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Adolescents' pornography use, gender-stereotypical sexual beliefs, negative attitudes towards homosexuality and the role of sex education

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Abstract

Internet pornography is easily accessible for adolescents and is associated with adverse effects on viewers. To investigate potential adverse effects heterosexual adolescents' gender-stereotypical sexual beliefs and negative attitudes towards homosexuality measured following their pornography use. Additionally, the potential attenuating role of sex education was examined. To investigate these associations the cross-sectional Dutch adolescents' panel study from *Sex under 25 II* was used (n=6832). Results show that pornography use is associated with increased gender-stereotypical sexual beliefs and negative attitudes towards gay males in boys, but not in girls. Additionally, sex education has shown to be associated with decreased gender-stereotypical sexual beliefs in boys only, decreased negative attitudes towards gay males in boys and girls and decreased negative attitudes towards lesbians in girls only. However, sex education did not interact the relation between pornography use and the outcomes. These findings support the idea that pornography use can have adverse effects on (male) adolescents. They also support the idea that sex education can have a positive influence on adolescents. This underscore the need in future research to target gender and the potential diminishing role of sex education surrounding pornography use in adolescents.

Key terms: Pornography, adolescence, gender-stereotypical sexual beliefs, homosexuality, sex education.

Samenvatting (Dutch)

Internet pornografie is gemakkelijk toegankelijk voor adolescenten en is geassocieerd met nadelige effecten onder kijkers. Om nadelige effecten te onderzoeken werden gender-stereotyperende seksuele opvattingen en negatieve attitudes tegenover homoseksualiteit onder heteroseksuele adolescenten gemeten in relatie met pornografie gebruik. Als toevoeging werd de mogelijk beschermende rol van seks educatie onderzocht. Om deze relaties te onderzoeken is er gebruik gemaakt van de Nederlands cross-sectionele panel studie van *Seks onder je 25^{ste} II* (n=6832). Resultaten tonen aan dat pornografie gebruik geassocieerd is met toegenomen gender-stereotyperende seksuele opvattingen en toegenomen negatieve attitudes tegenover mannelijke homoseksuelen onder jongens, maar niet onder meisjes. Daarnaast blijkt seks educatie geassocieerd te zijn met verminderde gender-stereotyperende seksuele opvattingen onder jongens alleen, verminderde negatieve attitudes tegenover homoseksuele mannen en lesbiennes onder zowel jongens als meisjes en verminderde negatieve attitudes tegenover lesbiennes onder meisjes alleen. Deze bevindingen ondersteunen het idee dat pornografie gebruik nadelige effecten kan hebben op (mannelijke) adolescenten. Dit benadrukt het belang om in toekomstige studies doelgericht onderzoek te doen naar sekseverschillen en de potentiële verzachtende rol van seks educatie aangaande het pornografie gebruik onder adolescenten.

Sleutelwoorden: Pornografie, adolescentie, gender-stereotyperende seksuele opvattingen, homoseksualiteit, seks educatie.

Introduction

Pornographic internet videos have become the most frequently consumed form of pornography (Peter, & Valkenburg, 2012), and can be described as (audio)visual material intended to sexually arouse the viewer by showing unconcealed genitals during sexual activities (Peter, & Valkenburg, 2011). Mainstream pornography mostly represents sexual activity in a heteronormative (Linz, & Malamuth, 1993; Treas, 2002) and gender-stereotypical way, where the male is portrayed as dominant and the female as submissive (Fritz, & Paul, 2017; Klaassen, & Peter, 2015; McKee, 2005). These pornographic characteristics might influence gender-stereotypical sexual beliefs (Peter, & Valkenburg, 2007; 2009; 2010), and negative attitudes towards homosexuality (Golom, & Mohr, 2011) in adolescents. Due to the easy and anonymous accessibility of such content and the potential adverse effects, pornography use among adolescents catches scholarly attention (Peter, & Valkenburg, 2016; Owens, Behun, Manning, & Reid, 2012).

One of the potential influences of pornography is an increase in gender-stereotypical sexual beliefs in heterosexual adolescents (Peter, & Valkenburg, 2016; Owens, Behun, Manning, & Reid, 2012). These beliefs are reflected by seeing women as sex objects (Peter & Valkenburg, 2007, 2009; Vandenbosch, & Van Oosten, 2017), and compliance with the sexual double standards for boys and girls (i.e., sexual prowess for boys and modesty for girls; Vanweesenbeeck, 2009). These sexual double standards are associated with a contribution to a generally disturbed sexual expression (Cong Bui et al., 2010) and sexual dissatisfaction in women (Sanchez, Fetterolf, & Rudman, 2012). Pornography use might increase gender-stereotypical sexual beliefs as a result of the gender power imbalance depicted in pornography (Fritz, & Paul, 2017; Klaassen, & Peter, 2015; McKee, 2005), which can be adopted by adolescents (Bandura, 2001; Huesmann, 1986; Wright, 2011).

Most existing research concerning pornography use and gender-stereotypical sexual beliefs found support for an increase of these beliefs in terms of seeing women as sex objects (Peter, & Valkenburg, 2007; 2009; Vandenbosch, & Van Oosten, 2017) or in terms of moral beliefs about gender roles in non-sexual behavior (Brown, & L'Engle, 2009). To gain more insight into adolescents' pornography use and its influence on gender-stereotypical sexual beliefs, in the present study these beliefs were measured in terms of moral views about gender roles in sexual behavior.

