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Longitudinal Assessment of the Association Between Pornography Use and Sexual Satisfaction in Adolescence

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Pornography has been theorized to affect sexual satisfaction for decades, yet only two prospective studies, both conducted in the Netherlands, have explored this link among adolescents. Given the unprecedented availability of (online) sexually explicit content and the potential importance of its relationship to sexual satisfaction for young people, we have revisited the association between these variables in a less sexually permissive society. Using a panel sample of 775 female and 514 male Croatian high school students ($M_{age\ at\ baseline} = 15.9\ years, SD = 0.52$) and latent growth curve modeling with six observation points, we did not find a significant association between changes in the frequency of adolescents' pornography use over time and their sexual satisfaction at wave six. The association between the initial levels of pornography use and sexual satisfaction, which, if present, would have indicated a possible relationship during middle adolescence, was also null. These patterns were similar across genders. Possible explanations for the difference between our results and the results of the previous studies are discussed.

Pornography has been theorized to affect sexual satisfaction for decades (Weaver, Masland, & Zillmann, 1984; Zillmann & Bryant, 1988), and research investigating pornography's potential effects on adolescents has become increasingly common across the social sciences in the past 20 years (Koletić, 2017). Despite this, only two prospective studies have investigated whether and how pornography use and sexual satisfaction correlate among adolescents, and both of these studies took place in the Netherlands (Doornwaard et al., 2014; Peter & Valkenburg, 2009). In response to the need for additional data points on the nature of this relationship, as well as the need for research in other cultural contexts, the present study assessed longitudinal associations between pornography use and sexual satisfaction in a six-wave panel study of Croatian adolescents.

Sexual Satisfaction

Sexual satisfaction may be defined as the degree to which individuals are content with the sexual aspects of their lives

(Sprecher & Cate, 2004; Štulhofer, Buško, & Brouillard, 2010). A person may be single and sexually inactive yet satisfied with his or her sexual life situation, while another person may be coupled and sexually active but deeply sexually dissatisfied. Thus, while sexual frequency (Sprecher & Cate, 2004) and being in a relationship (Higgins, Mullinax, Trussell, Davidson, & Moore, 2011) are generally associated with higher sexual satisfaction, it is important that studies assess the sexual satisfaction of persons both in and not in relationships. This is particularly true when the population of interest is adolescents, who may have strong feelings about their sexual status but are less likely to be in a sexually active relationship (or less likely to call it a "relationship") than adults.

Sexual Satisfaction and Well-Being

A variety of health indicators support the importance of understanding modifiable behavioral factors that may increase or decrease a person's sense of sexual satisfaction (e.g., use of pornography, in the case of the present study). Lower sexual satisfaction has been correlated with depressive symptoms. As an example, Nicolosi, Moreira, Villa, and Glasser (2004) surveyed men in Brazil, Italy,

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Japan, and Malaysia and found that lower levels of sexual satisfaction were associated with higher levels of depression. Lower sexual satisfaction has also been correlated with a lack of vitality (e.g., energy, verve, pep). To illustrate, Davison, Bell, LaChina, Holden, and Davis (2009) interviewed a community sample of women in Australia, and results indicated that lower levels of sexual satisfaction were associated with decreased vitality. Lower sexual satisfaction has also been correlated with higher anxiety. As an example, Montesi et al. (2013) surveyed couples in the United States and found that lower levels of sexual satisfaction were correlated with higher levels of nervousness, tension, worry, and unease. Research on sexual satisfaction and well-being among adolescents specifically is less common, but similar results are found. For instance, Auslander et al. (2007) surveyed a sample of U.S. youth that included participants as young as 14 and found that lower sexual satisfaction was associated with a higher likelihood of depression, hostility, interpersonal sensitivity, and anxiety.

Of course, causal statements about the adverse effects of lowered sexual satisfaction on well-being cannot be made from survey data. It is possible that the observed effects are bidirectional, with each variable adversely affecting the other, or that they operate in the opposite direction, with decrements in well-being resulting in lower sexual satisfaction, rather than vice versa (Auslander et al., 2007). It is also possible that some third variable, whether contextual, relational, or personal, confounds the association (Montesi et al., 2013).

Pornography and Sexual Satisfaction

While several communicative and social psychological processes have been brought to bear in an attempt to predict how pornography use may impact consumers' sexual satisfaction (Wright, Steffen, & Sun, 2017), the most common approach is a straightforward application of social comparison theory (Wright, Tokunaga, Kraus, & Klann, 2017). Social comparison theory postulates that feelings of satisfaction are, in part, influenced by comparisons between one's own and others' situations (Festinger, 1954; Suls, Martin, & Wheeler, 2002). Upward comparisons (i.e., comparisons to superior situations) result in a lowered sense of satisfaction. Researchers have variously suggested that users of pornography will, in comparison to pornographic depictions, find the performance, enthusiasm, availability, physical appearance, adventurousness, and responsiveness of their actual or potential sex partners insufficient (Doran & Price, 2014; Lambert, Negash, Stillman, Olmstead, & Fincham, 2012; Poulsen, Busby, & Galovan, 2013). In essence, the application of social comparison theory to the context of pornography use and sexual satisfaction has been guided by two key premises. The first is that satisfaction is a subjective state affected by comparisons to others and their experiences, including mediated others. According to

the second premise, pornographic actors are more sexually accessible, attractive, and skilled than most pornography users, and their partners and the gratifications from sex portrayed in pornography surpass the gratifications that most individuals experience in their lives.

Peter and Valkenburg (2014) suggested two amendments to the social comparison theory to enhance its usefulness in the specific context of pornography use. First, because consumers may not necessarily see themselves as similar to actors in pornography, they pointed to research findings suggesting that people compare themselves to both similar and dissimilar others (Jones, 2001; Strahan, Wilson, Cressman, & Buote, 2006). Second, as consumers generally do not view pornography for the purpose of self and partner assessments, Peter and Valkenburg (2014) noted that social comparisons are often automatic and spontaneous, rather than intentional and deliberate (e.g., Buunk, Collins, Taylor, VanYperen, & Dakof, 1990; Want, 2009).

