Impact of Pornography on Physical Self-Esteem And Sexual Satisfaction, Moderated by Perceived Realism

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Abstract

Although accumulating studies indicate that pornography use is associated with lower sexual satisfaction, little is known about these causal relationships among adolescents. The current study aims to investigate the effect of pornography use on sexual satisfaction, including the potential mediating effect of physical self-esteem and the moderating role of perceived realism on the relationship between pornography use and sexual satisfaction. Longitudinal two-wave data from $N = 945$ adolescents aged between 12-18 ($M = 14.76$, $SD = 1.19$) was collected using online questionnaires. Results from hierarchical linear regression analyses showed that the relationship between pornography use and sexual satisfaction is not significant, whereby a mediating effect of physical self-esteem was not found. Although the opposite direction was hypothesized, a positive moderating effect of perceived realism was found indicating that among adolescents who (regularly) use pornography, those who perceive pornography as realistic experience more sexual satisfaction than those who do not perceive it as realistic. These findings imply that pornography does not have negative effects, considering its positive effect on sexual satisfaction. Nevertheless, to guide adolescents in successfully handling and interpreting pornographic content, education should implement a curriculum that focuses on critical media analysis of pornography.

Keywords: pornography use, sexual satisfaction, physical self-esteem, adolescents, perceived realism

Samenvatting

Hoewel steeds meer studies erop wijzen dat pornografiegebruik geassocieerd is met lagere seksuele tevredenheid, is er weinig bekend over deze causale relatie onder adolescenten. Het doel van de huidige studie is om het effect van pornografiegebruik op seksuele tevredenheid te onderzoeken, inclusief het potentiële mediërende effect van lichamelijk zelfbeeld en de modererende rol van waargenomen realisme op de relatie tussen pornografie en seksuele tevredenheid. Er werd gebruik gemaakt van longitudinale data over twee meetmomenten van N = 945 adolescenten tussen de 12-18 jaar (M = 14,76; SD = 1,19), gemeten met online vragenlijsten. Resultaten van hiërarchische lineaire regressieanalyses toonden aan dat de relatie tussen pornografiegebruik en seksuele tevredenheid niet significant is, waarbij een mediërend effect van lichamelijk zelfbeeld niet werd gevonden. Hoewel de tegenovergestelde richting werd verondersteld, werd een positief modererend effect van waargenomen realisme gevonden. Onder adolescenten die (regelmatig) pornografie gebruiken, hebben degenen die pornografie als realistisch ervaren meer seksuele tevredenheid dan degenen die het minder als realistisch ervaren. Deze bevindingen impliceren een positief effect van pornografie op seksuele tevredenheid. Desalniettemin, moet het onderwijs een curriculum implementeren dat zich richt op kritische media-analyse van pornografie, om adolescenten te begeleiden bij het succesvol omgaan met en interpreteren van pornografische inhoud.

Kernwoorden: pornografiegebruik, seksuele bevrediging, fysiek zelfbeeld, adolescenten, waargenomen realisme

With the advent of the internet into everyday life, accessibility of sexualized media (i.e., sexual images/videos of individuals and characteristics on the internet) has expanded enormously (Janghorbani & Lam, 2003; Mattebo et al., 2013; Baams et al., 2015). Especially for Western adolescents, the internet has become a popular way to learn about, explore and develop their sexual identity (Boies et al., 2004). When it comes to access to online pornography (hereafter referred to as 'pornography'), adolescents have free availability to a wide range of sexual websites, which they often seek consciously. The active seeking of pornography by adolescents is a normal part of adolescent development and reflects an increasing interest in sexuality during this life period (Baams et al., 2015; Ševčíková & Daneback, 2013.)

Although the internet offers an opportunity to introduce adolescents to positive sexual experiences and information, there are also concerns about the influence of exposure to pornography on adolescents' sexual development (McKee, 2010). Several studies suggest that pornography use among adolescents may go at the expense of their sexual satisfaction (Vogels, 2018; Wright et al., 2017). This is worrisome, considering that lower sexual satisfaction has found to be correlated with sexual dysfunctions, decreased communication during sex, depressive symptoms, decreased happiness in relationships, and interpersonal sensitivity (Montesi et al., 2013). Given the extraordinary accessibility of pornography and the fact that very little longitudinal research has been conducted on this topic (Doornwaard et al., 2014), further research is critical to draw causal conclusions about adolescents' sexual health and well-being (Milas et al., 2019). Therefore, the current study aims to further investigate the impact of pornography use on adolescents' sexual satisfaction.

Pornography Use and Sexual Satisfaction

Sexual satisfaction can be defined as the degree to which individuals are satisfied with sexual aspects of their life (Milas et al., 2019). The Social Comparison Theory (SCT) provides an interesting perspective to understand the effects of pornography on sexual satisfaction (Krayer et al., 2008). Festinger (1954) introduced the SCT and postulated that feelings of satisfaction are, in part, influenced by comparisons between one's own and others' situations. These comparisons are mostly automatic and spontaneous (Peter & Valkenburg, 2014), whereby upward comparisons (i.e., comparisons to superior situations/persons) may result in a decreased sense of satisfaction (Milas et al., 2019). In line with this reasoning, pornography users may feel dissatisfied about their sexual life, due to upward social comparison with porn actors who portray idealized sexual encounters (Wright et al., 2017). Various empirical studies have indeed found that watching pornography may reduce adolescents' sexual satisfaction (Wright et al., 2017; Vogels, 2018; Vandenbosch & Eggermont, 2012; Dittmar, 2009),

indicating that pornography can present an unrealistic and one-sided image of sex, in which porn actors are portrayed as highly skilled, always ready for sex, and adventurous (Lambert et al., 2012; Poulsen et al., 2013). This unrealistic view displayed by pornography may negatively impact adolescents' (sexual) satisfaction (Vogels, 2018; Aubrey, 2006; Dittmar, 2009; Doornwaard et al., 2014), as they perceive themselves as less sexually skilled. As a result, participants experience increased apprehension and vulnerability to perform, which make them reluctant to take risks in their pursuit of sexual satisfaction (Zillman & Bryant, 1998).