A second potential effect of pornography use is an increase in negative attitudes towards homosexuality (Golom, & Mohr, 2011). This is especially worrisome since homo-negativity is linked to various adverse influences on homosexuals' wellbeing, like anxiety, depression,

suicidal thoughts (Díaz et al., 2001), and drug abuse (Wong, 2010). The potential positive association between pornography use and homo-negativity could be a result of the adoption of the heteronormativity depicted in pornography (Linz, & Malamuth, 1993; Treas, 2002; Wright, 2011), which might cause antigay attitudes as a way of defending this heteronormativity (Herek, 2000).

Vanweesenbeeck (2009) states that boys and girls differ when it comes to attitudes and beliefs related to sexuality. However, most research focused on adult males and attitudes towards gay males only (Wright, & Bae, 2013; Wright, & Randall, 2014; Wright, Tokunaga & Bae, 2014). This study focused not only on adolescent males, but also on females. To gain insight into the relation between heterosexual adolescents' pornography use and negative attitudes towards homosexuality, attitudes towards gay males and lesbians were examined for boys and girls separately.

Sex education might be a potentially attenuating factor in the relation between pornography use, gender-stereotypical sexual beliefs, and negative attitudes towards homosexuality (Vandenbosch, & Van Oosten, 2017). Sex education might counteract the formation of gender-stereotypical sexual beliefs and negative attitudes towards homosexuality through adoption of messages about progressive gender roles and the acceptance of homosexuality (Bandura, 1997; Barron, 2009). Also, sex education might lower the likelihood of adopting the messages from pornography by increasing adolescents' analytical skills (Bandura, 2001; Banerjee, & Kubey, 2013; Bergsma, & Carney, 2008 ; Jeong, Cho, & Hwang, 2012; Vandenbosch, & Van Oosten, 2017; Wright, 2011). Existing research focused on the role of media or porn literacy education, but in attempt to understand the role of sex education, the association between general sex education and the outcomes were examined in the present study. Also for the potential interaction of adolescents' pornography use and general sex education with the outcomes were examined.

More insight into the relation between heterosexual adolescents' pornography use, their gender-stereotypical sexual beliefs, their negative attitudes towards homosexuality and the role of sex education is needed to develop suitable interventions (Haste, 2013), which may decrease potential adverse effects of pornography use on adolescents. For that reason, this study focused on the relation between these factors among heterosexual adolescents.

To provide more insight into the potential relation between pornography use among heterosexual adolescents and gender-stereotypical sexual beliefs, the underlying mechanisms will be explained. Additionally, empirical support for this association will be given. One popular and modern approach in understanding the effect of pornography on viewers is the

acquisition, activation, and application model (3AM) of sexual media socialization (Wright, 2011), which is constructed by scripting theories (Bandura, 2001; Huesmann, 1986). According to this model, pornography can offer viewers sexual scripts they were unaware of (*acquisition*), activate aware but dormant scripts (*activation*), and stimulate the utilization of these scripts (*application*). Sexual scripts are cultural constructs, which prescribe the 'proper' way of and conditions for having sex (Wright, Tokunaga, & Bae, 2014) and can be taught by pornography. Scripting can take place in (a) a specific (Bandura, 2001) and (b) in an abstract way (Huesmann, 1986). Specific scripting occurs when viewers adopt behavior and attitudes depicted in pornography and integrate these in their own sexual relationships (Bandura, 2001). Abstract scripting occurs when viewers adopt underlying messages in pornography and integrate those in more general behavior (Huesmann, 1986). This made it likely that the adolescent viewer might adopt the gender-stereotypical sexual standards depicted in pornography and apply those in own behavior or even in the behavior of others through judgement (Wright, 2011, 2013; Wright, Malamuth, & Donnerstein, 2012).

Empirical support for these theories is found in two cross-sectional studies among Dutch adolescents, where seeing women as sex objects was increased by pornography use, especially when participants liked the pornography (Peter, & Valkenburg, 2009), and the pornography was viewed online (Peter, & Valkenburg, 2007). Furthermore, results from a cross-sectional study among undergraduate American males showed that pornography use reinforced men's norms of having more power over women (Mikorski, & Szymanski, 2017). In addition to these findings, longitudinal studies found that pornography use is associated with less progressive gender roles, especially in American girls (Brown, & L'Engle, 2009) and increased notions of seeing women as a sex object in Dutch adolescents (Vandenbosch, & Van Oosten, 2017). Additionally, an experiment among undergraduate American females have shown that women's acceptance of men seeing women as sex objects increased by pornography (Wright, Arroyo, & Bae, 2015).

In contrast to these findings, longitudinal study among Dutch adolescents found no significant association between pornography use and stronger gender-stereotypical beliefs (Peter, & Valkenburg, 2011). However, this study operationalized gender-stereotypical sexual beliefs as self-reported indications about whether participants believed that women say 'no' when they actually intend to have sex. It is worth noting that many adolescents may lack real life experience with situations in which women say 'no' but actually mean 'yes' (Peter, & Valkenburg, 2011). Therefore, the operationalization in this study might not have been an appropriate one. The strongest results suggest that there is a positive association between

pornography use and gender-stereotypical sexual beliefs, which fits into the 3AM (Wright, 2011), and is in line with the scripting theories (Bandura, 2001; Huesmann, 1986).

Beside providing more understanding of the relation between pornography use and gender-stereotypical sexual beliefs, the 3AM may also be used to provide more insight into the relation between heterosexual adolescents' pornography use and negative attitudes towards homosexuality (Wright, 2011). Based on this model it is plausible that adolescents might adopt the gender-stereotyping (Fritz, & Paul, 2017; Klaassen, & Peter, 2015; McKee, 2005) and heteronormativity (Linz, & Malamuth, 1993; Treas, 2002) depicted in pornography and integrate this in own behavior or through judgment in behavior of others (Wright, 2011, 2013; Wright, Malamuth, & Donnerstein, 2012).

