Internet pornography. As a consequence, students' academic performance deteriorates [32,73]. Besides the time-displacement effect, the cognitive absorption hypothesis [74] as well as Zillmann's [75] excitation transfer model [76] and the sexual behavior sequence by Byrne [6,77,78] are of central importance for explaining the association between those variables [32,79].

In general, we can conclude that the consumption of sexually explicit material portrays a reliable predictor for lower academic achievement [5]. However, it is important to define the form of sexual content that is consumed by adolescents more precisely [3,80], as further studies reveal contradictory findings. Neither the longi-

tudinal study of Peter and Valkenburg [45] nor the study of Šević, Mehulić and Štulhofer [81] found a relation between educational status and the consumption of Internet pornography. The use of sexually explicit material also had no longitudinal effect on the average grade [81].

#### 4.5.2. Sexual intercourse/sexual risk behavior

Another important question is whether pornography consumption affects the sexual behavior of adolescents. Having had anal sex and having had sex with a friend was associated with high pornography consumption among boys [38]. Moreover, in a regression analysis, risk for cybersex abuse (compulsive use and feeling out of control) was associated with pornography consumption, male gender, anal sex and sexual orientation for adolescents [82]. Among girls, around 40% of those girls who consumed pornography wanted to try out things they had seen in it [46]. Research findings from a Danish study suggest that frequent exposure to consistent themes in sexually explicit media can affect youth in the acquiring of sexual understanding and formation of sexual scripts about how to behave in a sexual setting [83]. Further, exposure to risky sexual behavior in sexually explicit online media may be associated with young people's dyadic sexual behavior [37].

Pornography use among female adolescents and emerging adults in general has been linked with outcomes such as a higher number of sex partners and a lower likelihood of using contraception [3,84]. Since the majority of previous studies have been cross-sectional, longitudinal research is needed to establish directionality in these associations. Several studies showed that pornography consumption was correlated with an earlier sexual initiation and the intention to have sex, for boys as well as for girls [20,85–88]. Longitudinal studies confirm this association [e.g. 34]. However, other studies contradict the reported findings and did not find a correlation between pornography consumption and numbers of sexual partners [86], nor relations with early sexual initiation or other sexual risk behaviors [80]. The only association found within this study was with having sex without condom for boys. This complements the result of a cross-sectional study, which found pornography consumption being associated with sexually transmitted infections [89], especially since the infrequent condom use in pornography does not educate about healthy sex and avoidance of pregnancy or sexually transmitted infections [35].

Findings by Maas, Bray and Noll [90] suggest that the combinations of various online sexual experiences are relevant for HIV risk, sexual assault, and subsequent victimisation by relationship violence. For maltreated female adolescents, engaging in more online sexual experiences predicted a significantly higher likelihood of sexual victimization. This implies the need of addressing online sexual experiences in order to prevent revictimization.

#### 4.5.3. Sexting

Pornography consumption is not only associated with offline sexual behaviors and attitudes but also with online sexual behaviors [91]. One of these online sexual behaviors is sexting. Sexting can be defined as “the exchange of provocative or sexually explicit content (text messages, photos, and/or videos) via smartphone, Internet, or social networks” [91, p. 113]. As Song, Song, and Lee [92] noted, there are different definitions of this phenomenon, which vary mostly in the description of the content of the messages. In addition, some definitions include only the sending of sexual content while others also include receiving it. Therefore, prevalence numbers of sexting vary greatly [93]. A systematic review revealed a mean prevalence rate of 12% among adolescents for sending sexually suggestive images and 16% for receiving such images [94]. Findings by Clancy, Klettke and Hallford [95] show that the normalization of sexting and being sexually active can predict engagement

in virtual and physical sexual activity. Peris [96] claims that with rising body self-esteem adolescents engage in more sexting. Schoeps, Hernández, Garaigordobil, and Montoya-Castilla [97] confirm that physical attractiveness and disinhibition are positively related to erotic-pornographic sexting.

