



Are sexual functioning problems associated with frequent pornography use and/or problematic pornography use? Results from a large community survey including males and females

Beáta Bőthe^{a,b,*}, István Tóth-Király^c, Mark D. Griffiths^d, Marc N. Potenza^{e,f,g}, Gábor Orosz^{h,a}, Zsolt Demetrovics^a

^a Institute of Psychology, ELTE Eötvös Loránd University, Budapest, Hungary

^b Département de Psychologie, Université de Montréal, Montreal, Canada

^c Department of Psychology, Concordia University, Montreal, Canada

^d Psychology Department, International Gaming Research Unit, Nottingham Trent University, Nottingham, UK

^e Yale University School of Medicine, New Haven, CT, USA

^f Connecticut Council on Problem Gambling, Wethersfield, CT, USA

^g Connecticut Mental Health Center, New Haven, CT, USA

^h Department of Psychology, Stanford University, Stanford, CA, USA

HIGHLIGHTS

- PPU had positive, moderate links to sexual function problems in males and females.
- FPU had negative, weak links to sexual function problems in males and females.
- FPU and PPU should be discussed separately concerning its links to sexual outcomes.

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ABSTRACT

There is much debate regarding whether pornography use has positive or negative associations with sexuality-related measures such as sexual functioning problems. The present study aimed to examine differential correlates between quantity (frequency of pornography use–FPU) and severity (problematic pornography use–PPU) of pornography use with respect to sexual functioning problems among both males and females. Multi-group structural equation modeling was conducted to investigate hypothesized associations between PPU, FPU, and sexual functioning problems among males and females ($N = 14,581$ participants; females = 4,352; 29.8%; $M_{age} = 33.6$ years, $SD_{age} = 11.0$), controlling for age, sexual orientation, relationship status, and masturbation frequency. The hypothesized model had excellent fit to the data ($CFI = 0.962$, $TLI = 0.961$, $RMSEA = 0.057$ [$95\% CI = 0.056-0.057$]). Similar associations were identified in both genders, with all pathways being statistically significant ($p < .001$). PPU had positive, moderate associations ($\beta_{males} = 0.37$, $\beta_{females} = 0.38$), while FPU had negative, weak associations with sexual functioning problems ($\beta_{males} = -0.17$, $\beta_{females} = -0.17$). Although FPU and PPU had a positive, moderate association, they should be assessed and discussed separately when examining potential associations with sexuality-related outcomes. Given that PPU was positively and moderately and FPU negatively and weakly associated with problems in sexual functioning, it is important to consider both PPU and FPU in relation to sexual functioning problems.

Although multiple studies have been conducted regarding possible positive and negative correlates of pornography use (Bőthe, Tóth-Király, & Orosz, 2015; Bőthe, Tóth-Király, Demetrovics, & Orosz, 2017; Hald & Mulya, 2013; Hook et al., 2015; Miller, Hald, & Kidd, 2018),

there remain unanswered and controversial questions needing further investigation. Some popular media reports suggest that sexual well-being and sexual functioning problems may be becoming more prevalent among younger adults (especially males) due to pornography use

* Corresponding author at: Department of Psychology, Université de Montréal, C.P. 6128, Succursale Centre-Ville, Montréal, QC H3C 3J7, Canada.

E-mail addresses: beata.bothe@umontreal.ca, beabothe@gmail.com (B. Bőthe).

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(Ley, Prause, & Finn, 2014; Montgomery-Graham, Kohut, Fisher, & Campbell, 2015; Zimbardo & Coulombe, 2012). Personal accounts, clinical presentations, and other data suggest that many young males may experience sexual functioning problems that they attribute to pornography viewing (Nation, 2019; NoFap, 2019; Pappu, 2016). However, empirical, scientific studies have reported inconsistent associations between pornography use and sexual functioning problems when considering different aspects of pornography use (e.g., problematic pornography use (PPU), frequency of pornography use (FPU)), or potential gender-related differences (Grubbs & Gola, 2019; Vaillancourt-Morel, Daspe, Charbonneau-Lefebvre, Bosisio, & Bergeron, 2019). Thus, it is important to examine whether different patterns of pornography use (i.e., FPU and PPU) may relate differently to sexual functioning problems and to identify whether such problems may relate differently among males and females.