On the contrary, two cross-sectional studies showed that there is a reason to believe that pornography use might have a positive impact on pornography users' sexual satisfaction. Studies by Hald and Malamuth (2008) and Kvalem et al. (2014) suggested that pornography users may experience learning by watching pornography due to modeling. Additionally, they may focus on similarities between themselves and the actors, thereby increasing positive sexual self-perceptions. For example, they may learn new sexual techniques, discover new sexual desires and experiment with new sexual behaviors. Although positive associations between pornography use and sexual satisfaction were found, current research findings are limited. Firstly, both studies used a cross-sectional design, which precludes causal inferences. Secondly, research was conducted among adolescents aged 18 and over, however, the effects of pornography may be different for younger adolescents since they may be more vulnerable to the negative impact of pornography (Flood, 2009). Thirdly, the results were based on self-perceived effects (Hald & Malamuth, 2008). It is common for individuals to perceive themselves as less susceptible than others to the possible negative effects of pornography use (Wright et al., 2017). Taking these limitations into account, it can be concluded that there is more conclusive research showing a negative association between pornography use and sexual satisfaction among adolescents. Therefore, the first hypothesis is:

H1: Pornography use will have a negative effect on adolescents' sexual satisfaction.

Pornography Use and Physical Self-Esteem

There is compelling evidence that exposure to pornography is associated with a negative body image. In their review of 21 studies, Palaksis et al. (2020) concluded that 18 of those provided evidence for negative associations between pornography use and physical self-esteem. Again, these effects can be understood based on the SCT that argues that unrealistic presentations of sex and sexual attractiveness in pornography, such as male porn actors with predominantly large penises and a muscular and strong physique and female porn stars with petite labia, big breasts and flat stomachs (Wright et al., 2017; Peter & Valkenburg, 2014). This causes adolescents to make upward comparisons, resulting in dissatisfaction with their bodies

(Doornwaard et al., 2014; Vogels, 2018). As a result, adolescents might feel intimidated by the bodies of porn actors and therefore considered themselves as less sexually attractive (Zillmann & Bryant, 1988). Moreover, Goldsmith et al. (2017) found that an increased watch time of pornography is associated with greater body insecurities, which in turn cause distraction from sexual activity. If individuals feel distracted during sex because they are not physically comfortable, this might go at the expense of sexual pleasure (Pujols et al., 2010). Considering that body image is associated with sexual satisfaction (Holt & Lyness, 2007; Woertman & Van Den Brink, 2012), the second hypothesis is:

H2: The negative impact of pornography use on adolescents' sexual satisfaction will (partly) be mediated by decreased physical self-esteem.

The Moderating Role of Perceived Realism of Pornography

Although a large amount of research showed that watching pornography can have adverse effects on sexual satisfaction, not all adolescents' sexual satisfaction will be equally impacted by their pornography use (Baams et al., 2014). Individual differences in the susceptibility to pornography can be explained by the 'Different Susceptibility to Media effects Model' (DSMM), which implies that some individuals are more susceptible to media effects than others, due to personal factors (Valkenburg & Peter, 2013). It can therefore be assumed that personal factors may be important in clarifying why some individuals are more vulnerable than others to the impact of pornography use. The findings of Baams et al. (2015) underline that media does not affect all adolescents in the same way and that the way adolescents perceive the media plays an important role. This is supported by several cross-sectional studies that suggest that one of the proposed moderators of the effect of pornography on sexual outcomes is the extent to which adolescents perceive pornography as realistic – also known as perceived realism (Hald & Malamuth, 2014; Wright & Štulhofer, 2019). When adolescents perceive images portrayed within pornography as realistic, they are more likely to feel that they do not meet the standards (Baams et al., 2014). Based on these assumptions, the third hypothesis is:

H3: The negative impact of pornography use on sexual satisfaction is stronger for adolescents who perceive pornography as realistic, in comparison to adolescents who do not perceive pornography as realistic.

The present study

Despite growing research focusing on pornography's potential effects, there is still a lack of longitudinal research regarding the impact of pornography use on sexual satisfaction (Doornwaard et al. 2014; Peter & Valkenburg, 2014). The role of perceived realism and physical self-esteem in the relationship between adolescents' pornography use and sexual

satisfaction has also not previously been examined in longitudinal context. To address these gaps in the literature, the current study examines how Dutch adolescents' pornography use impacts their sexual satisfaction, taking into account their physical self-esteem and the moderating role of perceived realism. Because participants in this study are early and middle-aged adolescents (i.e., aged 12-18), a significant number of them may not be sexually active yet, which may affect their sexual satisfaction (de Graaf & Poelman, 2012; Peter & Valkenburg, 2009). Therefore, this study controlled for several background variables and sexual experience.
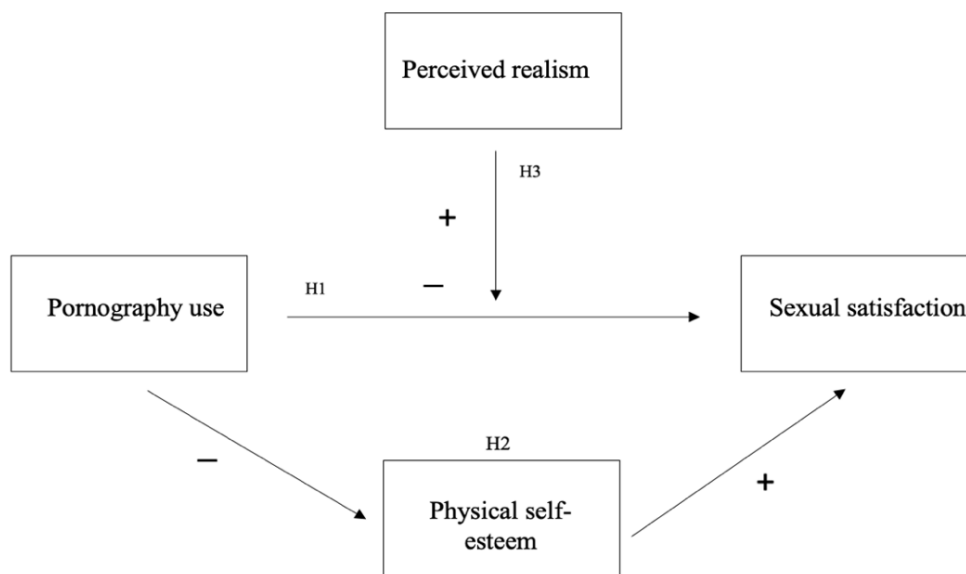