As noted above, pornography consumption is correlated with sexting behavior. Several studies show that greater pornography consumption was associated with more sexting behavior [91,98–100]. Non-Consensual Forwarding of Sexes (NCFS), which is defined as the forwarding, sending or receiving of sexually explicit material (e.g., messages, photos, ...) without consensus is linked to porn consumption, too [100,101].

By contrast, children themselves do not seem to be bothered much by unwelcome sexting [102] although most of the children know that sexting is illegal under the age of 18 [103]. The exchange of sexual photos or videos was considered to be more appropriate within the context of a romantic relationship as part of or as a substitute for offline sexual interactions [104]. However, young people's expectations about sexting in the context of a romantic relationship were highly diverse; therefore, it cannot be concluded that sexting scripts are culturally shared [105]. Although cybersex/sexting can be exciting and fun, adolescents are aware of the risk that personal photos could be forwarded. Younger children were more concerned about the consequences of sexting than older ones. In addition, younger children were more willing to report sexting to an adult (e.g., the police, teachers or parents) than older children. Again, gender played an important role: females had more negative attitudes towards sexting and were bothered more about the possible negative consequences than males did [103]. Qualitative research shows that both boys and girls perceive the potential consequences of sexting as being more severe for girls than for boys, such as in terms of social condemnation, reputation loss and slut-shaming (term to describe the phenomenon of especially women being disparaged or made feeling guilty when they contradict the behavior and outward appearance expected by society in relation to sexuality) [106]. Moreover, boys considered it more likely than girls to request as well as send sexually suggestive pictures themselves. [107]. Sexting is also consistently found to be more common among older adolescents [107,108] and among adolescents who are sexually active [109,110].

In sum, (consensual) sexting is seen as an activity that can support adolescents in their sexual development in terms of sexual agency, sexual expression, and sexual exploration.

#### 4.6. Pornography consumption and sexual aggression

Some early studies investigated pornography consumption and attitudes towards rape. Whereas Caron and Carter [111] found that negative attitudes towards pornography were unrelated to attitudes towards rape. Cowan and Campbell [112] did find that those who consumed pornography were more likely to blame the victim than those who did not consume porn. Some recent studies found that pornography consumption was associated with passive (being the victim) and active sexual aggression [113,114]. In addition, pornography consumption was associated with more positive attitudes towards sexual coercion [115,116]. Taking a closer look towards the content of the pornography, some studies revealed that especially violent pornography consumption was correlated with sexually coercive behavior in males and females [117–120]. As Peter and Valkenburg [3] noted, these findings should be interpreted with cautiousness since prevalence numbers of passive and active sexual aggression varied greatly. The engagement with mainstream pornography in early adolescence predicted sexual harassment perpetration among male American late adolescents [34]. Still, personality traits are likely to influence individual behavior more strongly than peers or pornography use. A predisposition

to sexual aggressiveness accounts for a greater part of variance in sexual aggression than pornography use [121]. Results by the longitudinal study by Dawson, Taft, and Štulhofer [122] do not confirm a positive association between male adolescents' pornography use and sexual aggressiveness.

##### 4.6.1. Sexual cybervictimization among peers

In this context, sexual cybervictimization is defined as a misbehavior, committed online by adolescents, that causes discomfort for the person addressed, e.g., acts such as unwanted sexual solicitation, sexual aggression or sharing pornographic material. In a representative study of adolescents aged 10–17, 25% of the respondents were involuntarily exposed to sexual material, 19% experienced an unwanted sexual solicitation and 6% reported online harassment [123]. Compared to the prevalence rates of face-to-face victimization, sexual cybervictimization appears to be nearly equally or lower present in its incidence. According to a recent study, the prevalence of sexual cybervictimization in Spain is around 20% [124]. Several studies investigated the link between Internet pornography and sexual (cyber)victimization [3,23,113,125,126]. The depiction of sexually explicit content leads to a normative acceptance and imitation of risky sexual behaviors, e.g., engaging in earlier and more varied sexual activities, having more sexual partners and having a higher consumption of alcohol [34,54,57]. All these behaviors can be seen as risk factors for sexual victimization.