1. Quantity versus severity of pornography use

While most individuals in industrialized countries have viewed pornographic materials, a smaller number experiences PPU (Bóthe et al., 2018, 2020; Grubbs, Kraus, & Perry, 2019; Rissel et al., 2017; Wéry et al., 2016). In recent nationally representative studies of Australian, US, and Polish participants (Grubbs et al., 2019; Lewczuk, Glica, Nowakowska, Gola, & Grubbs, 2020; Rissel et al., 2017), 70% to 85% of participants have ever used pornography in their lifetime. Concerning gender-related differences, 84% to 85% of males and 54% to 57% of females reported lifetime pornography use. However, only 3% to 4.4% of males and 1% to 1.2% of females considered themselves addicted to pornography (Grubbs et al., 2019; Lewczuk et al., 2020; Rissel et al., 2017). Despite relationships between FPU and PPU (Bóthe, Tóth-Király, Potenza, Orosz, & Demetrovics, 2020; Grubbs, Perry, Wilt, & Reid, 2019), it is important to distinguish between quantity (FPU) and quality/severity (PPU) of pornography use (Gola, Lewczuk, & Skorko, 2016) when examining associations with sexual functioning.

In PPU, pornography may impact people's lives significantly and dominate their thinking, feelings, and behaviors (Wéry, Schimmenti, Karila, & Billieux, 2019). Individuals with PPU may use pornography to reduce or eliminate stress or negative feelings (Wéry & Billieux, 2016; Wéry et al., 2019). They may increase time spent using pornography, consume more extreme pornography and engage in pornography use despite intrapersonal and interpersonal conflicts related to their use. Although individuals with PPU may often try to control or reduce their use (Wéry et al., 2019), they may experience mental distress and/or withdrawal symptoms leading to the return of previous pornography-use patterns (Groß et al., 2008).

FPU has been associated with PPU, although magnitudes are typically small to moderate in community samples while stronger, moderate associations have been reported in treatment-seeking and clinical samples (Bóthe, Koós, Tóth-Király, Orosz, & Demetrovics, 2019; Bóthe et al., 2018, 2020; Brand et al., 2011; Gola et al., 2016, 2017; Grubbs et al., 2015, 2019; Lewczuk, Szmyd, Skorko, & Gola, 2017; Twohig, Crosby, & Cox, 2009; Voon et al., 2014; Klucken, Wehrum-Osinsky, Schweckendiek, Kruse, & Stark, 2016). Many community-dwelling individuals may use pornography without perceiving significant adverse consequences and may control or stop use when necessary (Kor et al., 2014). Some people may experience PPU accompanied by relatively low-frequency pornography use, perhaps due to moral incongruence or other factors (Brand, Antons, Wegmann, & Potenza, 2019; Kraus & Sweeney, 2019).

Longitudinal data with one-year follow-ups and one or two measurement points (Grubbs, Wilt, Exline, & Pargament, 2018; Grubbs, Wilt, Exline, Pargament, & Kraus, 2018) suggest PPU and FPU may not be related to one another over time. However, study limitations should be noted (e.g., studies were conducted over short timeframes). Other longitudinal findings applying growth curve models with four time-points over a one-year period suggest that greater baseline FPU was

associated with greater baseline PPU, but they were negatively associated over time (i.e., greater baseline FPU statistically predicted decreases in PPU and greater baseline PPU statistically predicted decreases in FPU over time) (Grubbs, Kraus, Perry, Lewczuk, & Gola, 2020). In summary, complex associations may exist between FPU and PPU, especially when associations are examined longitudinally, suggesting a need for more precise understandings.

1.1. Sexual functioning problems and their associations with FPU and PPU among males and females

Despite important differences between FPU and PPU, their concurrent measurement has often been omitted or not fully considered, possibly leading to differences in findings across studies (Kohut et al., 2020). Multiple studies have reported no significant associations between FPU and sexual functioning in males (Dwulit & Rzymiski, 2019; Grubbs & Gola, 2019; Landripet & Štulhofer, 2015; Prause & Pfaus, 2015), while in females FPU has been associated with better sexual functioning (Blais-Lecours, Vaillancourt-Morel, Sabourin, & Godbout, 2016).