Figure 1. Research Model

Methods

Participants

Data were collected as part of STARS, a longitudinal research project on romantic and sexual development over time, conducted between 2011 and 2013 (Verbeek et al., 2017). Data were made available by the DANS data repository. Data were collected through an online questionnaire administrated at 4 measurement waves distributed over 1.5 years and separated by six-month intervals. The study started with 1230 participants at T1 and included 1200 (97.5%), 1095 (89.0%), and 996 (81.0%) participants at T2, T3, and T4 respectively. The current study only used the third and fourth measurement wave. A total of 957 participants completed both waves, however, due to missing values on the main variables used in this study, several participants were removed from the sample. Therefore, the total sample in this study is N = 945 (86.3% of the original sample at T3). T3 and T4 will be hereafter be referred to as T1 and T2 respectively.

Socio-demographic characteristics

The sample of 945 respondents consisted of 481 (50.9%) girls and 464 (49.1%) boys. The mean age of the participants at the 3rd wave was 14.76 years (SD =1.94). The vast majority of adolescents, 856 (90.6%), were of Dutch origin. In total, 889 (94.1%) participants were attending secondary school and 56 (5.9%) attended primary school. Of the participants attending secondary school, 347 (36.7%) attended VMBO and 598 participants (63.3%) attended HAVO or VWO (higher education level). Most of the adolescents reported having a heterosexual orientation (96.8%).

Data collection procedure

Schools of varying denominations and from different regions of the Netherlands were approached by mail or telephone to participate. Eligible adolescents and their parents received information in the form of an informed content letter, and information brochures and flyers. These documents described the aim of the study, voluntary participation, confidentiality of the data, and procedures for declining or ending participation. Parents could decline participation via active non-consent (via a paper non-consent form) and adolescents were able to decline or terminate at any point (via verbal confirmation). Participants filled in the online questionnaire at school under supervision of researchers, introducing the project and the procedure, answering questions, and ensuring maximum privacy.

Measures

Sexual satisfaction

A single-item indicator was used consisting of the questions: 'If you have had sex, how satisfied are you with your sexual experiences? And if you have not had sex, how satisfied are you about that?' The response categories were based on a 10-point Likert scale from 0 (*very dissatisfied*) to 10 (*very satisfied*).

Pornography use

Pornography use was measured with the question: 'How often did you use the Internet to view a porn website?' A pornography website was defined as a website with pictures or movies that show nudity or people having sex. Answers were based on a 6-point Likert scale and response options were as follows: 1 (*never*), 2 (*less than once a year*), 3 (*less than once a month),* 4 (*1 to 3 times a month*), 5 (*1 to 2 times a week*), 6 (*3 times a week or more*). Because the variable showed a skewed distribution and response options 2 and 3 can be classified as practically 'no pornography use', pornography use was used as a dichotomous variable (*no use* = 0, *use* = 1), so that participants were more equally distributed among the groups.

Physical self-esteem

Physical self-esteem was measured by 5 items with the following statements: 1 - I am happy with how I look, 2 - I wish my body was different, 3 - I am happy with my figure, 4 - I think I am quite attractive, and 5 - I am happy with my appearance. Response categories were based on a 5-point Likert scale from 1 (*completely untrue*) to 5 (*completely true*). Item 2 was negative stated and therefore recoded (α = .892).

Perceived realism

To assess adolescents' perceived realism of pornography, a simplified version of Peter and Valkenburg's scale (2006b) was used. Five statements about pornography were asked: 1 – The Internet gives reliable information on sex and relationships, 2 - Sex on the Internet is realistic, 3 - Pornography websites offer a good representation of sex in real life, 4 - Not everyone on the Internet is who she/he says she/he is, and 5 - I can learn a lot about from watching pornography on the Internet. Agreement with these statements was assessed using a 7-point Likert scale ranging from 1 (*completely disagree*) to 6 (*completely agree*). A higher score on the scale represents higher levels of perceived realism. Because item 4 does not explicitly measure the construct of perceived realism of pornography and because this item lowered the reliability of the total scale, it was decided to exclude this item (α = .782).

Control variables

Adolescents' gender was operationalized as *Boy* (= 0) and *Girl* (= 1). Religiosity was measured as whether adolescents were religious or not (0 = *No*, 1 = *Yes*). Education level was operationalized by 0 = *VMBO* and 1 = *HAVO* or *VWO*. To measure ethnicity a distinction is made between *Western* (= 0) and *Non-Western* (= 1). To assess adolescents' sexual experience, participants initially were asked two questions: 'Have you ever French-kissed somebody? and 'Have you ever had sex with another person?' Sex was described as everything from touching or caressing to sexual intercourse. Participants that indicated yes (0 = *No*, 1 = *Yes*), continued to follow-up questions about their experiences with different sexual activities: naked touching or caressing, performing or receiving manual sex, performing or receiving oral sex, and vaginal or anal intercourse. Kissing and sexual experience items were combined into one variable that measured the level of adolescents' sexual experience (α = .894), ranging from 0 to 7, whereby a higher score represents more sexual experience.