##### 4.6.2. Unwanted sexual solicitation and grooming

Grooming is described as the process of approaching children online for the purpose of sexual abuse [9]. In the first U.S. national study of online victimization of minors using the Internet on a regular basis, 19% reported having received a sexual solicitation or approach via the Internet in the previous year. Contradictory to common expectations on the profile of a typical sexual predator, 48% of adolescents themselves are involved as predators in online solicitations [127,128]. In fact, adult predators mostly range in age between 18 and 25 [8]. Vulnerable groups for unwanted sexual solicitation tend to be adolescents from a socioeconomically deprived environment [129] who experienced prior sexual abuse [130]. Other authors declared that further factors of impact include female gender, the use of chat rooms, sharing private information with online acquaintances, experiences with online harassment and similar risk behaviors [23,131–133]. Therefore, more girls (66%) than boys (34%) are affected. Most of the targets were 14 years or older, around 22% were even younger, between the age of 10–13 [123]. Since communication technologies are widely used and easily accessible, it's hardly surprising that sexual predators use websites and chatrooms as a potential mean for online grooming [8,134,135]. Wolak, Mitchell, and Finkelhor [126] state that the unwanted exposure to pornography is linked to unwanted online sexual solicitation. On the one hand, a recent multivariate analysis showed that students with higher levels of risk factors, including the exposure to sexually explicit material are more likely to experience sexual solicitation [126]. On the other hand, predators use pornographic material to encourage children in their sexual fantasies at a too early age to desensitize them for the act of grooming [8]. Younger victims (aged 10–13) report significantly more negative feelings [8]. In contrast, most of the youths did not talk about such incidences even though they were bothered. In around 75% of the cases, the youths were not upset [123]. Nevertheless, the trends in youth reports show a remarkable decline in unwanted sexual solicitation by 50% between 2000 and 2010 [136]. To be more precise, unwanted sexual solicitation decreased from 19% in 2000 to 9% in 2005 in the USA, which possibly provides evidence for the success of protective measures [11].



#### 4.7. Adolescent's perception of pornography

Valkenburg and Soeters [137] explored children's positive and negative experiences with the Internet in a sample of 8–13-year-old Dutch children. In all, 4.1% reported both exposure to porn and violence as a negative experience. Young people surveyed by Baker [35] considered pornography worse for younger children (11- to 14-year-olds). However, most young people disagreed that the pornography they have seen is a realistic representation of typical sexual relationships, with no significant correlation found between gender and perceived realism of pornography [35]. It was noted that more violence is directed against women than against men [138]. Most participants in the study by Doornwaard, den Boer, Vanwesenbeeck, van Nijnatten, ter Bogt, and van den Eijnden [139] shared the belief that each individual had the right to consume pornography, as long as the sex depicted in this material was legal and consensual. Only a few participants found pornography to be problematic and the general consensus among adolescents was that it was up to each individual whether to use pornography. Some participants noted that pornography might function as a substitute to real-life sex for satisfying sexual desires. Most participants perceived sex in pornographic representations as fake and unrealistic. The most obvious differences between pornography and real-life situations, according to these adolescents, were the lack of emotion, the submissive role of women in pornography [138], the exaggerated looks and performances of the actors, and the long duration of sex [108]. Almost all participants agreed that most pornographic material is misogynistic. Although adolescents' perceptions of pornography mainly reflected neutral or negative associations with this material, many participants also expressed that pornography offered useful information for enhancing one's sex life (improving certain sexual techniques). Participants experienced contradictory feelings when searching for and viewing pornography because of the entertainment on the one hand and the taboo factor, which triggers feelings of embarrassment and discomfort, on the other hand. Several adolescents believed that viewing pornography could potentially lead to copying more deviant forms of sexual behavior, including dangerous and violent sex. Girls in particular expressed fears that the extreme and exaggerated performances of porn actors as well as their physical looks may raise false expectations and lead boys to expect similar performances from them. Thus, they had increasing insecurity about their own appearance. An interesting observation in this regard was that some girls expressed viewing pornography as potentially interesting when it was viewed with a romantic partner or when they missed the intimacy of being with a romantic partner. All participants in the focus groups believed they could distinguish between exaggerated pornographic portrayals of sexuality and real-life sexual interactions and relationships. However, they assumed others, particularly younger individuals, to be at risk of adopting beliefs, expectations, and behaviors portrayed in pornography. In a non-representative study with a mostly female sample (aged 12 to 30), girls reported that a main difference between real life sex and porn was the lack of "intimacy" in pornography [140].