Specifically, in a large-scale cross-sectional study of Portuguese, Croatian, and Norwegian males (Landripet & Štulhofer, 2015), seemingly inconsistent associations were identified between FPU and sexual functioning problems (assessed by the level of delayed ejaculation, erectile dysfunction, and sexual desire). There were no significant associations between FPU and delayed ejaculation, erectile dysfunction, and sexual desire with one exception. After controlling for age and level of education, moderate pornography use was associated with lower odds of experiencing erectile dysfunction, and only among Croatians. Among American males, FPU was related to higher sexual desire and not erectile dysfunction (Prause & Pfaus, 2015). Additional cross-sectional and longitudinal studies of US males suggested that FPU was unrelated to erectile dysfunction (Grubbs & Gola, 2019). These results suggest that FPU *per se* may have little or no association with sexual functioning problems in males in community samples.

Few studies have directly investigated associations between PPU and sexual functioning problems (Grubbs & Gola, 2019; Wéry & Billieux, 2016). In a recent survey-based study on males (Wéry & Billieux, 2016), problematic online sexual activities were positively and weakly related to erectile dysfunction and levels of sexual desire, and no significant associations were identified between problematic engagement in online sexual activities and orgasmic dysfunction. Cross-sectional and longitudinal data from US males indicated that PPU and erectile dysfunction have positive associations in cross-sectional studies, while inconclusive results were reported longitudinally (Grubbs & Gola, 2019).

Existing studies are limited in that few have examined possible roles of pornography use in sexual functioning problems among females (Dwulit & Rzymiski, 2019). When FPU and PPU were assessed simultaneously, one study found a weak and negative association with sexual functioning problems among females (and males) (Blais-Lecours et al., 2016). Counterintuitively, individuals having higher FPU and PPU experienced lower levels of sexual functioning problems. The positive associations between FPU, PPU, and sexual function may be interpreted as frequent pornography use possibly exerting a protective role against self-perceived sexual dysfunction among individuals with PPU, or that individuals with sexual dysfunctions may not engage in FPU or PPU. Distress induced by pornography use has been associated positively and weakly with sexual functioning problems, while efforts to access pornography were unrelated (Blais-Lecours et al., 2016).

1.2. The aim of the present study

The aim of the present study was to examine the extent to which PPU and FPU may relate similarly or dissimilarly to sexual functioning problems among males and females in a large non-clinical sample.

Based on the extant literature, we hypothesized that sexual functioning problems would relate positively to PPU but not to the FPU, particularly among males. Given that pornography use is often accompanied by masturbation, masturbation was considered in analyses (Perry, 2020; Prause, 2019), along with age (Grubbs et al., 2018; Lewczuk et al., 2017), relationship status (Gola et al., 2016; Lewczuk et al., 2017), and sexual orientation (Bóthe et al., 2018; Peter & Valkenburg, 2011).

2. Methods

2.1. Participants and procedure

This study was conducted following the Helsinki Declaration and was approved by the Institutional Ethical Review Board of the research team's university. Data collection occurred in January 2017 on a popular Hungarian news portal via an online survey. The study was part of a larger project. Different subsamples from this dataset were used in previously published studies. All previously published studies and included variables can be found at OSF (https://osf.io/dzxrw/?view_only=7139da46cef44c4a9177f711a249a7a4). Based on prior recommendations for large-scale studies (Keith, 2015; Kline, 2015), we aimed to recruit at least 1000 participants to ensure appropriate power. However, we did not set an upper limit for participation. Informed consent was obtained before data collection. Survey completion took approximately 30 min, and relevant data were analyzed. Individuals aged 18 years old or older were invited to participate. Before responding to pornography-related questions, participants were provided with a definition of pornography: "Pornography is defined as material (e.g., text, picture, video) that (1) creates or elicits sexual feelings or thoughts and (2) contains explicit exposure or descriptions of sexual acts involving the genitals, such as vaginal or anal intercourse, oral sex, or masturbation." (Bóthe et al., 2018).