Statistical analysis

SPSS Statistics 26.0 was used for the analyses. Pearson and Spearman correlation analyses were used to test correlations between variables. Hierarchical linear regression analyses were performed to test the hypotheses. Sexual satisfaction (T2) was included as the

dependent variable. In step 1, control variables (e.g., gender, age, education, religion) and sexual satisfaction (T1) were entered. To test its direct effect (H1), pornography use (T1) was added in step 2. To test the moderating effect (H3), pornography use (T1) and perceived realism (T1) were added in step 2. In step 3, the centered interaction term of pornography use (T1) and perceived realism (T1) was added to the model. The interaction term was created by centering perceived realism to avoid multicollinearity problems. To test for mediation (H2), the method of Baron and Kenny (1986) was used. In the first step, pornography use (T1) on sexual satisfaction (T2) was tested (*path c*). In step 2, the relationship between pornography use (T1) and physical self-esteem (T2) was tested (*path a)*. In step 3, it was investigated whether pornography use (T1) and physical self-esteem (T2) were predicting sexual satisfaction (T2) (*path b and c'*). The steps of Baron and Kenny (1986) were conducted while controlling for background variables and the dependent variable (in step 1 and 3) and the mediator (in step 2 and 3) at the previous wave. In all analyses, $p = .05$ was used as significance level.

Prior to the analyses, assumptions have been checked. The Variance Inflation Factor (VIF) of the linear regression indicated that there is no multicollinearity present among the variables used in this study. All variance inflation factors were clearly below the critical value of 5. Variables in sex research are typically skewed, as confirmed by the Shapiro-Wilk test showing that the variables in this study were not normally distributed (Peter & Valkenburg, 2009). Although the test gave significant p-values, with W-values for the main variables ranging from $W(760) = .490$ to $.870, p < .001$), the Central Limit Theory states that the assumption of normality is satisfied when the sample is large ($N > 30$), even though the variable in the population itself is not normally distributed. As a consequence, test results are unaffected by severe violations of normality.

<center>**Results**</center>

Descriptive Analysis

Table 1 gives a description of the mean, minimum and maximum scores of the variables analyzed in this study.

Table 1

Description Statistics of Research Variables

Variables	*n*(%)	*M* (*SD*)	Minimum score	Maximum score
Gender (T1) - Boys	464 (49.1)		0	1
Age (T1)		14.76 (1.19)	11.53	18.29
Religion (T1) - Religious	316 (33.4)	.	0	1
Education (T1) - VMBO	347 (36.7)		0	1
Pornography use (T1)	209 (22.1)		0	1
Physical self-esteem (T2)		3.52 (0.92)	1	5
Perceived realism (T1)		1.86 (0.78)	1	6
Sexual experience (T2)		0.73 (1.78)	0	7
Sexual satisfaction (T2)		7.95 (2.34)	1	10

Note. n = number of participants; *M* = mean; *SD* = standard deviation.

At baseline, 209 participants (22.1%) indicated that they did watch porn. Of the pornography users, 97 (10.3%) participants reported watching pornography 1 to 3 times a month, 74 (7.8%) participants reported watching 1 to 2 times a week and 38 participants (4.0%) reported watching pornography more than 3 times a week. Additionally, the majority of the participants (65.7%) reported that they were highly satisfied (rated between 8-10) with their sex life.

Gender differences were assessed on the main variables. A Chi-squared test showed that there was a significant relationship between watching pornography and gender ($\chi^2(1)$ = 218.961, $p < .001$), which can be determined as a reasonable effect (V = .48) (Table 2). Boys reported watching pornography significantly more often than girls. Independent samples T-test identified significant gender differences in sexual satisfaction, perceived realism and physical self-esteem (see Table 3). Boys had significantly higher levels of physical self-esteem and perceived realism. Girls rated their sexual satisfaction significantly higher than adolescent boys, whereby this effect size of gender differences in sexual satisfaction can be determined as large (d = 2.3).

Table 2

Chi-Square Test for Pornography Use for Boys and Girls at T1.

| | T3 | | |
| | Frequency (%) | | |
	Boys	Girls	**Total**
Pornography use (T1)			
No	267 (36.3%)	469 (63.7%)	736 (77.9%)
Yes	197 (94.3%)	12 (5.7%)	209 (22.1%)
Total	464 (49.1%)	481 (50.9 %)	945 (100%)

Table 3

Gender Differences were assessed using Independent Sample T-Test on the Main Variables.

Variables	Mean (SD)	Boys' mean (SD)	Girls' mean (SD)	*T*-Test for independent samples	Effect size Cohen's d
Physical self-esteem (T1)	3.52 (0.92)	3.79 (0.83)[a]	3.26 (0.93)[a]	$t = 9.08^*$, $df = 937$	0.88
Perceived realism (T1)	1.86 (0.78)	2.06 (0.90)[a]	1.64 (0.58)[a]	$t = 9.1^*$, $df = 783$	0.75
Sexual experience (T2)	0.73 (1.78)	0.73 (1.77)	0.74 (1.80)	$t = -.082$, $df = 943$	1.79
Sexual satisfaction (T2)	7.95 (2.34)	7.51 (2.45)[a]	8.39 (2.15)[a]	$t = -.581^*$, $df = 918$	2.3

N for boys = 464, *N* for girls = 481 for all variables

[a] Means and SDs were used in the calculation of effect sizes

* $p < .05$

Correlations

Spearman Rho and Pearson correlations were computed to examine associations among the variables of interest (see Table 4). Gender, age, religion and education were all significantly correlated with both pornography use and sexual satisfaction. This means that these variables could be confounding variables and therefore they were included as control variables in the regression analysis. Besides these significant background variables, sexual satisfaction (T2) was significantly correlated with physical self-esteem (T2) and pornography use (T1). This means that lower physical self-esteem (T2) was negatively correlated with

sexual satisfaction (T2) and that using pornography at T1 decreased sexual satisfaction at T2. These significant correlations are in line with the hypotheses of this study.