Whereas girls mostly respond negatively to sexually explicit content, boys have ambivalent opinions on this topic. Nevertheless, social desirability could be one of the reasons, why girls conceal their real attitude towards pornography and their level of use [27]. Overall, the youths think that the exposure to sexually explicit websites has no influence on them [141]. As a result, they are not willing to take protection measures by supporting restrictions of pornography. The Youth Internet Safety Survey by Ybarra and Mitchell [13] identified concerns such as the encouragement of earlier sexual intercourse, promotion of misogynistic attitudes and promotion of unprotected sexual activities among younger consumers. In fact, young consumers mostly respond to visual features, whereas older

consumers are more mindful of the content and its plot elements. Most emotional responses towards pornography result in negative feelings such as embarrassment, surprise, and disgust. Typical physical responses range between sexual arousal and avoidance. In summary, the exposure to pornography embodies a memorable experience that causes a mixture of ambivalent feelings and attitudes [142]. In conclusion, most adolescents are aware of the fact that the depiction of sexual intercourse in sexually explicit content is unrealistic and exaggerated. Girls stated that pornography is less arousing for them compared to their male peers due to the lack of affection, emotions, and romance in the depiction of pornography [104,143]. Overall, however, young people still see pornography as an inspiration and guide to expanding their sexual knowledge [27].

##### 4.7.1. Talking about consumption and reasons for consumption

In modern times, it seems to be a matter of common knowledge that most adolescents (75%) use the Internet as a source of information regarding sexual health due to its easy access, affordability, and anonymity [144]. On the one hand, the initial reason to seek pornographic material tends to be curiosity, information-gathering, and exploration [104]. On the other hand, a number of consumers use it in order to experience sexual arousal and pleasure [38]. Especially, girls watched pornography mainly out of curiosity, whereas boys mainly watched it to be aroused [104,143]. However, the initial reason for consumption for boys may also be curiosity and changes eventually over time to the need for sexual arousal [145]. Besides the consumption to satisfy sexual needs, the majority agreed that pornography can also be used to pass time and release stress [14]. As these topics are generally considered personal, adolescents are ashamed of discussing their questions regarding sexuality with family or friends. According to a recent study [145], around 20% of female and 25% of male adolescents talked about pornography with their parents. With increasing age, girls talked more about their pornography consumption especially within relationships. It is noteworthy that boys talking to peers about pornography was associated with a higher pornography consumption [50]. Nevertheless, Peter and Valkenburg [145] stated that asking questions about past consumption did not influence the consumption, which was confirmed by Koletic, Cohen, Štulhofer, and Kohut [146] in a longitudinal study among Croatian adolescents. Although young people know about the unreliability of online information, they still search information on the Internet and via pornographic media [27]. A qualitative study [146] showed that pornographic media conveyed expectations and demands regarding what to do. This is in accordance with Bandura's social learning theory, which suggests that young people can learn about sexuality from observing others depicted in the media [113,147]. Moreover, the visualization of sexual techniques and practices acts as an instruction for adolescents to imitate the represented performances [27]. Internet pornography could therefore also be viewed as a normative validation for own sexual preferences [20]. As presented, the reasons for consumption differ greatly.