According to the scripting theories, adoption of the gender-stereotyping and heteronormativity in pornography might reinforce the appreciation of the traditional gender roles (i.e. the masculinity of men and the femininity of women; Bandura, 2001; Huesmann, 1986; Lippa, 2008). In contrast to the traditional gender roles, gay males are linked to femininity (Sandfort, 2005) and lesbians to masculinity (Peplau, & Garnets, 2000). This might explain why homosexuality can cause feelings of threat in fulfilling individual's own traditional gender identity when the individual is strongly attached to those traditional roles (Herek, 2000). These feelings of threat could result in displaying homo-negativity as a way of 'ego'-defense (Helgeson, 2002).

An experimental study showed that young heterosexual male students who were insecure about their own sexual qualities and were exposed to heterosexual pornographic videos demonstrated increased negative attitudes towards gay males (Golom, & Mohr, 2011). According to research, this could have been a result of the insecurity about males' own masculine identity, which might have made these males more sensitive to feelings of threat about their own traditional male role in sexual situations. These feelings could have led to antigay attitudes as a way of 'ego' defense, triggered by the heteronormative pornography (Helgeson, 2002; Herek, 2000).

In contrast to these findings, three longitudinal studies among American heterosexual male adults found an association between pornography use and positive, instead of negative, attitudes towards homosexuality, (Wright, & Randall, 2014), moderated by higher levels of importance of personal freedom (Wright, Tokunaga & Bae, 2014), and higher levels of individual moralism (Wright, & Bae, 2013). It is worth noting that these studies mainly used liberal participants. According to the gender role hypothesis, liberal participants are less attached to traditional gender roles and might be less sensitive to pornography as a trigger to

feelings of threat to their masculinity. Therefore, they seem to be less likely to develop antigay attitudes (Helgeson, 2002; Herek, 2000).

However, the gender intensification hypothesis states that a sudden stronger affection with traditional gender roles takes place during adolescence (Hill & Lynch, 1983; Lynch 1991), which makes it likely that heterosexual adolescents might be sensitive to feelings of threat in their traditional gender roles. Therefore, it is made likely that heterosexual adolescents might develop antigay attitudes, which could be triggered by pornography (Herek, 2000). Based on the most relevant results it is plausible that adolescents' pornography use might increase negative attitudes towards homosexuality, which fits the 3AM (Wright, 2011) and the gender role hypothesis (Herek, 2000). However, most research has been done among males' pornography use related to attitudes towards gay males. Beside studying the relation between boys' pornography use and negative attitudes towards gay males, also girls' pornography use and negative attitudes towards lesbians were investigated.

To gain more insight into the attenuating role of sex education, the potential direct influence of sex education on gender-stereotypical sexual beliefs and negative attitudes towards homosexuality in adolescents will be discussed. Moreover, the potential moderating role of sex education in the relation between adolescents' pornography use and the outcomes will be discussed. Since sexual scripts are cultural constructs, sex education might have a role in teaching adolescents the conditions concerning sex and sexuality (Bandura, 1977). In the Netherlands, sex education provides adolescents with messages about progressive gender roles and acceptance of homosexuality (CvTE, 2018). These messages might be adopted and integrated in adolescents' own behavior through social learning (Bandura, 1977). This made it likely that sex education might decrease gender-stereotypical sexual beliefs (Vandenbosch & Van Oosten, 2017), likewise for negative attitudes towards homosexuality (Barron, 2009).

The potential moderating role of sex education in association with pornography use and the outcomes may also be explained by the 3AM . This model states that the actual acquisition, activation and application of sexual scripts triggered by pornography depends on the level of skills in analyzing the pornographic content more critically (Wright, 2011). Studies have shown that media literacy interventions improved these skills in adolescents (Banerjee, & Kubey, 2013; Bergsma, & Carney, 2008 ; Jeong, Cho, & Hwang, 2012). Additionally, a longitudinal study showed that porn literacy education diminished the relation between adolescents' pornography use and seeing women as sex objects, with no gender or age difference (Vandenbosch and Van Oosten, 2017). Beside porn literacy, general sex education in the Netherlands also covers information about gender roles and homosexuality (CvTE, 2018). For

that reason, the role of general sex education was examined in the present study. Based on given theory and empirical findings it has been made likely that sex education might actually directly reduce gender-stereotypical sexual beliefs and negative attitudes towards homosexuality among adolescents, but also moderates the relation between adolescents' pornography use and the outcomes.

In sum, research strongly suggests that pornography use among heterosexual adolescents might reinforce gender-stereotypical sexual beliefs and negative attitudes towards homosexuality. Sex education might attenuate effects of pornography, but also minimize the level of the outcome variables directly, regardless of whether the adolescents were using pornography. The main questions in this study are; *Is pornography use among heterosexual adolescents associated with stronger gender-stereotypical sexual beliefs and negative attitudes towards homosexuality? And does sex education moderate these associations?* To investigate these questions, several hypotheses will be tested among heterosexual adolescents (see Figure 1).

H1: There is a positive relation between pornography use and gender-stereotypical sexual beliefs.

H2: There is a positive relation between pornography use and negative attitudes towards homosexuality.

H3: There is a negative relation between sex education and gender-stereotypical sexual beliefs.

H4: There is a weaker effect of pornography use on gender-stereotypical sexual beliefs when sex education is included as moderator.

H5: There is a negative relation between sex education and negative attitudes towards homosexuality.

H6: There is a weaker effect of pornography use on negative attitudes towards homosexuality when sex education is included as moderator.