Data from 14,581 participants were considered (female = 4,352, 29.8%) according to who used pornography in the past year and had sexual relationships before. Participants were aged between 18 and 76 years ($M_{age} = 33.58$ years, $SD_{age} = 10.95$). Concerning sexual orientation, 12,063 were heterosexual (82.7%), 1,470 were heterosexual with homosexuality to some extent (10.1%), 268 were bisexual (2.5%), 60 were homosexual with heterosexuality to some extent (0.6%), 414 were homosexual (2.8%), 15 were asexual (0.1%), 73 were unsure about their sexual orientation (0.5%), and 40 indicated the 'other' option (0.3%). Concerning place of residence, 7,882 lived in the capital city (54.1%), 2,267 in county towns (15.5%), 3,082 in towns (21.1%), and 1,350 in villages (9.3%). Concerning the level of education, 364 had primary school degrees or less (2.5%), 597 had vocational degrees (4.1%), 4,649 had high-school degrees (31.9%), and 8,971 had higher-education degrees (i.e., bachelor, masters or doctoral) (61.5%). Regarding relationship status, 3,802 were single (26.1%), 6,316 were in a relationship (43.3%), 590 were engaged (4.0%), 3,651 were married (25.0%), 409 were divorced (2.8%), 71 were widow/widower (0.5%), and 222 selected the 'other' option (1.5%). Individuals on average viewed online pornography weekly.

2.2. Measures

2.2.1. Problematic Pornography Consumption Scale (PPCS; Bóthe, Tóth-Király, et al., 2018)

The PPCS was developed based on a six-component addiction model (Griffiths, 2005). The scale includes six factors (salience; tolerance; mood modification, conflict, withdrawal, and relapse), each with three items concerning past-six-month use of pornography. Respondents indicate answers on a seven-point scale (1 = "never"; 7 = "all the time"). The internal consistency of the scale was high ($\alpha = 0.94$), as in prior studies (Bóthe et al., 2019a, 2019b; Tóth-Király, Vallerand, Bóthe, Rigó, & Orosz, 2019).

2.2.2. Sexual Functioning Problems (Sexual Function Scale (SFS); (Burwell, Case, Kaelin, & Avis, 2006; Sherbourne, 1992)

Sexual functioning problems were assessed with four questions related to different aspects of sexual functioning: lack of interest in sexual activities, difficulty in becoming sexually aroused, difficulty in achieving orgasm, and difficulty in enjoying sex. Respondents indicated their level of problems on each dimension on a four-point scale (1 = "not a problem"; 4 = "much of a problem"). These dimensions cover main aspects of sexual functioning problems among males and females, and the scale has been widely used (Addis et al., 2006; Broeckel, Thors, Jacobsen, Small, & Cox, 2002; Kuppermann et al., 2005; Lerman et al., 1996; Thompson et al., 2005; Zebrack, Foley, Wittmann, & Leonard, 2010).¹ The internal consistency of the scale was relatively low in the present study ($\alpha = 0.56$) but demonstrated adequate reliability in previous studies (Broeckel et al., 2002; Lerman et al., 1996; Zebrack et al., 2010). Reliability may vary as a result of the number of items (i.e., having a small number of items may result in lower reliability (Cortina, 1993), particularly when items cover broad constructs, which is the case for the SFS. Therefore, composite reliability (CR) was calculated because it better represents the construct (i.e., it takes into account factor loadings with their respective measurement errors) (Bagozzi & Yi, 1988; Dunn, Baguley, & Brunson, 2014; McNeish, 2018; Raykov, 1997). The scale demonstrated adequate reliability in terms of CR (0.74).

2.2.3. Frequency of Pornography Use (Bóthe et al., 2018)

Respondents indicated their frequency of online pornography use over the past year on a 10-point scale (1 = "never", 10 = "6 or 7 times a week").

2.2.4. Control variables

Age was assessed as a continuous variable. Sexual orientation was assessed with one question ("What is your sexual orientation?", answer options: heterosexual; heterosexual with homosexuality to some extent; bisexual; homosexual with heterosexuality to some extent; homosexual; asexual; unsure about sexual orientation; and 'other') (Træen, Nilsen, & Stigum, 2006). Relationship status was assessed with one question ("What is your current relationship status?", answer options: single; in a relationship; engaged; married; divorced; widow/widower; and 'other'). Frequency of masturbation was assessed with one question. Respondents indicated their frequency of masturbation over the past year on a 10-point scale (1 = "never", 10 = "6 or 7 times a week") (Bóthe et al., 2018).