Table 4

Bivariate Correlations between the Control-, Mediator-, Moderator-, Dependent- and Independent Variables

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. Gender	1.00									
2. Age	.025	1.00								
3. Religion	.104**	.130*	1.00							
4. Ethnicity	.027	-.130**	.140**	1.00						
5. Education	.104**	.074*	.149**	-.108**	1.00					
6. Pornography use (T1)	-.481**	.154**	-.091**	-.023	-.091*	1.00				
7. Physical self-esteem (T2)	-.295**	.010	-.008	-.022	-.019	.147**	1.00			
8. Perceived realism (T1)	-.244**	-.005	-.076*	-.021	-.027	.360**	.059	1.00		
9. Sexual experience (T2)	-.013	.352**	-.032	-.854	-.108**	.194**	.349	.139**	1.00	
10. Sexual satisfaction (T2)	.205**	-.181**	.087**	.053	.112**	-.226**	-.142**	-.056	.016	1.00

Note. Underscored correlations are Pearson correlations, the other correlations are Spearman correlations.

** Correlation is significant at the 0.01 level (2-tailed)

* Correlation is significant at the 0.05 level (2-tailed)

The Effect of Pornography Use on Sexual Satisfaction

A regression analysis was performed to examine the impact of pornography (T1) use on sexual satisfaction (T2), while controlling for background characteristics (i.e., gender, age, education, religion) and sexual satisfaction (T1). Table 4 shows that pornography use (T1) was not a significant predictor of sexual satisfaction (T2). Therefore, hypothesis 1 was rejected.

Table 4

Linear Regression Analysis for the Prediction of Sexual Satisfaction T2

	B	β	SE	p	R²	ΔR²	F (df)
							Longitudinal Analysis
							N = 945
Step 1:				<.001	.249	.249	62.180** (5,939)
Gender	.436	.093	.136	.001			
Age	-.270	-.138	.057	.009			
Education	.369	.076	.141	<.001			
Religion	.192	.039	.143	.182			
Sexual Satisfaction (T1)	.414	.419	.029	<.001			
Step 2:				.179	.250	.001	52.163 (6,938)
Pornography Use (T1)	-.252	.045	.187	.179			

Note. *df* = degrees of freedom, *SE* = Standard Error

The Impact of Pornography Use on Adolescents Sexual Satisfaction Mediated by Physical Self-Esteem

Considering there was no main effect of pornography use (T1) on sexual satisfaction (T2), it was concluded that a mediation effect through physical self-esteem (T2) cannot be found (*path c,* Figure 2). Nevertheless, further analyses were conducted to identify the individual relationships between pornography and physical self-esteem (*path a*, Figure 2), and physical self-esteem and sexual satisfaction (*path b,* Figure 2). Adding pornography (T1) to the regression analysis did not make a significant improvement, which indicated that *path a* was not significant. However, physical self-esteem (T2) showed to be a significant predictor of sexual satisfaction (T1), which indicated that *path b* was significant. The mediation model is displayed in Figure 2. Taking into account that there was no main effect of pornography use (T1) on sexual satisfaction (T2), and thus no mediating effect of physical self-esteem (T2), hypothesis 2 was rejected.

Table 5

Linear Regression Analysis for the Prediction of Physical Self-Esteem T2 (path a)

	B	β	SE	p	R²	ΔR²	F (df)
Longitudinal Analysis							
N = 945							
Step 1:				.579	.579	.579	258.29
							(5,939)
Gender	-.127	-.069	.041	.002			
Age	.006	.007	.017	.729			
Education	-.023	-.012	.041	.569			
Religion	-.004	-.002	.042	.927			
Physical Self-esteem (T1)	.746	.022	.022	<.001			
Step 2:				.273	.580	.001	43.905
							(8,36)
Pornography Use (T1)	.058	.026	.054	.286			

Note. df = degrees of freedom, *SE* = Standard Error

Table 6

Linear Regression Analysis for the Prediction of Sexual Satisfaction T2 (path b and c')

	B	β	SE	p	R²	ΔR²	F (df)
Longitudinal Analysis							
N = 945							
Step 1:				<.001	.252	.252	52.679
							(6,938)
Gender	.523	.112	.142	<.001			
Age	-.272	-.139	.057	<.001			
Education	.361	.074	.141	.010			
Religion	.180	.036	.143	.208			
Physical Self-esteem (T1)	.157	.061	.076	.040			
Sexual Satisfaction (T1)	.411	.415	.029	<.001			

					<.001	.273	.021	43.905
Step 2:								(8,936)
Pornography Use (T1)	-.283	.050	.185	.126				
Physical Self-esteem (T2)	.547	.214	.110	<.001				