##### 4.7.2. Pornography as an educational source for minority groups

Accessing relationship, sexuality and sexual health information can be difficult for young people from minority cultural and ethnic backgrounds, including migrants and refugees. Botfield, Zwi, Rutherford, and Newman [139] interviewed migrants and refugees in Sydney and could identify pornography as a source of information alongside school, Internet, friends, and health professionals. Nearly, all the participants reported that they were unable to discuss these topics at home with their parents. There is also a lack of relevant sexual information for LGBT people at schools and at home. For example, young men who have sex with men (both straight and gay) rely on other sources for sexual education, such as Internet and pornography [148,149]. Compared to heterosexual

adolescents, pornography use is more common and more frequent among LGBT adolescents, not only to experience sexual pleasure, but also to learn about sexual activities and as a part of their sexual identity development process [7]. Another study, investigating the perspective of gay male pornography users, also reported that the participants acknowledge learning from gay male pornography. However, they do not strongly support the social representation of gay male pornography for educational purposes, which is contradictory [150].

Furthermore, Vigna-Taglianti, Bambilla, Priotto, Angelino, Cuomo, and Diecidue [151] found visiting pornographic sites to be associated with an increased risk of problematic Internet use, while Internet use for searching specific information has a protective effect. Taken together, pornography can serve as a source of inspiration and education, but it may also have a negative impact and lead to a distorted image of sexuality [152,153].

#### 4.7.3. The impact of social distancing and isolation because of the COVID-19 pandemic

Since the beginning of the COVID-19 pandemic in December 2019 caused by the SARS-CoV-2 virus, there have constantly been issued various orders by the governments around the world. But during the periods of the highest prevalences, social distancing, lockdown, and social isolation to stem the spreading of the virus, restricted everybody's life.

Under these circumstances, especially children and adolescents have suffered enormously [153,154]. Because of the loss of social contact and the removal of many activities, screen time in general increased [154]. Therefore, one may suggest that the increase of the screen time for using the Internet would include a rising interest in and more time spend on watching porn. Maes and Vandenbosch [155] wanted to explore the adolescent's changes in the frequency of the use of sexually explicit internet materials (SEIM) before, during and after the strict lockdown period in Belgium. SEIM use did not increase significantly during the 15-month period. With respect to gender, gender predicted a change in SEIM use frequencies. Girls showed a greater, increasing change of SEIM use than boys. The most frequently reported reasons for using SEIM during the strict lockdown were sexual exploration, stress, and boredom regulation whereas loneliness regulation was not mentioned more often.

Another study [156] dealt with the impact of the COVID-19 pandemic and distancing measures affecting well-being and sexual health among adolescent sexual minority males (ASMM) during the initial period in the U.S. Online survey data were available from  $n = 151$  ASMM (age: 14–17;  $M_{\text{age}} = 16$ ,  $SD = 0.9$ ). During the past three months, participants reported masturbating and viewing porns more often. Furthermore, sexting and massaging on men-seeking-men websites/phone applications increased as well.

In sum, there is not enough evidence to clearly state that the COVID-19 pandemic led to a higher online porn consumption of children and adolescents in general.