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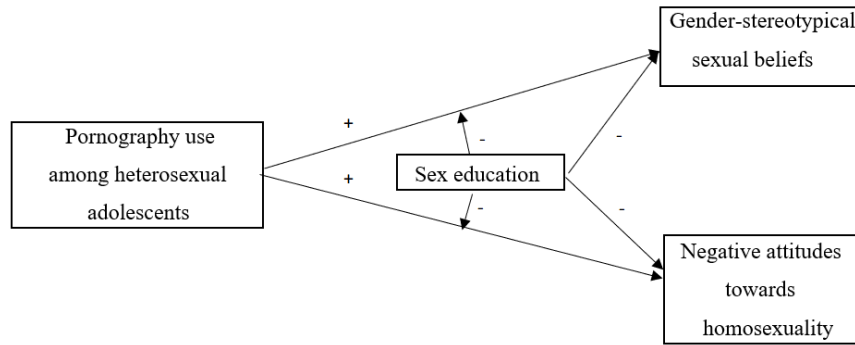


Figure 1. Hypothetical model for the relation between pornography use, gender-stereotypical sexual beliefs and negative attitudes towards homosexuality in heterosexual adolescents, moderated by sex education.

As gender plays an important role in attitudes and beliefs related to sexuality (Vanwesenbeeck, 2009), gender cannot be ignored in this type of study. Therefore, in the present study boys and girls were analyzed separately. Other factors might influence the results as well. One of these factors is religion. The more religious the adolescent, the bigger the possibility of feelings of affection with the traditional gender roles, which might influence the results (Wright, & Bae, 2013). Another factor is education. The higher the educational level of the adolescent, the greater the capacity for development of analytical skills (Wright, 2011), which might influence the results. Also, the older the adolescents become, the more developed they might have become in analyzing pornographic content more critically (Wright, 2011), which could influence the results. Hence, the role of age, religion and educational level were taken into account during analysis.

Method

Sample and procedure

In the present study, the Dutch adolescents' 2012 panel with participants aged 12 to 25 from the cross-sectional study *Sex under 25 II* was used (n=6832). This national study examined adolescents' social beliefs and behaviors related to several themes of sexuality through electronic self-surveys (De Graaf, Kruijer, Van Acker, & Meijer, 2012).

Recruitment of potential participants took place in high schools and municipalities. First, participants under the age of 17 were recruited by a random selection of high schools in the Netherlands. In total, 43 schools cooperated, consistent with the national distribution of schoolyear and level. Second, participants over the age of 17 were recruited randomly from a list of all Dutch municipalities. In total, 55 municipalities cooperated, with regard to the

generalizability to the national population concerning the demographic variables. Only 16,4% of the approached potential participants responded. This part of the sample did not represent the national population, hence, additional recruitment took place.

Electronic questionnaires were administered through email for the older adolescents and through school computers for the younger adolescents. Every participant was provided with a unique username and password. Participants who mentioned filling in the questionnaire untruthfully and participants who were inconsistent in their answers were excluded from the sample. In total, 7841 participants were included in the dataset *Sex under 25 II*. The sampling strategy of this cross-sectional study is described extensively in the report of *Sex under 25 II* (De Graaf, Kruijer, Van Acker, & Meijer, 2012).

To be included for analysis in the present study it was necessary that the participant was heterosexual. Heterosexuality was assessed by indicating to what extent participants were attracted to the same, the opposite or both sex(es). Only participants who mentioned to be attracted to the opposite sex exclusively, were included in this study (n=7203). Furthermore, information about pornography use was critical for analysis. Due to absence of answers on this variable, 371 participants were excluded. In total, 6832 participants were included for this study of which 41.9% were male.

Measures

Pornography use. Audio-, visual and internet pornography were used to measure pornography use (Brown, & L'Engle, 2009; Peter, & Valkenburg 2007). Participants were asked to what extent they had watched a porn-DVD or visited a porn website during the past six months. Response categories ranged from 1 (*never*) to 3 (*more than once*). For analysis, pornography use was dichotomized. Sum scores on these items of 4 and higher were categorized as 1 'pornography use', if not, they were categorized as 0 'pornography non-use'.

Sex education. Sex education was measured as the extent to which adolescents had received sex education on ten topics, such as information about sex and relationships, homosexuality, STD's, pregnancy and sex on the television or internet (Van Fulpen et al., 2002). Response options were 0 (*not received*) or 1 (*received*). For analysis, sex education was dichotomized. If participants responded with 1 on at least 6 topics they were categorized as 1 'highly sex educated', if not, they were categorized as 0 'lower sex educated'.

Gender-stereotypical sexual beliefs. Gender-stereotypical sexual beliefs were measured with four items about moral views related to gender in sexual situations (Van Fulpen et al., 2002). These beliefs were assessed by asking participants to what extent they approved

(a) a boy flirting with a girl, (b) a boy having sex with a lot of different girls, (c) a girl flirting with a boy, and (d) a girl having sex with a lot of different boys. Response categories ranged from 1 (*very inappropriate*) to 5 (*very appropriate*). Gender-stereotypical sexual beliefs were indexed by the differential score between answers to the items about boys and girls, represented by $(a+b)-(c+d)$ with a score range of -8 to 8. Scores between -8 and -1 indicated reversed double standard in sexual beliefs. Scores between -1 and 1 indicated gender equality, and scores between 1 and 8 indicated gender-stereotypical sexual beliefs. Cronbach's alpha for the current sample was .72.

Negative attitudes towards homosexuality. Negative attitudes towards homosexuality were measured with two items (Brugman et al., 1995). These attitudes were assessed by asking participants to what extent they approved (a) two boys kissing on the street, and (b) two girls kissing on the street. Response categories ranged from 1 (*very appropriate*) to 5 (*very inappropriate*). Scores higher than 3 indicated negative attitudes (Brugman et al., 1995). The scale reliability for the present sample was .75, with an inter-item correlation of .60.