2.3. Statistical analyses

SPSS 21 and Mplus 7.3 were used for statistical analyses. To assess variables' internal consistencies, Cronbach's alphas were calculated (Nunnally, 1978). CR was calculated following Raykov's formula (Raykov, 1997), because it better represents the construct as it considers factor loadings with their respective measurement errors (> 0.60 acceptable, > 0.70 good (Bagozzi & Yi, 1988; Dunn et al., 2014; McNeish, 2018; Raykov, 1997).

Before conducting structural equation modeling (SEM), data were examined for assumptions of multivariate analyses based on detailed guidelines (Field, 2009). Specifically, univariate normality (i.e., the inspection of skewness and kurtosis values) was not achieved based on pre-established guidelines (Muthén & Kaplan, 1985). Mardia's two-

¹ The SFS was translated into Hungarian based on a pre-established translation-back-translation protocol (Beaton, Bombardier, Guillemin, & Ferraz, 2000). Confirmatory factor analysis (CFA) was conducted to examine its factor structure in the present sample. According to the CFA results, the scale showed excellent structural validity with on error covariance (CFI = 0.999, TLI = 0.995, RMSEA = 0.026 [90% CI 0.012-0.044]).

sided tests for multivariate normality were significant (all $p < .001$), supporting the violation of multivariate normality (Wang & Wang, 2012). Nevertheless, the Durbin-Watson test suggested independence of residuals (1.16) (Field, 2009), and linearity and homoscedasticity were verified by examining scatterplots, histograms, and P-P plots of residuals. In summary, apart from normality, all other assumptions were met.

SEM was performed to investigate associations between PPU, FPU, and sexual functioning problems. To test whether PPU and FPU had similar associations with sexual functioning problems among males and females, we first examined the model in the whole sample (Model 1). Next, we examined whether the model varied across genders using multi-group SEM (Model 2). To ensure that the path coefficients were not significantly different for males and females, the paths between FPU and sexual functioning problems and PPU and sexual functioning problems were constrained to be equal in the two groups (Model 3). In the final step, we included theoretically relevant control variables in the model: age, sexual orientation (dummy coded), relationship status (dummy coded), and frequency of masturbation. To simplify analyses, we created two groups based on sexual orientation: heterosexual group ($n = 13,533$) and sexual minority group ($n = 1,048$), and two groups based on relationship status: single group ($n = 3,802$) and in-a-relationship group ($n = 10,557$). Items were treated as categorical indicators and the mean- and variance-adjusted weighted least-squares estimator (WLSMV) was used because assumptions of normality were not met (Finney & DiStefano, 2006). Commonly accepted goodness-of-fit indices (Pappu, 2016) were used to assess acceptability of examined models. Namely, Comparative Fit Index (CFI; ≥ 0.90 for acceptable; ≥ 0.95 for excellent), Tucker–Lewis index (TLI; ≥ 0.90 for acceptable; ≥ 0.95 for excellent), and Root-Mean-Square Error of Approximation (RMSEA; $\leq .08$ for acceptable; $\leq .06$ for excellent) with 90% confidence intervals were examined (Bentler, 1990; Brown, 2015; Browne & Cudeck, 1993; Hu & Bentler, 1999; Kline, 2011; Schermelleh-Engel, Moosbrugger, & Müller, 2003; Tabachnick and Fidell, 2001). Significant decreases in CFI and TLI ($\Delta\text{CFI} \leq 0.010$; $\Delta\text{TLI} \leq 0.010$) and significant increases in RMSEA ($\Delta\text{RMSEA} \leq 0.015$) indicated if a model had significantly worse fits than previous ones when the four examined models were compared (Chen, 2007; Cheung & Rensvold, 2002). To reduce risk of Type I errors when testing hypotheses, Bonferroni correction was applied ($\alpha = 0.05$; $m = 2$)². Consequently, associations in path analyses were considered significant at $p < .025$.