A recent meta-analysis indicated that there are two longitudinal studies that have applied the social comparison framework to their rationale for expecting that adolescents who consume pornography more regularly will express less sexual satisfaction than adolescents who consume pornography less regularly (Wright et al., 2017). The first was a three-wave panel study (six months between waves) involving Dutch adolescents aged between 13 and 20 years old at baseline (Peter & Valkenburg, 2009). Cross-lagged panel analysis was carried out for the sample as a whole, and gender was tested as a possible moderator. More frequent pornography consumption at Time (T)1 was associated with lower sexual satisfaction at T2 above and beyond the relationship between T1 and T2 sexual satisfaction. Likewise, more frequent pornography consumption at T2 was associated with lower sexual satisfaction at T3 above and beyond the relationship between T2 and T3 sexual satisfaction. Gender did not significantly interact with pornography use, suggesting similar relationships for males and females. The additional finding that lower sexual satisfaction at T2 was associated with more frequent pornography consumption at T3 supported the hypothesis of a reciprocal relationship (i.e., pornography use decreases sexual satisfaction, which then drives the consumption up).

The second was a four-wave panel study (six months between waves) also involving Dutch adolescents, this time between ages 11 and 18 at baseline (Doornwaard et al., 2014). Latent growth curve analysis of online pornography use was carried out separately for males and females. Among males, more frequent pornography use at T1 predicted less sexual satisfaction at T4, controlling for sexual satisfaction levels at T1. In their female peers, sexual satisfaction was negatively associated with growth in pornography use.

Taken together, the results of these two studies suggest that pornography use may have a negative effect on some adolescents' sexual satisfaction—keeping in mind that observational studies cannot definitively rule out the possibility of a confounding variable. It should be noted that the

two longitudinal studies employed different indicators of sexual satisfaction, but in both cases the authors measured general sexual satisfaction, as is also true with the current study. The findings of Peter and Valkenburg (2009) also suggest that the effect may operate in the opposite direction (some adolescents may start using pornography more in an effort to increase their sexual satisfaction). However, given the fact that both studies were carried out in the same sociocultural environment, the authors' analytical decision to pool participants in different developmental phases (ranging from the end of early adolescence to emerging adulthood), and the small effect sizes found suggest a need for additional research.

The Current Study

Considering that only two Dutch studies have assessed the link between adolescents' pornography use and sexual satisfaction longitudinally (Doornwaard et al., 2014; Peter & Valkenburg, 2009), we aimed to further explore the relationship. To enable insights into developmentally specific dynamics of the association, our study sampled an age cohort (16-year-olds at baseline) and used a longer period under observation (a six-wave panel design).

The fact that the previous studies were carried out in the same sociocultural environment narrows the external validity of their findings. The current study was conducted in a substantially less sexually permissive (Hodžić & Štulhofer, 2017; Štulhofer & Rimac, 2008), highly religious (Luijkx, Halman, Sieben, Brislinger, & Quandt, 2016) and predominantly Roman Catholic country that only recently entered the European Union. This is important as there is evidence that religiosity may moderate the association between pornography use and sexual satisfaction (Cranney & Štulhofer, 2017; Perry & Whitehead, 2018). The mechanism that has been implied is moral incongruence (Kohut & Štulhofer, 2018) or, more precisely, the effect of negative feelings such as guilt, which are triggered by a clash between religious teachings, on one hand, and pornography use and enjoyment of (premarital) sex, on the other hand.

General sexual permissiveness, as well as specific social norms that regulate adolescent sexuality in a given society may also affect young people's understanding and first experiences of sexual satisfaction through particular expectations. Although the existence of such culture-specific processing of sexual satisfaction would present a serious methodological problem for cross-cultural assessments, adolescents' sexual development (i.e., growing sexual experience) and the globalization of (online) pornography are likely driving the (cultural) convergence of personal expectations.

It should also be noted that changes in Internet-based pornography and the apparent normalization of its use in adolescence may have resulted in a more critical attitude toward such content among young people (Vandenbosch &

van Oosten, 2017; Wright & Randall, 2014). To keep up with these largely technologically driven changes, more frequent research assessment may be required. To that end, the aim of our study was to explore the relationship between pornography use and sexual satisfaction in the period from middle to late adolescence and contribute to this research field in two ways. Based on the existing literature, two specific hypotheses were tested:

H1: Changes in pornography use over time is associated with changes in sexual satisfaction, so that an increase in the former construct is linked to a decrease in the latter construct.

H2: The link between pornography use and sexual satisfaction is significant in adolescents of both genders.

Method

Participants. A panel sample of adolescents from a large urban setting in Croatia was recruited as a part of the Prospective Biopsychosocial Study of the Effects of Sexually Explicit Material on Young People's Sexual Socialization and Health (PROBIOPS) research project. Only high school sophomore students from 14 larger secondary schools (for details, see Štulhofer, Tafro, & Kohut, 2019) were recruited. At baseline, participants' age ranged between 15 and 18 years ($M = 15.9$ years, $SD = 0.52$). Following the initial survey (December 2015), participants were resurveyed at approximately six-month intervals. In total, six data collection waves were carried out. The panel included 1,287 participants at baseline (T1) but shrank to 892 at the final wave (T6). Due to illness or school absenteeism, a number of adolescents first joined the panel at T2 or T3. The most substantial attrition, which was observed between T4 and T5, is explained by the fact that students enrolled in three-year vocational schools completed their education and left school several months before T5. Assuming that the true population correlation between pornography use and sexual satisfaction among men is approximately $-.13$ —the value obtained in the most recent meta-analysis (Wright, Tokunaga, et al., 2017)—this study's statistical power exceeded .90 (Faul, Erdfelder, Lang, & Buchner, 2007). Wright, Tokunaga, et al. (2017) found a null correlation of $-.01$ for women.