Age and gender. Participants indicated their age with birth year and month, and biological sex with 0 'boy' or 1 'girl'.

Religiosity. Participants answered to what extent religion is important to them (Brugman et al., 1995). Response categories ranged from 1 (*not important*) to 3 (*very important*). If participants responded with 0 they were categorized as 0 'not religious', all other options were categorized as 1 'religious'.

Educational level. Participants mentioned their current or highest finished educational level (Brugman et al., 1995) and were categorized as 0 'lower educated (i.e., *primary school*, *vmbo*, *mbo*)' and as 1 'higher educated' (i.e., *havo*, *vwo*, *hbo*, *university*).

Data analysis

All analyses were conducted using IBM SPSS Statistics version 25.0. First, the group differences in characteristics between pornography users and non-users were examined. Second, correlations between all variables were tested with Pearson's correlation coefficients or Spearman's rho. Third, sequential multiple regression analyses were employed to investigate the potential relation between (a) pornography use, (b) sex education, (c) the moderating role of sex education and the outcomes (a) gender-stereotypical sexual beliefs and (b) negative attitudes towards homosexuality. All analyses were done separately for boys and girls, and homosexuality was subdivided in gay males and lesbians.

All assumptions of sequential multiple regression were tested and checked, except for the measure gender-stereotypical sexual beliefs, which was found distributed leptokurtic. Outliers were examined but found valuable and kept included, hence, bootstrapping was applied. Also multicollinearity was found between age and the interaction term of sex education and pornography use. After centering the variables multicollinearity remained, therefore, age needed to be excluded for the relevant analyses.

Results

Descriptive statistics

Table 1 shows the descriptive statistics for adolescent boys' and girls' characteristics from the group who used pornography and the group who did not. 21.5 % of the participants used pornography during the past six months. The group of male adolescents that used pornography were predominantly older ($M=19.67$, $SD=3.28$), lower educated (69.4%), and not religious (70.8%). Dominant characteristics of the girls who used pornography were being older ($M=20.68$, $SD=2.91$), lower educated (63.8%) and not religious (66.3%).

Boys using pornography scored higher on gender-stereotypical sexual beliefs and negative attitudes towards gay males compared to the boys who did not use pornography. However, the opposite was found in girls. Boys and girls who used pornography scored lower on negative attitudes towards lesbians than adolescents who did not use pornography.

The Pearson's coefficients and Spearman's rho from the zero-order correlations of all variables of interest are presented in Table 2. All independent variables correlated significantly with the dependent variables, except for sex education with gender-stereotypical sexual beliefs in girls and sex education with negative attitudes towards lesbians in boys.

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Table 1

Descriptive Statistics For Adolescent Boys' and Girls' Characteristics From The Group Of Pornography Users And Non-Users

Characteristics	Pornography users	Non-users
Highly sex educated (n (%))	336 (34.2) <i>171 (35.0)</i>	640 (34.0) <i>1137 (32.7)</i>
Gender-stereotypical sexual beliefs ^a (M (SD))	.54 (1.30) <i>.19 (.93)</i>	.33 (1.17) <i>.22 (.94)</i>
Negative attitudes towards gay males ^b (M (SD))	3.67 (1.30) <i>2.73 (1.19)</i>	3.55 (1.28) <i>2.95 (1.15)</i>
Negative attitudes towards lesbians ^b (M (SD))	2.28 (1.14) <i>2.66 (1.14)</i>	2.63 (1.16) <i>2.92 (1.11)</i>
Age (M (SD))	19.67 (3.28) <i>20.68 (2.91)</i>	18.56 (3.42) <i>18.89 (3.33)</i>
Lower educated (n (%))	682 (69.4) <i>312 (63.8)</i>	1413 (75.1) <i>2384 (68.5)</i>
Religious (n (%))	287 (29.2) <i>165 (33.7)</i>	585 (31.1) <i>1284 (36.9)</i>
Total n (%)	983 (66.8) <i>489 (33.2)</i>	1882 (35.1) <i>3478 (64.9)</i>

Note. M= mean, SD= standard deviation. Boys are in bold and girls are in italics.

^ascale range; -8 - 8, ^bscale range; 1-5.

Table 2

Zero-Order Correlation of The Variables of Interest In Adolescent Boys (n=2865) And Girls (n=3967)

	1.	2.	3.	4.	5.	6.	7.	8.
1. Pornography use	1.00							
2. Gender-stereotypical sexual beliefs	.082***^a <i>-.011***^a</i>	1.00						
3. Negative attitudes towards gay males	.045***^a <i>-.063***^a</i>	.228***^a <i>.156***^a</i>	1.00					
4. Negative attitudes towards lesbians	-.142***^a <i>-.077***^a</i>	.046***^a <i>.155***^a</i>	.403***^a <i>.897***^a</i>	1.00				
5. Highly sex educated	.002^b <i>.016^b</i>	-.039***^a <i>.005^a</i>	-.053***^a <i>-.049***^a</i>	-.024^a <i>-.042***^a</i>	1.00			
6. Age	.151***^a <i>.176***^a</i>	-.064***^a <i>-.082***^a</i>	-.169***^a <i>-.078***^a</i>	-.101***^a <i>-.088***^a</i>	-.083***^a <i>.098***^a</i>	1.00		
7. Religiosity	-.019^b <i>-.022^b</i>	.075***^a <i>.081***^a</i>	-.186***^a <i>.283***^a</i>	.226***^a <i>.294***^a</i>	-.025^b <i>-.025^b</i>	.020***^a <i>-.005^a</i>	1.00	
8. Higher educated	.060***^b <i>.034***^b</i>	-.042***^a <i>-.089***^a</i>	-.200***^a <i>-.113***^a</i>	-.077***^a <i>-.105***^a</i>	-.002^b <i>-.030^b</i>	.464***^a <i>.505***^a</i>	-.043***^b <i>.004^b</i>	1.00

Note. ^aPearson's correlation coefficient, ^bSpearman's rho. Boys in bold and girls in italics. *p<.05, **p<.01.