3. Results

Descriptive data, reliability indices, and associations between PPU, FPU, sexual functioning problems, and control variables (i.e., age, sexual orientation [dummy coded], relationship status [dummy coded], frequency of masturbation) by gender are shown in Table 1. Comparisons of scores by gender are presented in Table 2. Significant, moderate-to-strong differences were observed between males and females for all variables, except for sexual orientation, which showed a weak difference. Compared to females, males reported significantly higher levels of PPU, FPU, and masturbation frequency, and lower levels of sexual functioning problems; they were older, and a lower proportion belonged to the sexual minority group. Males and females did not differ on relationship status.

All estimated SEMs showed acceptable-to-excellent fits (Table 3). First, a baseline model was estimated on the total sample in which FPU and PPU predicted sexual functioning problems (Model 1). Next, the same model was tested using gender as a grouping variable (Model 2). To test whether path coefficients were not significantly different for males and females, the paths between FPU and sexual functioning

problems and PPU and sexual functioning problems were constrained to be equal across groups (Model 3). Changes in model fit indices remained in the acceptable range (Model 3 compared to Model 2), suggesting that associations between FPU and sexual functioning problems, and PPU and sexual functioning problems did not differ between genders. In the final step (Model 4), we examined the same model as in Model 3, including control variables (i.e., age, sexual orientation [dummy coded], relationship status [dummy coded], frequency of masturbation). Changes in model fit indices remained in the acceptable range (Model 4 compared to Model 3), suggesting that associations between FPU and sexual functioning problems, and PPU and sexual functioning problems did not change after controlling for theoretically relevant correlates. Based on results of Model 4, PPU was moderately and positively related to sexual functioning problems ($\beta_{\text{males}} = 0.37$ [95% CI 0.34 to 0.39], $p < .001$; $\beta_{\text{females}} = 0.38$ [95% CI 0.35 to 0.40], $p < .001$) and FPU was weakly and negatively associated ($\beta_{\text{males}} = -0.17$ [95% CI -0.20 to -0.14], $p < .001$; $\beta_{\text{females}} = -0.17$ [95% CI -0.20 to -0.13], $p < .001$) (Fig. 1).³

4. Discussion

Given seemingly inconsistent results concerning associations between pornography use and sexual outcomes (Grubbs & Gola, 2019; Vaillancourt-Morel et al., 2019), the aim of the present study was to examine potentially different roles for FPU and PPU with respect to relationships with sexual functioning problems among males and females. FPU had a weak, negative association with sexual functioning problems, and PPU had a moderate, positive association with sexual functioning problems. Although most studies of PPU have investigated males (Bóthe, Tóth-Király, Demetrovics, & Orosz, 2020; Dwulit & Rzymiski, 2019; Gola et al., 2016; Kraus & Rosenberg, 2014; Kraus, Rosenberg, Martino, Nich, & Potenza, 2017)—especially when associations between PPU and sexual functioning problems have been examined (Grubbs & Gola, 2019; Landripet & Štulhofer, 2015; Prause & Pfau, 2015; Wéry & Billieux, 2016)—the present results suggest that similar associations may be identified among females concerning associations between PPU, FPU, and sexual functioning problems. Implications are discussed below.

4.1. Differences between the quantity and severity of pornography use

Similarities and differences between FPU and PPU is an understudied field within behavioral addictions and problematic sexual behaviors (Gola et al., 2016; Grubbs, Wilt, Exline, & Pargament, 2018; Grubbs, Wilt, Exline, Pargament, & Kraus, 2018). The results of the present study corroborate recent findings (Bóthe et al., 2020; Gola et al., 2016; Grubbs, Wilt, Exline, & Pargament, 2018; Grubbs, Wilt, Exline, Pargament, & Kraus, 2018) suggesting that FPU and PPU are distinct yet related patterns of pornography consumption. In the

³ When the bivariate associations were examined between FPU and sexual functioning, weakly positive and non-significant associations were found among males and females, respectively, while structural equation modeling (SEM) demonstrated negative associations between FPU and sexual functioning problems among males and females as well. These differences between the results of the bivariate correlations and the complex SEM model may be explained by the shared variance between FPU and PPU (supported by the positive, moderate correlations between these variables). When analyses of FPU and sexual functioning problems do not control for PPU, the shared variance between PPU and FPU may conceal a negative, weak association between FPU and sexual functioning problems. This potential explanation is supported by the results of partial correlations. When partial correlations were conducted (controlling for the effect of PPU when examining associations between FPU and sexual functioning problems), negative, weak correlations were found between FPU and sexual functioning problems in both males ($r = -0.05$, $p < .001$) and females ($r = -0.05$, $p < .001$).