For robust estimations of latent trajectories in pornography use, only adolescents who participated in at least three of the six data collection waves were included in this study ($n_{\text{female adolescents}} = 775$; $n_{\text{male adolescents}} = 514$). To address whether this decision introduced some bias, a multivariate logistic regression analysis was carried out with the dependent variable denoting two groups of adolescents: those included in this study (coded 1) and those who were omitted (coded 0). Sociodemographic characteristics (gender, father's and mother's education, academic achievement, and religiosity) and baseline frequency of pornography users were included as independent variables. According

to the findings, female adolescents (adjusted odds ratio [AOR] = 1.89, $p < .01$) and those characterized by a higher academic achievement (AOR = 2.32, $p < .001$) had higher odds of being included in the current study.

Procedures. To maximize confidentiality in this classroom-based panel, screens were placed between students. Preserving anonymity, a simple five-digit alphanumeric (generated by students) was used to link questionnaires over time. Considering that, according to the national guidelines for ethical research in minors, adolescents aged 14 and older are able to give informed consent, students' parents were informed about the study only prior to the initial survey. In addition to consent-related information (printed on the cover page), all questionnaires contained the contact of a national organization specialized in offering psychological support and counseling to children and young people. The ethical research board of the University of Zagreb approved all study procedures.

Measures.

Pornography Use. Following the approach used by a number of researchers (e.g., see Landripet & Štulhofer, 2015; Morgan, 2011; Muusses, Kerkhof, & Finkenauer, 2015), the frequency of pornography use was assessed with the following question: "How often have you used pornography during the last 6 months?" In the questionnaire, pornography was defined as "any material which openly depicts sexual activity; material which shows naked bodies but not sexual intercourse or other sexual activity does not belong to pornography as here defined." Response options were as follows: 1 = *Not once*, 2 = *Several times a month*, 3 = *Once a month*, 4 = *2–3 times a month*, 5 = *Once a week*, 6 = *Several times a week*, 7 = *Every day or almost every day*, and 8 = *Several times a day*. Stability coefficients for the indicator ranged from .74 to .83 across all six data collection waves, pointing to a satisfactory test-retest reliability.

Sexual Satisfaction. To assess subjective evaluation of one's sexual life, including both physical and nonphysical aspects, a single-item indicator (see also Doornwaard et al., 2014; Laier, Pekal, & Brand, 2014) was used at T5 and T6: "In general, how satisfied are you with your sex life?" Answers were anchored using a 7-point scale ranging from 1 = *Completely unsatisfied* to 7 = *Completely satisfied*. Considering that the majority of our participants had no or only limited sexual experience at baseline, this general indicator of sexual satisfaction was preferred to more complex, multifaceted measures (see Leonhardt & Willoughby, 2019; Štulhofer et al., 2010). The construct was also measured at two previous waves (T3 and T4), but only in participants who reported sexual intercourse. In the final two waves, everyone was asked to evaluate their sexual satisfaction, regardless of their sexual experience. The stability coefficient for the T5–T6 measurement was .51 in both gender groups, indicating acceptable test-retest

reliability for a characteristic that is expected to substantially fluctuate among adolescents for developmental reasons.

Analytical Strategy. Taking into account cluster-based sampling used in this study, we first explored the effect of students' nestedness in classes. Because hierarchical unconditional means regression modeling pointed to a negligible proportion of variability in participants' pornography use over time that could be attributed to classroom environment ($\leq 4\%$), the effects of intraclass correlation were disregarded in subsequent analyses.

Less than 2% of data were missing due to nonresponse to particular questions. Considering that attrition bias was reasonably small and unrelated to pornography use, full information maximum likelihood estimation was employed to handle missing observations (Graham, 2012).

Similar to Doornwaard et al. (2014), we used latent growth curve modeling (LGCM; Bollen & Curran, 2006; Duncan, Duncan, & Strycker, 2006) to explore the association between the use of pornography and sexual satisfaction among adolescents. This method enables the estimation of a growth trajectory over a period of time, providing information on the mean trajectory for the entire group, as well as on individual differences in growth trajectories. The LGCM approach has several advantages over a traditional repeated-measures analysis of variance (ANOVA) approach to longitudinal data (Tomarken & Waller, 2005), such as the capacity to evaluate a range of growth functions, the ability to include time-varying covariates, and a superior assessment of measurement change. This approach can be regarded as a factor-analytical method of modeling repeated observations using a broader structural equation framework (Duncan et al., 2006). In its simplest form (i.e., when growth is considered linear), growth is represented by two parameters: latent intercept and latent slope.

The analysis was carried out in three steps. First, the shape of change in pornography use over time was tested using linear, unspecified nonlinear or cumulative, and piecewise growth curves by gender (Flora, 2008). As recommended, error variances of observed variables were constrained to equality (Duncan et al., 2006). A piecewise growth curve was tested to enable a more detailed insight into latent growth than provided by the unspecified model (which fit the data better than the linear model). In the absence of a conceptual rationale, several knots (cutoff points that separate two linear parts of overall growth) were tried and compared. The best fitting piecewise model included a latent slope reflecting the T1–T3 period (ages 16 to 17) and the other one covering the T4–T6 period (ages 17.5 to 18). Nested models were compared using the standard chi-square difference test, while Akaike information criterion (AIC) and Browne–Cudeck criterion (BCC) indices were compared in the case of nonnested models (piecewise models were not nested in the linear or cumulative models).