Sequential multiple regression analysis

To test whether and to what extent pornography use and sex education correlates explain the variance in gender-stereotypical sexual beliefs, a sequential multiple regression analysis was conducted. The results are summarized in Table 3. Analysis started with a basic model that included the control variables age, religion and educational level. Then the potential predictors entered the model, started with pornography use (model 1). The addition of adolescents' pornography use resulted in a significant positive relation with gender-stereotypical sexual beliefs in boys ($\beta=.10$, $p<.001$, $R^2=.019$), but not in girls ($\beta=.00$, $p=.149$). Sex education, as entered in model 2, resulted in a significant negative relation with gender-stereotypical sexual beliefs in boys ($\beta=-.05$, $p<.001$, $R^2=.021$), but not in girls ($\beta=.01$, $p=.150$). The model fit was not improved after the addition of the interaction term of pornography use and sex education in model 3.

Table 3

Sequential Multiple Regression Analysis Predicting Gender-stereotypical Sexual Beliefs From Pornography Use And Sex Education Among Heterosexual Adolescent Boys And Girls

n=2860 3963	Models			
	Base	1	2	3
<i>Control variables</i>				
Age ^a	-.06**	-.08***	-.09***	
	<i>-.05**</i>	<i>-.05**</i>	<i>-.05**</i>	
Religiosity	.08***	.08***	.08***	.08***
	<i>.08***</i>	<i>.08***</i>	<i>.08***</i>	<i>.08***</i>
Higher educated	-.01	-.01	-.01	-.04*
	<i>-.07***</i>	<i>-.07***</i>	<i>-.07***</i>	<i>-.09***</i>
<i>Independent variables</i>				
Pornography use		.10***	.10***	.09**
		<i>.00</i>	<i>.00</i>	<i>.01</i>
Highly sex educated			-.05*	-.03
			<i>.00</i>	<i>.01</i>
Pornography use x Higher sex education				-.03
				<i>-.02</i>
Total R ²	.010***	.019***	.021***	.016***
	<i>.016***</i>	<i>.016***</i>	<i>.016***</i>	<i>.015***</i>

Note. *** $p<.001$, ** $p<.01$, * $p<.05$. Boys are in bold and girls are in italics. The scale range of gender-stereotypical sexual beliefs was from -8 to 8. ^aAge was excluded due to multicollinearity.

Table 4 summarizes the sequential multiple regression analysis for adolescents' negative attitudes towards gay males and lesbians in relation with pornography use and sex education. When pornography use was added to the models (model 1), negative attitudes

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towards gay males significantly increased in boys ($\beta=.08, p<.001, R^2=.086$), but significantly decreased in girls ($\beta=-.05, p<.01, R^2=.095$). For both genders, negative attitudes towards lesbians significantly decreased after the addition of pornography use (*boys*; $\beta=-.13, p<.001, R^2=.079$, *girls*; $\beta=-.06, p<.001, R^2=.103$). When sex education was added to the model (model 2), negative attitudes towards gay males decreased significantly for both genders (*boys*; $\beta=-.06, p<.01, R^2=.078$, *girls*; $\beta=-.05, p<.01, R^2=.098$), negative attitudes towards lesbians significantly decreased in girls ($\beta=-.04, p<.01, R^2=.104$), but did not in boys ($\beta=-.03, p=.172$). Addition of the interaction term of adolescents' pornography use and sex education in model 3, did not improve the models' fit.

Table 4

Sequential Multiple Regression Analysis Predicting Negative Attitudes Towards Gay Males And Lesbians From Pornography Use And Sex Education Among Heterosexual Adolescent Boys And Girls

n= 2861 3963	Attitudes towards gay males				Attitude towards lesbians			
	Base	1	2	3	Base	1	2	3
<i>Control variables</i>								
Age ^a	-.11*** <i>-.03</i>	-.12*** <i>-.01</i>	-.13*** <i>-.02</i>		-.10*** <i>-.04*</i>	-.08*** <i>-.03</i>	-.08*** <i>-.04*</i>	
Religiosity	.18*** <i>.28***</i>	.19*** <i>.28***</i>	.18*** <i>.28***</i>	.18*** <i>.28***</i>	.23*** <i>.29***</i>	.23*** <i>.29***</i>	.23*** <i>.29***</i>	.22*** <i>.29***</i>
Higher educated	-.14*** <i>-.10***</i>	-.14*** <i>-.11***</i>	-.14*** <i>-.10***</i>	-.20*** <i>-.11***</i>	-.02 <i>-.08***</i>	-.03 <i>-.09***</i>	-.03 <i>-.09***</i>	-.06** <i>-.10***</i>
<i>Independent variables</i>								
Pornography use		.08*** <i>-.05**</i>	.08*** <i>-.05**</i>	.06** <i>-.03</i>		-.13*** <i>-.06***</i>	-.12*** <i>-.06***</i>	-.16*** <i>-.06**</i>
Highly sex educated			-.06** <i>-.05**</i>	-.05* <i>-.04*</i>			.03 <i>-.04**</i>	-.04 <i>-.03</i>
Pornography use x Higher sex education				-.00 <i>-.04</i>				.04 <i>-.02</i>
Total R ²	.081*** <i>.093***</i>	.086*** <i>.095***</i>	.078*** <i>.098***</i>	.078*** <i>.097***</i>	.064*** <i>.099***</i>	.079*** <i>.103***</i>	.080*** <i>.104***</i>	.076*** <i>.104***</i>

Note. *** $p<.001$, ** $p<.01$, * $p<.05$. Boys are in bold and girls are in italics. The scale range of negative attitudes towards homosexuality was from 1 to 5. ^aAge was excluded due to multicollinearity.