Note. *df* = degrees of freedom, *SE* = Standard Error

Figure 1

The Total, Direct and Indirect Effect of Pornography Use T1 on Sexual Satisfaction T2, Through Physical Self-Esteem T2
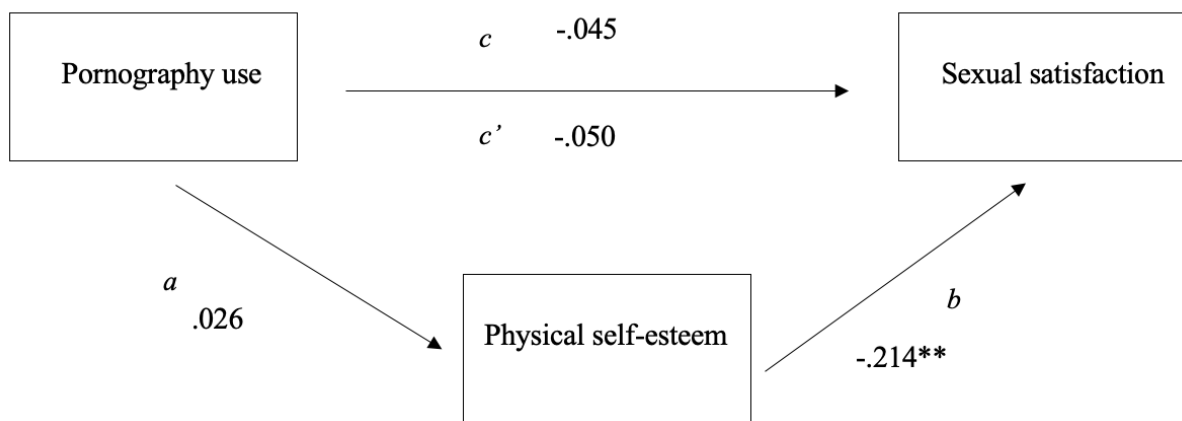
Note. Values are standardized regression coefficients.

** $p < .001$

Moderating Role of Perceived Realism on Pornography and Sexual Satisfaction

Table 7 showed that the main effect of pornography use and perceived realism was not significant. However, adding the interaction-term of pornography use and perceived realism made a significant improvement to the model. The significant interaction-term is visually illustrated in Figure 2, showing that the effect of pornography use on sexual satisfaction is depended on the value of perceived realism. More specifically, adolescents who (regularly) use pornography and perceive it as highly realistic, experience higher sexual satisfaction than those who do not or hardly use pornography. Although a significant interaction effect was found, the result is not in line with what was hypothesized, as the opposite effect was predicted. Therefore, hypothesis 3 was rejected.

Table 7

Linear Regression Analysis for the Interaction-Term of Pornography Use and Perceived Realism T1 on Sexual Satisfaction T2

	B	β	SE	p	R^2	ΔR^2	F (df)
				Longitudinal Analysis			
				N = 945			
Step 1:				<.001	.249	.249	62.180 (5,939)
Gender	.436	.093	.136	<.001			
Age	-.270	-.139	.141	<.001			
Education	.369	-.138	.057	.009			
Religion	.192	.039	.143	.182			
Sexual Satisfaction (T1)	.414	.414	.029	<.001			
Step 2:				<.001	.250	.001	44.675 (7,935)
Pornography Use (T1)	-.237	-.042	.197	.229			
Perceived Realism (T1)	-.023	-.008	.094	.808			
Step 3:				<.001	.256	.006	40.316 (8,936)
Pornography Use (T1) * Perceived Realism (T1)	.522	.116	.189	.006			

Note. The asterisk represents the interaction-term. *df* = degrees of freedom, *SE* = Standard Error

Figure 2

Visual Representation of the Interaction Between Pornography Use T1 and Perceived
Realism T1 on Sexual Satisfaction T2
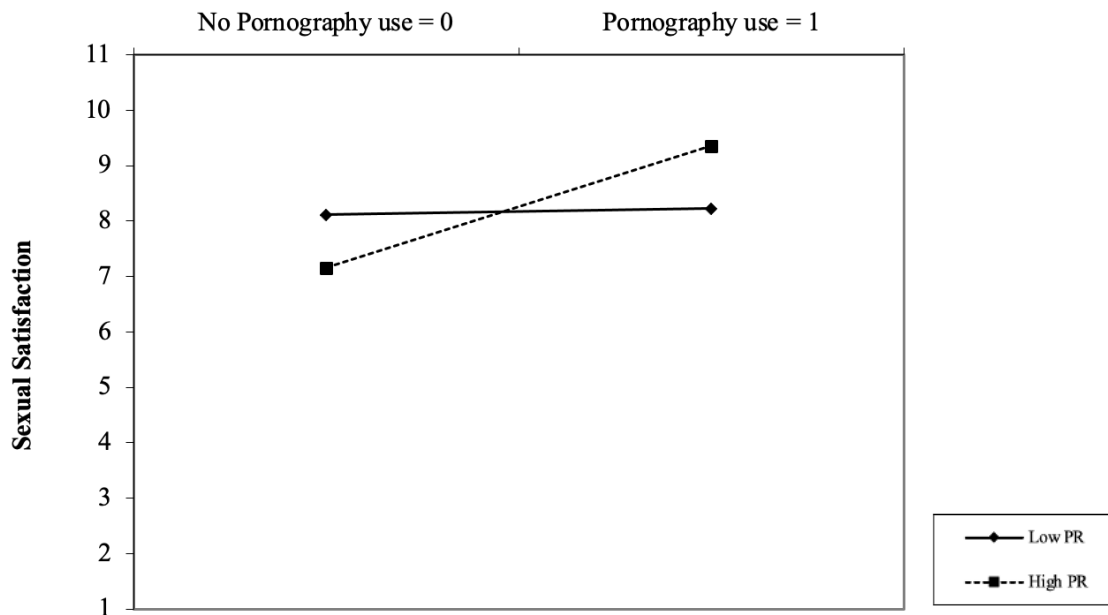
Note: Unstandardized coefficients are used to visualize this graph.

PR = Perceived Realism

Discussion

This study aimed to investigate longitudinal relations between pornography use and sexual satisfaction. The present study indicated that among adolescents who regularly use pornography, those with higher perceived realism have higher sexual satisfaction than those who have lower perceived realism. Specifically, indicating that having a high perceived realism of pornography and (regularly) using pornography has a positive effect on sexual satisfaction.