Next, a multigroup unconditional model was tested, with female and male adolescents as groups. Due to the fact that only configural invariance across gender was observed ($\chi^2 = 253.24$, $df = 35$, TLI = .929, CFI = .941, RMSEA = .070 (90% CI = .062–.078), the full path analytic model was carried out by gender. In the final step, a path analytic model was explored in which latent intercept and slopes associated with pornography use over time were specified as predictors of sexual satisfaction measured at the final wave (T6). To control for previous levels, the outcome was autoregressed on sexual satisfaction at T5 (i.e., sexual satisfaction at T6 was expressed as an additive function of satisfaction at T5 plus a random disturbance). Thus, we were able to control for students' previous levels of sexual satisfaction and focus on the remaining variance. To control for potential confounding of being in a relationship at T6, the relevant binary variable ("Are you currently in a relationship?") was also added to the model. People in a relationship may be less likely to use pornography and also more sexually satisfied (Wright, Miezan, & Sun, 2018).

Results

At baseline, more than 90% of the male participants reported some pornography use in the past month. The percentage of those who reported no use remained relatively stable across time, ranging from 7% to 11%. Among female participants, more than two-thirds (67%) reported no pornography use at baseline. By T6, the proportion had decreased to (57%).

Table 1 provides the description of the key indicators and their zero-order correlations over time. Expectedly, gender differences in pornography use were consistently large, almost two standard deviations apart. During the observed period, the mean pornography use among male participants was once a week. In contrast, the majority of female participants reported no pornography use. Compared to their male peers, adolescent females were substantially more satisfied with their sex lives. At the bivariate level, we observed no significant associations between the two key constructs. Zero-order correlations indicated that pornography use and sexual satisfaction were unrelated in both genders.

At the final data collection wave, 51.1% of female participants and 34.9% of male participants reported being in a relationship. Sexual satisfaction was observed to be substantially higher in students who were in a relationship than those who were single. While only a minority of participants reported sexual intercourse at baseline (22.5% of males, 19.7% of females), a slight majority of adolescent females (52.9%) and about half of adolescent males (49.2%) were sexually active at T6.

Latent Growth in Adolescent Pornography Use.

Table 2 shows fit indices for the linear, nonspecified (cumulative) and piecewise growth curve models of pornography use, separately for each gender. The piecewise model had a superior fit over the other two curve specifications (as reflected in the smallest AIC and

BCC values obtained for the model) in both male ($\chi^2_{(17)} = 38.69$, TLI = .981, CFI = .985, RMSEA = .049 [.029–.070]) and female adolescents ($\chi^2_{(17)} = 47.86$, TLI = .984, CFI = .987, RMSEA = .048 [.033–.065]). As presented in Table 3, all latent factors' means—with the exception of latent growth in the T1–T3 period (midadolescence)—and individual variation around them was statistically significant. In other words, there was a significant mean (or between-person) growth in pornography use during the second part of the period under observation (T4–T6), as well as significant individual variation in baseline levels and the dynamics of pornography use during both T1–T3 and T4–T6 periods.

In addition to markedly higher mean levels of pornography use at baseline, male adolescents reported substantially higher individual variation in the initial frequency of pornography use compared to their female peers. In the light of these baseline differences, we found an almost identical mean growth in pornography use in the T4–T6 period (late adolescence) in both genders. The growth was significant and of a small magnitude.

Hypotheses Testing. Next, a multigroup model was explored, with female and male students as groups. Due to the fact that measurement invariance was not achieved—pointing to gender-specific dynamics of mid- to late adolescent pornography use—the full path analytic model was explored and interpreted separately for each gender. This final model, with paths from the latent factors representing pornography use directed to sexual satisfaction at T6 (see Figures 1 and 2), had a very good fit in both genders (female students: $\chi^2_{(26)} = 58.16$, TLI = .978, CFI = .987, RMSEA = .040 [.026–.054]; male students: $\chi^2_{(26)} = 46.46$, TLI = .977, CFI = .986, RMSEA = .039 [.020–.057]). In the female model (Figure 1), no significant associations between sexual satisfaction and pornography use were found. Female adolescents' sexual satisfaction was unrelated to the initial frequency of pornography use, as well as to two latent slopes that represented subsequent dynamics of use. Being in a relationship was significantly and positively related to sexual satisfaction ($\beta = .29$; $p < .01$) but not to pornography use. Female participants who used pornography more often at baseline were characterized by a lesser increase in use during late adolescence ($r = -.17$; $p < .05$).

The findings from the male path analytic model (see Figure 2) were similar to the female model. No significant correlations were found between sexual satisfaction and pornography use. However, the nonsignificant associations between sexual satisfaction and growth in pornography use in the T1–T3 and T4–T6 periods had different signs, suggesting that pornography use in midadolescence might relate differently to the evaluation of personal sexual satisfaction than pornography use in later adolescent years. Further research in a larger sample would be needed to test this conjecture. As observed among their female peers, male students who reported being in a relationship also indicated that they