Discussion

The purpose of this study was to investigate the relation between heterosexual adolescents' pornography use, their gender-stereotypical sexual beliefs and (negative) attitudes towards homosexuality, and to what extent these relations were moderated by sex education.

Results show that pornography use is associated with increased gender-stereotypical sexual beliefs and negative attitudes towards gay males in boys, but not in girls. Additionally, sex education has shown to be associated with decreased gender-stereotypical sexual beliefs in boys only, decreased negative attitudes towards gay males in boys and girls and decreased negative attitudes towards lesbians in girls only.

In line with existing empiricism (Brown, & L'Engle, 2009; Peter, & Valkenburg, 2007, 2009; Vandenbosch, & Van Oosten, 2017), results from the present study show that heterosexual boys' pornography use increased gender-stereotypical sexual beliefs, which also fits the 3AM (Bandura, 1977; Huesmann, 1986; Wright, 2011). After age, religion and educational level were taken into account, pornography use remained a significant contributor to the explained variance. However, girls' pornography use did not increase gender-stereotypical sexual beliefs.

A possible explanation for these findings can be given based on an experiments among young adults which found that boys' sexual beliefs were affected more after exposure to pornography than girls' (Zillmann, 1989), while girls' sexual beliefs were more influenced by exposure to sexual content on television (Aubrey et al., 2003; Ward, 2003). This could indicate that pornography use as operationalized in the present study affected boys' gender-stereotypical sexual beliefs more than girls'. It could have been the case that boys were more receptive for messages in pornography than girls were, which could have resulted in increased gender-stereotypical beliefs in boys following pornography use, but not in girls.

An alternative explanation for the obtained results could be given by a societal factor. The present study was conducted in the Netherlands, which is known as rather liberal to sexuality (Schalet, 2000; Ševčíková, Šerek, Barbovski, & Daneback, 2014), where heterosexual adolescents' romantic relationships seem to have become more egalitarian (Bordini, & Sperb, 2013; Crawford, & Popp, 2003; Eaton, & Rose, 2011; Fugère, Escoto, Cousins, Riggs, & Haerich, 2008; Sanchez, Fetterolf, & Rudman, 2012). These Dutch societal norms enables to provide sexual scripts about progressive gender beliefs, which are conflicting with the gender-stereotypical scripts reflected by pornography. According to the 3AM , sexual scripts that are discordant with preexisting beliefs are less likely to be applied than sexual scripts that are less discordant (Malamuth et al., 2012; Wright, 2011). It could be possible that the adolescents from the current sample, especially girls, were less receptive to adopt the gender-stereotyping depicted in pornography through preexisting liberal sexual beliefs. Albeit the present sample might be seen as liberal, pornography use remained to increase gender-

stereotypical sexual beliefs in boys. Therefore, the impact of pornography use on adolescents' gender-stereotypical sexual beliefs should not be underestimated.

Beside increased gender-stereotypical sexual beliefs in boys, pornography use also increased boys' negative attitudes towards gay males, which fits the β AM (Bandura, 1977; Huesmann, 1986; Wright, 2011) and is in line with other prior research (Golom, & Mohr, 2011; Helgeson, 2002; Herek, 2000). In contrast to the expectations, pornography use decreased negative attitudes towards lesbians in girls. When age, religion and educational level were taken into account, pornography use remained to contribute significantly to the explained variance in negative attitudes towards homosexuality in boys and girls.

A first possible explanation for the obtained findings can be given by gender role beliefs. Herek (2000) argues that males' attachment to their traditional masculine identity is stronger than females' attachment to the traditional female role. Research has found that strong masculine norms in males increased males' negativity towards gay males (Bridges, 2014), which again turned out to be stronger for males towards gay males than for females towards lesbians (Nierman et al., 2007). In addition, pornography use is associated with reinforced masculine norms in young males (Mikorski, & Szymanski, 2017). This makes it likely that women's weaker connection with the traditional female role lowers women's likelihood to feel the need of expressing homonegativity compared to males (Helgeson, 2002). Logically, it could have been the case that the girls from the present study were less likely to apply sexual scripts about gender-stereotyping and heteronormativity than the boys were. This could explain why boys' negative attitudes towards gay males did increase, but girls did not display increased negative attitudes towards lesbians nor towards gay males following their pornography use. Future research is needed to investigate the role of gender role beliefs and pornography use related to negative attitudes towards homosexuality.

A second, but alternative, explanation for the obtained results can be given by the role of a societal factor. Apart from attitudes towards gay males in boys, results from the present study demonstrate that adolescents have relatively neutral attitudes towards homosexuality. These results support the idea that the earlier mentioned preexisting liberal sexual scripts provided by the Dutch societal norms might have made the adolescents from the current sample less receptive to adopt the gender-stereotyping and heteronormativity depicted in pornography (Malamuth et al., 2012; Wright, 2011). Despite, pornography use remained to increase negative attitudes towards gay males in boys. Therefore, the potential adverse effect of pornography use on negative attitudes towards homosexuality should not be ignored.