#### 4.8. Prevention and guidelines

All in all, it must be said that studying the consumption of porn by children and adolescents is not that easy because the topic itself is among others a very sensitive and private one. Therefore, researchers often have to deal with high dropout rates in cases of longitudinal studies. Štulhofer, Matković, Kohut, Koletić, Buško, Landripet et al. showed that there is a difference whether adolescents fill out a survey about the use of porn online alone or as a paper pen version in class as the early and later attrition were lower in the second panel group [157]. Also, the participation gaps (e.g., skipping T2 but returning to T5 again) were higher in the online panel group. Notably, adolescents being vulnerable to adverse outcomes related to watching porn showed higher early

as well as later attrition in both panel groups. So, the vulnerable group, to which special attention must be paid, is especially prone to leaving (survey) studies which has to be kept in mind when thinking of prevention interventions. It appears that attempts to regulate and restrict adolescents' exposure to pornography have limited effectiveness in regard of the widespread normalization of pornography and the accessibility, which new technologies provide [115,158]. Instead, sex and relationships education should attempt to support critical approaches, targeted at promoting an understanding of pornography, which endorses its lack of congruence with lived experience and gendered attitudes. A combination of psycho-educative and technological protective tools limiting access to inappropriate materials are recommended as protective measures, such as firewalls, parental monitoring and education about Internet dangers [8,159]. Positive ways to limit the influence of sexually explicit media on a child are open family communication and a willingness to discuss sex [160]. Ballester, Rosón, and Noya [161] used a two-round electronic Delphi panel with 30 experts and concluded that interventions like social support in the maturation process, education of emotions, affections, and sexuality and regulations in the access system to online pornography, are supportive when facing the negative consequences because of porn consumption. Another important point is that training programs for family counselors should be advanced in working with adolescents' concerns regarding sexual health and pornography use. Comprehensive knowledge about contemporary pornography is needed to provide a higher comfort level and engage in a conversation of appropriate sexual education [2]. Overall, there is a need for education on sexual health [162]. More sexual education for adolescents at school regarding sexual violence, offense and assault portrays an important element in further preventive measures [113]. Davis, Wright, Murphy, Dietze, Temple-Smith, Hellard et al. stated that detailed and practical information about sex, sexual ethics, and relationships might be helpful to identify and contrast with any problematic messages they receive from pornography and society [163]. Furthermore, information about same-sex sexuality should be added to the sexual education programs at schools, to replace pornography as an educational source [149]. Because pornographic material can be accessed by accident or intentionally, Wishart [164] also recommends teaching Internet literacy and safe surfing practices at school to enable children to use the Internet in a responsible and useful way. More research should be conducted to implement appropriate protection measures for the consequences of pornography use. Unfortunately, a common problem, which should be addressed in the future, is that many of the proposed legal acts to censor pornographic sites available to children do not get a judicial confirmation/approval (by the court) [165].

## 5. Discussion

The cultural script regarding pornography seems to have changed from a morally reprehensible attitude to social acceptance [19]. This is mainly forced by the Internet and the resulting easier access to pornography. Personal characteristics such as sensation seeking and general risk behavior [e.g. 13, 21, 46] as well as environmental variables such as peers, family and culture [e.g. 13, 17, 28, 29, 50, 51] play a role when it comes to the consumption of online sexually explicit media. The consumption of Internet pornography can have negative effects on academic performances [e.g. 32, 73]. Furthermore, Internet pornography consumption can lead to increased emotional and conduct problems, as well as unrealistic and harmful attitudes, beliefs and values about sexual intercourse and sexuality in general [2–4]. An increased sexual pre-occupancy and higher levels of sexual risk activities are associated with pornography consumption and can result in permissive sex

behavior, sexual aggression, more positive attitudes towards sexual coercion [115] and female sexual objectification [5,6,113]. Additionally, there might be a lower likelihood of using contraception [3,84], especially since the infrequent condom use in pornography does not educate about healthy sex, avoidance of pregnancy or sexually transmitted infections [35].

Nevertheless, this literature review illustrates that research on the impact of online sexually explicit media exposure on young people's attitudes and behavior is limited and often contradictory. Partly due to the multiple limitations inherent in such research and to the ethical constraints in experiments involving young people.