Table 1. Statistical Descriptors and Associations Between the Key Variables

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | Male | | Female | | Gender Diff. (θ). | Effect Size |
|---------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|------|------|--------|------|----------------------------|-------------|
| | | | | | | | | | | M | SD | M | SD | | |
| | | | | | | | | | | | | | | | |
| 1. Pornography use T1 | | 0.68** | 0.58** | 0.56** | 0.57** | 0.53** | 0.00 | 0.05 | 0.08 | 4.82 | 2.17 | 1.73 | 1.36 | 26.57** | 1.79 |
| 2. Pornography use T2 | 0.70** | | 0.72** | 0.67** | 0.65** | 0.61** | 0.01 | 0.03 | 0.13 | 5.04 | 2.12 | 1.77 | 1.40 | 28.92** | 1.89 |
| 3. Pornography use T3 | 0.62** | 0.76** | | 0.68** | 0.67** | 0.63** | -0.05 | 0.00 | 0.11 | 4.75 | 2.14 | 1.77 | 1.42 | 25.82** | 1.72 |
| 4. Pornography use T4 | 0.56** | 0.69** | 0.75** | | 0.77** | 0.70** | -0.01 | 0.07 | 0.15 | 4.92 | 2.11 | 1.90 | 1.54 | 25.39** | 1.69 |
| 5. Pornography use T5 | 0.51** | 0.59** | 0.68** | 0.71** | | 0.78** | -0.10 | 0.00 | 0.12 | 5.14 | 2.02 | 1.91 | 1.49 | 24.69** | 1.89 |
| 6. Pornography use T6 | 0.51** | 0.54** | 0.60** | 0.66** | 0.69** | | -0.08 | 0.00 | 0.13 | 5.14 | 2.06 | 1.99 | 1.53 | 23.35** | 1.80 |
| 7. Sexual satisfaction T5 | 0.05 | -0.01 | -0.05 | -0.03 | -0.04 | -0.05 | | 0.50** | 0.35** | 4.50 | 1.75 | 5.25 | 1.59 | -6.23** | -0.45 |
| 8. Sexual satisfaction T6 | 0.05 | 0.00 | -0.08 | -0.04 | 0.04 | -0.01 | 0.52** | | 0.43** | 4.53 | 1.74 | 5.16 | 1.70 | -5.12** | -0.37 |
| 9. In a relationship T6 | 0.03 | 0.07 | -0.05 | 0.06 | 0.05 | 0.02 | 0.26** | 0.40** | | 0.35 | 0.48 | 0.51 | 0.50 | 19.96** | 0.16 |

Note. Zero-order coefficients in the female sample are presented above the main diagonal; those in the male sample are shown below it.

^aChi-square test.

* $p < .05$; ** $p < .01$.

Table 2. Model Fit Associated With Different Latent Growth Curve Models of Adolescent Pornography Use

| | χ^2 (df) | | $\Delta\chi^2$ (df) | | AIC | | BCC | |
|------------------|------------------|--------------------|---------------------|--------------------|------------------|--------------------|------------------|--------------------|
| | Male Adolescents | Female Adolescents | Male Adolescents | Female Adolescents | Male Adolescents | Female Adolescents | Male Adolescents | Female Adolescents |
| Linear model | 58.03 (21) | 78.76 (21) | | | 70.03 | 90.76 | 70.19 | 90.87 |
| Cumulative model | 54.09 (17) | 59.39 (17) | 4.06 (4) | 19.37 (4)** | 74.09 | 79.39 | 74.37 | 79.57 |
| Piecewise model | 38.37 (17) | 47.86 (17) | / | / | 58.37 | 67.86 | 58.64 | 68.04 |

Note. AIC = Akaike information criterion; BCC = Browne-Cudeck criterion.

* $p < .05$; ** $p < .01$.

Table 3. Estimates and Fit of the Final Latent Growth Curve Model by Gender

| | Female Adolescents (<i>n</i> = 775) | Male Adolescents (<i>n</i> = 514) |
|-----------------------------------|---|---------------------------------------|
| <i>Pornography Use</i> | | |
| Mean intercept | 1.73 (SE = .05)*** | 4.92 (SE = .10)*** |
| Variance in individual intercepts | 1.34 (SE = .10)*** | 3.42 (SE = .29)*** |
| Mean slope A (T1 – T3) | 0.01 (SE = .01) | 0.00 (SE = .01) |
| Variance in individual slopes A | 0.01 (SE < .01)*** | 0.01 (SE < .01)*** |
| Mean slope B (T4 – T6) | 0.01 (SE < .01)** | 0.01 (SE < .01)* |
| Variance in individual slopes B | 0.01 (SE < .01)*** | 0.01 (SE < .01)*** |
| χ^2 (<i>df</i>) | 58.16 (26) | 46.46 (26) |
| TLI/CFI | .978/.987 | .977/.986 |
| RMSEA (90% CI) | .040 (.026–.054) | .039 (.020–.057) |

Note: SE = standard error = Tucker–Lewis index; CFI = comparative fit index; RMSEA = root mean square error of approximation; CI = confidence interval

* $p < .05$; ** $p < .01$; *** $p < .001$.

were more sexually satisfied ($\beta = .29$; $p < .001$). Taking into account relatively high levels of pornography use among male participants in this sample, negative associations between the initial levels of pornography use and both of its latent slopes may be a measurement artifact rather than a true relationship (see Little, 2013, p. 260).

Taking into account concerns that the use of lagged dependent variables produces biased estimates (Wilkins, 2018), the path analytic models were also estimated without the lagged component (sexual satisfaction at T5). The fit of these more parsimonious models did not significantly differ from the full models (female students: $\Delta\chi^2_{(3)} = 2.27$; male students: $\Delta\chi^2_{(3)} = 1.10$). The directed paths leading from pornography use to sexual satisfaction remained nonsignificant in both genders.

Discussion. Considering that the link between pornography use and sexual satisfaction among adolescents has been longitudinally assessed only among young Dutch people (Doornwaard et al., 2014; Peter & Valkenburg, 2009), with the second of these two studies carried out more than 10 years ago, the current study aimed to reassess the association in a society characterized by higher religiosity and more traditional views about sexuality (Štulhofer & Rimac, 2008). In contrast to previous findings, we found no significant association between the frequency of pornography use and adolescents' sexual satisfaction. This finding held in both gender groups. In addition, we did not observe a significant association between the initial levels of pornography use and sexual satisfaction, which would indicate a possible relationship during middle adolescence.