As expected, high sex education decreased gender-stereotypical sexual beliefs in boys, which is in line with the empiricism (Vandenbosch, & Van Oosten, 2017) and fits the β_3 AM (Wright, 2011). However, no relation was found in girls. An alternative explanation for these obtained findings could be given by a methodological factor. Results from the present study demonstrate that the adolescents displayed relatively gender-equality in sexual beliefs in general, which was slightly more among girls than among boys. In addition, the Dutch school curriculum about sex education states to teach adolescents about gender equality (CvTE, 2018). It could have been the case that a potential ceiling effect has occurred among the girls from the current sample, which may explain that an association between sex education and gender-stereotypical sexual beliefs is found in boys, but not in girls. Even though a potential ceiling effect might have occurred among the girls from the current sample, evidence is found for significantly decreased gender-stereotypical sexual beliefs in highly sex educated boys. Through these findings, the role of sex education concerning gender-stereotypical sexual beliefs among heterosexual adolescents should be examined more extensively in future research.

In the present study higher sex education decreased negative attitudes towards gay males in boys and girls, and decreased negative attitudes towards lesbians in girls. Although the effect sizes were small, after age, religion and educational level were taken into account significant relations remained, which supports the theory (Bandura, 1977). In contrast to these findings, no relation was found between sex education and negative attitudes towards lesbians in boys. A potential explanation can be given by the role of adolescents' behavior surrounding sex education. In prior research, educators have pointed out that boys regularly respond less 'mature' to sex education than girls, which influence the impact of sex education in boys (Haste, 2013). It could have been that girls from the current sample adopted messages from sex education better than boys did. This might explain why an association was found between sex education and negative attitudes towards lesbians in girls, but not in boys.

An alternative explanation for the findings can be given by a methodological factor. Results from the present study were obtained with information about which sex related topics were covered, but not in which way they were taught. According to Vandenbosch and Van Oosten (2017), the way in which sex related topics are taught to adolescents plays a role in the effect of sex education. This indicates that the quality of sex education matters regarding the effect of sex education. To examine this idea future research is needed. Nevertheless, with the current operationalization of sex education significant decreases of negative attitudes towards homosexuality were found. Future research should not ignore the importance of the role of sex education in decreasing adolescents' negative attitudes towards homosexuality.

Although most of the main effects were found in the present study, no evidence was found for an interaction between sex education and pornography use in association with the outcomes. A potential explanation for these obtained results can be given by the learning process in adolescents. Potter (2004) explains that receiving sex education is a first step in developing a critical way of thinking in processing the pornographic content, but doesn't make an individual automatically competent in these skills. A second step in this process is needed by application of the obtained lessons in practice, which is supported by evidence from a longitudinal study (Vandenbosch, & Van Oosten, 2017). Because the current dataset is cross-sectional, no statements about a causality or a developmental processes can be made. To examine this process, a longitudinal design in future research is needed.

Alternative explanations for the obtained results can be given by two methodological factors. First, it could have been the case that the effect sizes of the observed main effects were not big enough to reveal an actual interaction effect between pornography use and sex education on the outcomes. Second, it is possible that the group of adolescents who used pornography and were highly sex educated was not big enough to reveal an actual interaction effect. To gain more insight into the potential interaction between sex education and pornography future research is needed.

Limitations

In the present study a sample of 6832 heterosexual adolescents was used. This size improves the generalizability of the results to all Dutch youth. Worth mentioning, interpretation of these results needs to be done carefully due to limitations. Important limitations will be given. First, as is true with self-reported data, results could give a distorted image as a result of the tendency of responding emotionally biased or not responding with full honesty. Second, the cross sectional data limits the ability to draw causality between variables, thence, alternative explanations for the obtained findings or bidirectional relations are plausible. This is why longitudinal or experimental designs are needed.

Third, this study was also limited for interpretation of the results due to limitations of the operationalization of the concepts. For example, at the conceptual construction of sex education it was expected from adolescents to remember the perceived sex related topics. It could have been the case, especially for the older adolescents, that it was hard to remember which topics were covered during classes. This has been able to lead to a distorted image of sex education. Further research is needed to develop a scale which measures sex education suitable for all ages (Vandenbosch, & Van Oosten, 2017). Additionally, gender-stereotypical sexual

beliefs from the present study were measured with two types of items, but other more comprehensive measures for constructs of gender-stereotyping sexual beliefs exist, suitable for all stages of sexual development during adolescence, which might increase the ability for interpretation (Emmerink, Van den Eijnden, Ter Bogt, & Vanwesenbeeck, 2017). Furthermore, in this study negative attitudes towards homosexuality were measured with only one item for lesbians and one for gay males. However, other models for measuring attitudes towards homosexuals exist (e.g., cognitive and affective dimensions; Herek, 1984). To see if these models add to our understanding about adolescents' pornography use affecting attitudes towards homosexuality they should be included in future research.

Finally, qualitative research would offer a descriptive and contextual understanding of adolescents' pornography use and sex education in association with gender-stereotypical sexual beliefs and negative attitudes towards homosexuality.

Conclusion

Findings from the present study are important in the context of working with heterosexual adolescents in educational as well as in other (e.g., clinical) settings. Currently, youth grow up in a media environment that provides them with unauthorized access to pornographic material. It is important to increase knowledge on the potential adverse effects of pornography use on adolescents (Peter, & Valkenburg, 2016). Results from the present study support the view that pornography use can contribute to increased gender inequality and adversity towards sexual minority groups, such as LGBTs. Results also suggest that sex education can promote gender equality and acceptance of homosexuality. Even in a country that is seen as sexually liberal, such as the Netherlands, adolescents are not equally protected against adverse effects of pornography. This underscores the need to target youth, (e.g., heterosexual boys) who are vulnerable to such adverse effects of pornography use, as well as susceptible the factors that can either endorse or diminish these influences of pornography (e.g., sex education).

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