Several critical points about the methodology need to be addressed, including the risk for bias and publication bias. Results differ depending on the type of media that is regarded whether it is sexual orientated reality TV or sexually explicit Internet material or online sexual self-representation [e.g., 22, 61]. Nevertheless, many studies do not distinguish between different sources. Moreover, investigations were carried out in different countries (e.g. Taiwan [e.g., 58], Ethiopia [113], Netherlands [e.g., 55], etc.). Therefore, it remains unclear to what extent these results are comparable [3]. Recent data focused mainly on adolescents' use of pornography that consists of male, heterosexual samples, outside the United States. Therefore, further research needs to address sexual minority clients, female samples from different age groups and cultural backgrounds, to counter the current limitation in variance and comparability [2]. Qualitative studies assessing mediating and moderating variables and causal effects are warranted, e.g., gender, sexuality, culture. Hence, in-depth research that provides greater understanding about the framework is needed [6]. Moreover, to improve the level of understanding of adolescents' pornography use, Alexandraki, Stavropoulos, Anderson, Latifi, and Gomez [4] pointed out that more research needs to be conducted on activity related and contextual factors linked to pornography use. In the extant literature, the research focus has been on individual characteristics.

A further limitation is that research on young people's use of online sexually explicit material remains taboo in some countries. This can be challenging for researchers in this field, especially in doing school-based sexuality research [166].

Another limitation concerns the inconsistent, varying definitions and conceptualizations referring to sexually explicit material throughout the literature. There is no official consensus regarding a terminology, so there are different measurements of the examined variable, which hinders comparability [5]. While negative effects of sexually explicit material gain a lot of attention, possible positive effects remain under-researched, if not ignored. Furthermore, only the minority of the findings has been replicated. Therefore, progress in research will depend on the availability of replication studies to minimize risks for bias [5].

However, the exploration of the associations between sexually explicit material use and positive outcomes regarding sexual health may contribute to the understanding of sexual development in adolescence but public anxieties and mass media coverage interferes with gathering useful findings [9]. Contemporary technological advances and various media have to be taken into account in respect to the production and distribution of pornographic material [6].

Peter and Valkenburg [3] state three characteristics of studies that may endanger the validity and generalizability of the findings: survey mode, sampling procedure, and design. First, private and intimate questions, such as questions regarding adolescents' pornography consumption, may lead to a higher number of item non-response or dropouts and to a decrease in validity and accuracy, as the respondents may feel ashamed by exposing sensitive information and thus are affected by social desirability. Second, self-selection bias may occur as voluntary participants in sex

related surveys “are more sexually experienced, have more progressive sexual attitudes and greater sexual esteem, and tend to be sexual sensation seekers” [3, p. 511]. Third, advantages and disadvantages of a study's design and its statistical techniques have to be weighed up. Various statistical analyses differ in validity as well as in the inclusion of alternative explanations and control variables. Moreover, Peter and Valkenburg [3] consider four biases that have to be prevented in research: cultural bias, heteronormativity bias, negativity bias, and bias related to status quo. As stated above, most articles regarding Internet pornography originate from a restricted number of countries, mainly Europe, North America and Australia. Few data are collected in Central and South America, Asian countries, Russia, and Middle East. As a result, the findings may be biased by cultural differences mediating pornography consumption and its outcomes. Furthermore, nearly all studies focus on heterosexual pornography. Knowledge about functions, meanings and implications of pornography use among participants with different sexuality (e.g., homosexuality) is limited. In addition, research mainly focuses on negative effects and outcomes of adolescents' pornography use, e.g., risk factors and dangers. In terms of preventive measures to reduce these risk factors and dangers, sex education should seek to support critical approaches aimed at promoting an understanding of pornography that affirms its lack of congruence with lived experiences and gendered attitudes. A combination of psycho-educative and technological protective tools that limit access to age-inappropriate material is recommended.

Finally, in recent times, the development of one's sexuality is a matter of personal choice, especially in Western countries this process is more characterized by individualization than control of authorities and social desirability. As a result, the outcomes of pornography use may also be viewed as the impact of sociocultural changes.

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The authors declare that they have no competing interest.

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