As observed in other studies, male adolescents have used pornography much more frequently than their female peers during the observed period. Notwithstanding the difference,

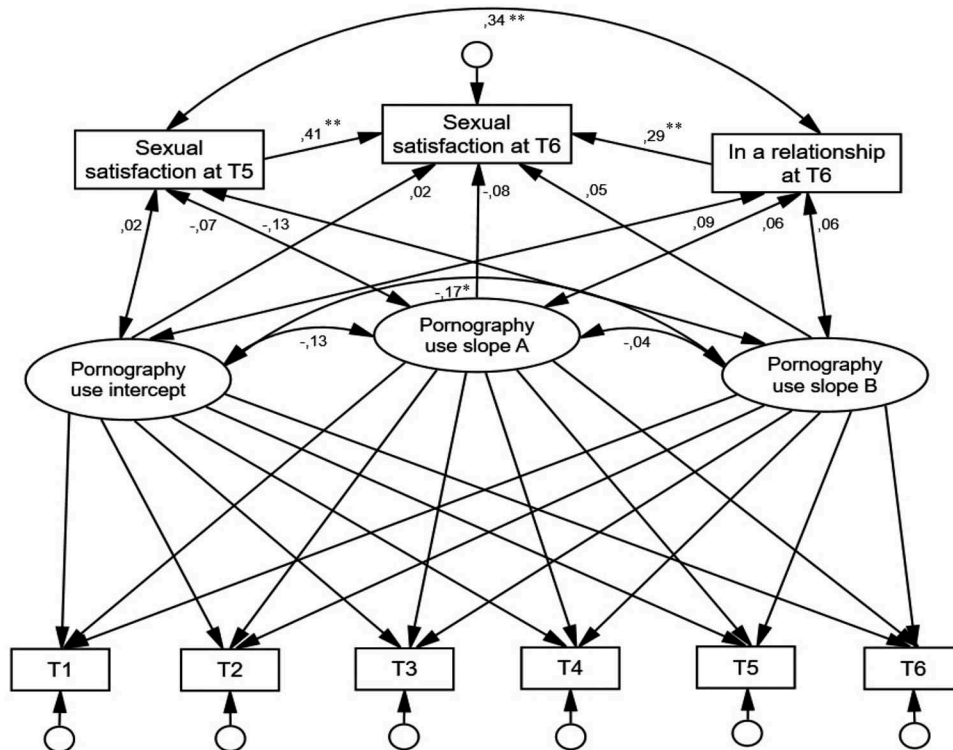


Figure 1. Structural associations between female adolescents' pornography use and sexual satisfaction ($n = 775$). Standardized path coefficients are presented; model fit: $\chi^2_{(26)} = 58.16$, TLI = .978, CFI = .987, RMSEA = .040 (.026–.054); * $p < .01$; ** $p < .001$.

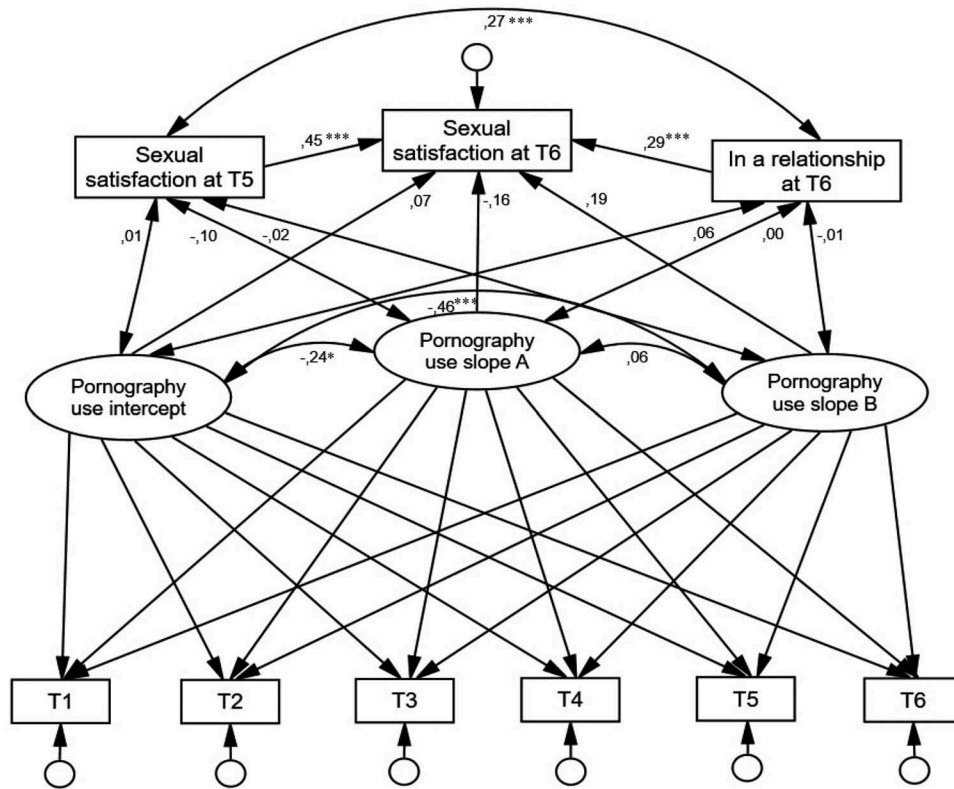


Figure 2. Structural associations between male adolescents’ pornography use and sexual satisfaction ($n = 514$). Standardized path coefficients are presented; model fit: $\chi^2_{(26)} = 46.46$, TLI = .977, CFI = .986, RMSEA = .039 (.020–.057); * $p < .05$; ** $p < .01$; *** $p < .001$.

a significant albeit slight growth in pornography use was observed only in the second part of the period under observation (when participants were between 17 and 18 years of age) and in both genders. This coincides with the average age at first sexual intercourse (17.5 years) observed in a population-based study of emerging Croatian adults that was carried out in 2010 (Landripet, Štulhofer, & Baćak, 2011). Suggesting that pornography use is largely a solitary activity among adolescents, we found no significant association between relationship status at the final observation point and the frequency of pornography use. Participants of either gender who reported being in a relationship at the age of 18 were no different in their pornography use from those who were single.