Relationship between Pornography Use and Sexual Satisfaction

It was hypothesized (H1) that pornography use among adolescents would have a negative effect on adolescents' sexual satisfaction. However, results showed that pornography use among adolescents did not significantly decrease their sexual satisfaction, which is not in line with hypothesis 1.

There are three possible explanations for this finding. First, it may be that the relationship between pornography use and sexual satisfaction is the reverse. No evidence was found for an effect of pornography use on sexual satisfaction over time, however, a negative

correlation was found between pornography use and sexual satisfaction. This correlation between pornography use and sexual satisfaction may suggest that the relationship between pornography use and sexual satisfaction exists, but is the opposite, indicating that sexual satisfaction has an effect on pornography use. This is in line with findings of Peter and Valkenburg (2009) that suggest that some adolescents may increase their use of pornography in an effort to increase their sexual satisfaction. Second, gender accounted for a substantial variance explained in sexual satisfaction which suggests that gender or other variables may play a moderating role in the relationship between pornography use and sexual satisfaction. Third, it may be possible that the sample in this study was not large enough, which lowered the statistical power to find longitudinal significant results between pornography use and sexual satisfaction. The study by Peter and Valkenburg (2009) that found longitudinal significant results of pornography use on sexual satisfaction, used a sample twice as large. Nevertheless, the effect size of their finding was rather small, which may also explain why this study did not find significant results.

Mediating role of Physical Self-Esteem

It was hypothesized (H2) that the assumed negative impact of pornography use on adolescents' sexual satisfaction would be (partly) mediated by decreased physical self-esteem. Although the main effect of pornography use on sexual satisfaction was not significant, further analyses were conducted in order to analyze the individual relationships between pornography use and physical self-esteem and between pornography and sexual satisfaction. Results showed that there was no effect of pornography use on physical self-esteem but did show a negative association between physical self-esteem and sexual satisfaction, which may suggest that higher physical self-esteem decreases adolescents' sexual satisfaction. However, the interpretation of this result should be treated with caution since both variables are measured on the same wave. Although a significant relationship is found between physical self-esteem and sexual satisfaction, hypothesis 2 was not supported.

An explanation for the inconsistency between earlier results and this study findings may be that excluding genital appearance in the operationalization of physical self-esteem may explain why pornography does not have an effect on physical self-esteem in this study. Veale et al., (2014) demonstrated that pornography use was associated with genital appearance dissatisfaction, whereupon a study of Kvalem et al., (2014) suggested that genital appearance dissatisfaction, in turn, was associated with lower sexual satisfaction. Another explanation may be that the review study of Paslakis et al., (2020) based their research exclusively on non-adolescent populations. Therefore, relationships between pornography and

physical self-esteem in adolescents cannot be evaluated conclusively at this point. Moreover, adolescents in this sample were relatively young (i.e., mean age around 14) whereby the majority do not (yet) watch pornography. Findings may be different when the adolescents are somewhat older since they will be more likely to use pornography (Peter & Valkenburg, 2006a). As a result, pornography may also become more of a theme in adolescents' lives by then, which may affect their physical self-esteem.

Moderating Role of Perceived Realism

It was hypothesized (H3) that the assumed negative effect of pornography use on sexual satisfaction would be stronger for adolescents with higher perceived realism of pornography compared to those with lower perceived realism. The results, however, showed that the direction of this effect is the opposite. Among adolescents who (regularly) use pornography, those who perceive pornography as realistic, experience higher sexual satisfaction compared to those who have lower perceived realism. Therefore, hypothesis 3 is not supported.

One possible explanation may be that adolescents consider pornography as the norm for what constitutes good sex. If adolescents perceive pornography as realistic and have sexual experiences themselves that resembled the images in pornography, this may result in satisfaction with their sexual life. On the contrary, if adolescents' own sexual life does not resemble the image portrayed in pornography, then they are less satisfied with their sex lives. Thus, pornography may act as a standard for what constitutes good and bad sex as adolescents believe that pornography portrays realistic images (Mattebo et al., 2014). Another explanation may be that the proposed underlying mechanism of the expected effect of pornography on physical self-esteem and sexual satisfaction needs nuancing to maximize its explanatory power. Earlier studies showed that the SCT only applies to some adolescents, indicating that there are differences in the tendency to compare oneself with others. For example, doubts about oneself, a higher level of self-consciousness, and an orientation towards others are related to a greater tendency to engage in social comparisons (Kvalem et al., 2014).

Strengths and Limitations

The present study is based on a large sample and used a longitudinal design, which provides insights into the causal direction of the studied relationship. This study also involved a sample with a low drop-out rate. Additionally, controlling for the previous level of the outcome variables allowed a more precise assessment of change. While these are important strengths, this study also has some limitations.