There are several possible explanations for the differences between our findings and those reported in the two prior studies. When comparisons are made to the 2009 Peter and Valkenburg study, it is important to take into account the fact that the Dutch study was carried out in 2006, a year before the launch of the first popular smartphone. In our study, 80% of participants reported that they used a smartphone to assess pornographic material. The normalization of pornography use, which seems to have intensified in the meantime (Mulholland, 2013), as reflected in the commonality of peer discussions about pornography (Scarcelli, 2015; Smith, 2013), may have affected adolescents’ “reading” of pornography by making them more critical

when thinking about the relevance of pornographic depictions of sexuality for their lives. There is some evidence from adults (Wright, 2013), as well as adolescents (Vandenbosch & van Oosten, 2017), suggesting that critical viewing of pornography reduces its cognitive effects.

Methodologically, our study differed from the previous studies in several ways. First, it covered a longer period of time, which made it less sensitive to short-term effects. Second, unlike Peter and Valkenburg (2009), who sampled participants aged 13 to 20, and Doornwaard et al. (2014), who included participants aged 11 to 18, our sample included an age cohort of mainly 16-year-olds. The analytical decision to pool participants in different developmental phases (early to late adolescence and emerging adulthood) who differed in group means on both target variables may have distorted the reported association (see Howell, 2013). This also obscured possible developmentally specific links. Finally, the 2009 study focused on group-level estimates of the key relationship, while ours allowed both group- and individual-level assessments. It should be noted that the group-level correlations between pornography consumption and sexual satisfaction were small, ranging between $-.06$ and $-.15$ (Peter & Valkenburg, 2009). Several of the group-level correlations between pornography consumption and sexual satisfaction in the present study were within this range (e.g., a $-.08$ correlation for male and a $-.10$ correlation for female adolescents). However, the fact that significance tests for the 2009 study included the combined (male and

female) sample increased the likelihood of smaller associations reaching statistical significance.¹

Culturally, Dutch adolescents grow up in a markedly more liberal and gender egalitarian social environment than their Croatian peers. Croatia presents a specific socioreligious context for adolescent sexual development due to a substantial increase in religiosity—observed also among young people (Marinović Jerolimov & Jokić, 2010)—that marked the sociocultural dynamics in the country during and in the aftermath of the post-Communist transition and the 1991–1995 independence war (Nikodem & Zrinščak, 2012). Interestingly, there has been little evidence that emerging Croatian adults' sexual behaviors are influenced by their religious identity and/or religious education, which was introduced in national schools at the end of the 1990s (Puzek, Štulhofer, & Božičević, 2012; Štulhofer, Šoh, Jelaska, Bačak, & Landripet, 2011). It should be noted, however, that the recent opposition to the official introduction of comprehensive sexuality education in primary and secondary schools (Kuštreba, Elezović, & Štulhofer, 2015)—which, effectively, halted the project—found support for this traditionalist backlash against sexual permissiveness also among some young people. Although it remains unclear how the dominant cultural norms and expectations could have affected the link between adolescent pornography use and sexual satisfaction (i.e., should we expect sexual permissiveness to amplify, weaken or even reverse the relationship?), culture-specific effects should not be disregarded when considering the findings from the three studies.

Another approach to the assessment of differences between the studies would consist of revisiting the proposed mechanism underlying the negative association between adolescents' pornography use and sexual satisfaction. According to Peter and Valkenburg (2009), social comparison theory (Buunk & Gibbons, 2007) is a useful tool for understanding psychological costs associated with young people's comparisons to actors in pornographic videos, their bodies, sexual skills, lust, and capacity for pleasure. Although plausible, the comparison narrative may need nuancing to maximize its explanatory power,² as suggested by adolescents' descriptions of their cognitive and emotional processing of pornography. In a number of qualitative studies that have been carried out among adolescents and

emerging adults in different cultural settings during the past 10 years, participants' reflections on pornography appear more complex and critical toward the pornographic fantasy (Böhm, Franz, Dekker, & Matthiesen, 2015; Löfgren-Mårtenson & Månsson, 2010; Rothman, Kaczmarzsky, Burke, Jansen, & Baughman, 2015). What this body of research suggests is that the adolescents' "reading" of pornography is complex, because it treats sexually explicit imagery as a source of information about sexual practices, pleasure, and entertainment but also disgust and ambiguity over one's own competencies—often simultaneously. Pornography seems to be a tool for alleviating boredom and a means to socialize with peers, but also the arena of critical assessment and discerning between what is real and what is staged (see Attwood, 2005).

Strengths and Limitations. There are several strengths and limitations to the current study that need to be mentioned. One of the strengths worth noting is a large number of measuring points and a relatively long period of observation. The number of waves is important both in a practical and theoretical sense. As is well-known, model identification requires a sufficient number of time points (e.g., higher-order polynomial functions of order x require a minimum of $x + 2$ repeated observations). In the absence of clear theoretical expectations regarding the shape of the latent curve describing pornography use during adolescence, this ability to fit different curve specifications is of great importance. The research was carried out on a reasonably large-scale panel sample, which enabled separate analysis on male and female respondents with sufficient statistical power. Justifying a joint analysis would have been difficult, given the substantial gender differences in the frequency of pornography consumption and gender-specific shape of the growth curve in pornography use. Furthermore, we used the autoregressive model to control for the previous level of the outcome variable, which allowed a more precise assessment of change in sexual satisfaction.

These advantages apart, a few limitations should also be taken into account. First, our key constructs were measured by single-item indicators. However, these items have been used in other international studies (Hald, Malamuth, & Lange, 2013; Štulhofer, Buško, & Landripet, 2010). Furthermore, considering that sexual satisfaction is a complex construct, correlations in the .50 to .58 range found between a single-item indicator and two frequently used multi-item sexual satisfaction scales suggest that a single-item can represent the construct moderately well (Mark, Herbenick, Fortenberry, Sanders, & Reece, 2014). In the case of pornography use, a recent meta-analysis found no significant difference in the associations between pornography use and interpersonal satisfaction reported in studies which used a single-item measure of pornography use and those that employed a composite indicator (Wright et al., 2017). This is consistent with the literature that encourages the use of single-item indicators when the measured construct and its attributes are easily and

¹ It appears that Doornwaard et al. (2014) specified only linear latent growth in participants' pornography use, which is not standard practice. Although this may not have affected their finding in the male sample (the relationship between baseline pornography use and sexual satisfaction), the robustness of the reported association between latent slope in pornography use and female adolescents' sexual satisfaction is dependent on whether latent growth is best approximated by a linear or a nonlinear curve.

² More recent explorations of the process of social comparison point to the importance of individual differences, as well as to strategical minimization of unfavorable comparisons by emphasizing differences between self and the target of comparison (see Buunk & Gibbons, 2007). In the context of pornography, the latter point would suggest that the likelihood of finding pornography a reliable guide to how sex should be would be reduced if it is dependent, at least to a degree, on the viewer's identification with (socially stigmatized) protagonists of pornographic videos.

uniformly understood (Bergkvist & Rossiter, 2007; Diamantopoulos, Sarstedt, Fuchs, Wilczynski, & Kaiser, 2012). Of note, the LGCM approach used in this study enabled the estimation of within-person pornography use measurement error, which is the usual concern with single-item indicators.

Beyond the problem of whether to use single- or multiple-item indicators lies the question of whether sexual satisfaction studies should assess variations in sexual media content at a more nuanced level. Recently, Leonhardt, Spencer, Butler, and Theobald (2018) proposed that varying categories of sexual media (i.e., “suggestive” versus “explicit” versus “paraphilic”) have differing effects on sexual satisfaction. For example, their framework suggests that explicit more so than suggestive content would lead to upward comparisons due to its more graphic and open displays of sexual behavior. Although several of their hypotheses were not supported, Leonhardt and Willoughby (2019) found enough dissimilarity between the two measures of sexual media use they used (“provocative” and “pornography”) and correlations with various indicators of sexual satisfaction to recommend that future studies continue to probe this line of theorizing by measuring various types of sexual media.

It is also possible that the anticipated upward social comparison effect of pornography on reduced sexual satisfaction would be more detectable with a measure of sexual satisfaction that was dyadic or partner specific, as opposed to general. While pornography users without partners can certainly make upward social comparisons between their current sexual situation and the sexual situations of participants in pornography (e.g., increases in sexual dissatisfaction resulting from observing others have enthusiastic and pleasurable sexual relations with multiple attractive partners while they themselves are involuntarily celibate), it may be the case that those with partners are more likely to make immediate and unfavorable comparisons. We note, however, that because Peter and Valkenburg (2009) and Doornwaard et al. (2014) also used general measures of sexual satisfaction, this measurement question cannot explain the difference between our null results and their significant results.

Another possible weakness lies in this study’s inability to track longitudinal dynamics of the outcome (sexual satisfaction). In the first four waves (T1–T4), only participants who already reported the experience of sexual intercourse were asked about sexual satisfaction. In that respect, we were unable to apply parallel process or dual-domain modeling to study dynamic relationship between the two key constructs or the autoregressive latent trajectory approach to explore reciprocal causal links between pornography use and sexual satisfaction (see Bollen & Curran, 2004). Thus, we may have overlooked the potential influence of sexual satisfaction on pornography use, which was suggested in previous research (Peter & Valkenburg, 2009). It remains a question, however, whether the meaning of sexual satisfaction remains unchanged from mid- to late adolescence—in spite of developmental changes and increasing sexual experience. If the meaning of sexual satisfaction is related

to adolescent sexual experience (i.e., if the appraisal of sexual satisfaction in sexually experienced adolescents is categorically different from the appraisal among their sexual inexperienced peers), asking all participants about their sexual satisfaction in earlier study waves would have been burdened with incommensurability. At T5, when we first asked all panelists about their sexual satisfaction, most of the participants were 18 years of age and had at least some sexual experience (see Landripet et al., 2011).

Finally, the fact that the attrition resulted in the overrepresentation of students with higher (baseline) academic achievement should be noted, as more educated persons may be more critical and media literate—in other words, less likely to incorporate information from pornography into their own sexual scripts (Wright, 2013; Wright & Randall, 2014). It should be noted, though, that the magnitude of overrepresentation of students with high academic achievement was small.

Conclusions

This article focused on the relationship between adolescent pornography use and sexual satisfaction with an aim to provide a cross-cultural generalizability test of the findings from previous longitudinal assessments. Given the unprecedented availability of (online) sexually explicit content, the topic—which has not received much attention, particularly in longitudinal research—is of substantial importance for young people’s sexuality and well-being (Fortenberry, 2016; Harden, 2014). According to this study’s findings, changes in pornography use were unrelated to sexual satisfaction in this adolescent age cohort. This may be explained by the process of becoming more critical of pornographic portrayals of sex and sexuality, as suggested in a Swedish study that sampled young people aged 14 to 20 years (Löfgren-Mårtenson & Månsson, 2010). The authors observed that the older participants were more “porn savvy” than the younger ones. Additional research is needed to elucidate whether the increase in more critical assessment of pornography lowers the likelihood of the relation between pornography consumption and lower sexual satisfaction and whether this effect is moderated by the frequency of pornography use (see Wright et al., 2017). We also need a better understanding of how exactly a more critical appraisal of pornography may affect a relation between sexual satisfaction and pornography use. Is the effect mediated by a reduced exposure to pornographic imagery and/or moderated by the emotional as well as erotic quality of the relationship (Leonhardt et al., 2018)?

With age, some adolescents may find the successful navigation of the pornographic landscape becoming easier (see Löfgren-Mårtenson & Månsson, 2010). To assist young people in this process, school-based media literacy and comprehensive sexuality programs, which promote and can improve critical thinking about pornography (Vandenbosch & van Oosten, 2017), may prove more important yet more morally contested than ever before.

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