First, key constructs were measured by single-item indicators, which limit the reliability or validity of the constructs (Leonhardt & Willoughby, 2017). It seems plausible that different types of pornography (e.g., explicit versus suggestive) may have different effects on varying aspects of sexual satisfaction (e.g., satisfaction with sexual variety, masturbation and love) (Leonhardt & Willoughby, 2017). However, single-item measurements of sexual satisfaction have been used in other international studies and have shown sufficient validity, sometimes even more than traditionally validated sexual satisfaction scales (Milas et al., 2019). Nevertheless, a multifaceted measure of sexual satisfaction, as used by Štulhofer et al (2010), would be recommended for future research to acquire a more reliable measurement. Furthermore, sexual satisfaction in this study did not distinguish between masturbation satisfaction and satisfaction regarding sexual interactions with (causal or romantic) partner(s). However, consuming pornography during masturbation may satisfy adolescents' sexual needs and is thereby regarded as satisfactory, independent of their sexual interactions with partner(s). Second, the data collection for this study was conducted between 2011 and 2013. One may question to what extent the questionnaire is representative today given the changing norms concerning sexuality and the many technological developments that have made pornography more readily available. Third, self-reports from adolescents were used, which may provide a false representation of pornography use. It is highly likely that adolescent boys overreport their pornography use and adolescent girls underreport their use, due to social desirability and fear of being stigmatized (Flood, 2007). However, self-reported measures are often the standard approach for sexuality research and provide data comparable to previous studies (Smith et al., 2018). Fourth, asking questions this directly about adolescents' pornography use and sexual satisfaction may lead to defensive responses. For pornography use this may risk a floor effect, as pornography use is often seen as taboo. On the contrary, for sexual satisfaction this may result in a ceiling effect, as reporting about one's sexual life is very personal (Wright et al., 2019). Fifth, pornography use had to be dichotomized because of skewed distribution. This may have resulted in a loss of relevant information and thereby in less nuanced conclusions. Sixth, strict longitudinal analyses in this study (i.e., controlling for four background variables and the previous levels of the outcome variables) may explain why some hypothesized effects were not found while they may exist in the population. Seventh, intervals between the different measurements might be too short to find an effect of pornography on adolescents' physical self-esteem and sexual satisfaction.

Conclusions and Implications

This research combined insights from different scientific disciplines and perspectives across social and sexual health sciences to increase current understandings of the possible impact of pornography use among adolescents. Overall, this study found no evidence that the frequency of pornography use poses a risk for Dutch adolescents' sexual satisfaction. Results showed the opposite, considering the positive effect of perceived realism on sexual satisfaction. Nonetheless, in the long run these adolescents may have more difficulty establishing satisfying sexual relationships with others (Perry, 2020). This considered, along with the study's limitations and unexpected insignificant results suggests that further research on this topic is necessary. To be more conclusive about the relationship between pornography use and sexual satisfaction, future research should perform a less rigorous longitudinal analysis, including investigating possible moderating variables (e.g., gender), and including longer intervals between measurements. In addition, further research is needed for a more nuanced view on personal tendencies to engage in social comparisons. And recommendable, also in other cultural environments since the Netherlands has relatively liberal and egalitarian views towards pornography and sex (Milas et al., 2019). In sum, this research indicates that there is a need for a more holistic perspective on the promotion of sexual health rather than one focused on risk reduction (Litsou et al., 2020). To assist adolescents in the successful navigation of their sexuality and the pornographic landscape, it is recommended that adolescents need to be educated in critical media analysis of pornography, which should be included in the curriculum.

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Appendices

Appendix 1: Contract data use (TED)

Contract data use (TED)

Utrecht, 2020

This letter constitutes formal confirmation of the fact that the data from the Utrecht University **Master Youth Studies, data project STARS 2010** have been made available to **Mylène Janssen** of Utrecht University.

These data will not be made available to others, and the data may be used only for analysis and reporting on topics for the thesis, about which agreement has been reached with **Regina van der Eijnden**.

Mylène Janssen will receive access to the data from the dataset in order to answer the following research questions within the framework of the thesis:

Research questions: *Does the use of pornography predict a decrease in adolescents' sexual satisfaction? (1) Is the relationship between the use of pornography and sexual satisfaction among adolescents (partly) mediated by decreased physical self-esteem? (2) Does the negative impact of pornography use on adolescents' sexual satisfaction differ for adolescents who perceive pornography as realistic, in comparison to adolescents who do not perceive pornography as realistic? (3)*

The following variables will be used:

Dependent variable: **sex_satis (chapter 1, number 11)**
Independent variables: **Inet_porn (chapter 5, number 10)**

Other variables: Mediator: **Phys_self (chapter 1, number 14),** Moderator: **Inet_realism (chapter 5, number 7),** In between groups variable: **kiss, sex, sex_beh, sex_rel, mastur (chapter 1, number 5),** and control variables: **Gender_overall (chapter 6, number 1**); **religion** (**chapter 6, number 12**); **age (chapter 6, number 2).** And other demographic variables: **education** (**chapter 6, number 3**); **ethnicity (chapter 6, number 5)**.

No report based on the data from the project entitled **Project STARS** may be made public, unless permission has been obtained in advance from the Project Coordinator for the **Project STARS**.
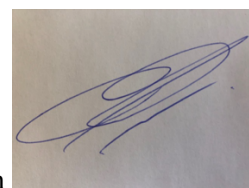
After the expiration of this contract, dated 30/06/2021 **Mylène Janssen** shall delete the **Project STARS 2010** data.

Dates and signature (14-01-2021):

Mylène Janssen   Regina van den Eijnden

Appendix 2: Interdisciplinary approach

Relevance of the research

This research combined insights from different scientific disciplines and perspectives across social and sexual health sciences to increase current understandings among possible impacts of pornography use among adolescents (Litsou & Byron, 2020). The research question of the current study has a psychological, sexual, biological and technological nature, since the developed questionnaire drew on information about adolescents' online pornography use, their sexual behavior, feelings and motivations and statements about the influence of pornography use on their self-esteem and sexuality.

By collecting information on these domains, the current research makes a relevant contribution to social science and society. Analyzing and interpreting the data regarding adolescents' pornography use will contribute to increased knowledge in the field of public sexual health among adolescents. Since the results of the current study can also provide insights into the consequences of offering a wide range of pornography online, current research should be seen as an invitation for clinical and scientific exploration of this topic. By addressing the potential impacts of pornography use among adolescents, it can be an implication for developing interventions that aim to make pornography and sex more negotiable among adolescents. In addition, since pornography may also be used among adolescents as a tool of sex education it would be important to educate them in developing a critical view on how to interpret pornography. Further research is needed to investigate the possible impacts of pornography in order to mitigate possible negative effects on physical and sexual self-esteem (Paslakis et al., 2020).

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