² According to the Bonferroni correction formula, the number of hypotheses (m) should be divided by the desired overall alpha level (α).

Table 1
Descriptive statistics, reliability indices, and correlations between pornography use, sexual functioning problems, and control variables among males and females.

Scales	Skewness (SE)	Kurtosis (SE)	Range	Mean (SD)	1	2	3	4	5	6	7
1. Problematic pornography use	1.61 (0.02)	2.57 (0.04)	18–126	34.67 (18.17)	—	0.48**	0.10**	0.29**	-0.09**	0.12**	-0.07**
2. Frequency of pornography use ^a	-0.52 (0.02)	-0.69 (0.04)	1–10	6.55 (2.47)	0.43**	—	< 0.01	0.52**	-0.18**	0.13**	-0.12**
3. Sexual functioning problems	1.25 (0.02)	1.66 (0.04)	4–16	6.16 (2.19)	0.23**	0.06**	—	-0.04*	-0.03*	0.07**	-0.04*
4. Frequency of masturbation ^a	-0.78 (0.02)	0.21 (0.04)	1–10	7.14 (2.13)	0.37**	0.61**	0.05**	—	-0.09**	0.14**	-0.27**
5. Age	0.97 (0.02)	0.58 (0.04)	18–76	33.58 (10.95)	-0.17**	-0.26**	0.07**	-0.37**	—	-0.04*	< -0.01
6. Sexual orientation (dummy coded) ^b	3.33 (0.02)	9.10 (0.04)	0–1	0.07 (0.26)	0.08**	0.10**	0.05**	0.12**	-0.05**	—	-0.05**
7. Relationship status (dummy coded) ^c	-1.07 (0.02)	-0.09 (0.04)	0–1	0.74 (0.44)	-0.13**	-0.18**	-0.13**	-0.26**	0.19**	-0.11**	—

Note. SE = standard error; SD = standard deviation. ^a = 1: never; 2: once in the last year; 3: 1–6 times in the last year; 4: 7–11 times in the last year; 5: monthly; 6: two or three times a month; 7: weekly; 8: two or three times a week; 9: four or five times a week; 10: six or seven times a week. ^b = 0: heterosexual; 1: sexual minority. ^c = 0: single; 1: in a relationship. Correlations presented below the diagonal represent the associations among males, correlations presented above the diagonal represent associations among females. **p* < .05; ***p* < .01.

Table 2
Descriptive statistics for pornography use, sexual functioning problems, and control variables and comparison of males and females.

	Range	Males' <i>M</i> (<i>SD</i>) (<i>n</i> = 10,028–10,148)	Females' <i>M</i> (<i>SD</i>) (<i>n</i> = 4,256–4,352)	<i>t</i> (<i>df</i>)	<i>p</i>	<i>d</i>
1. Problematic pornography use	18–126	38.56 (19.30)	25.61 (10.71)	51.56 (13602.24)	< 0.001	0.83
2. Frequency of pornography use ^a	1–10	7.33 (2.19)	4.72 (2.10)	2.61 (8565.01)	< 0.001	1.22
3. Sexual functioning problems	4–16	5.81 (1.99)	6.98 (2.40)	-28.14 (7039.58)	< 0.001	0.53
4. Frequency of masturbation ^a	1–10	7.59 (2.02)	6.07 (2.00)	41.36 (14410)	< 0.001	0.76
5. Age	18–76	35.31 (11.33)	29.53 (8.76)	33.21 (10510.53)	< 0.001	0.57
6. Sexual orientation (dummy coded) ^b	0–1	0.06 (0.25)	0.09 (0.28)	-4.52 (7324.96)	< 0.001	0.11
7. Relationship status (dummy coded) ^c	0–1	0.74 (0.44)	0.73 (0.44)	0.95 (14282)	0.344	0.02

Note. *M* = mean; *SD* = standard deviation. ^a = 1: never; 2: once in the last year; 3: 1–6 times in the last year; 4: 7–11 times in the last year; 5: monthly; 6: two or three times a month; 7: weekly; 8: two or three times a week; 9: four or five times a week; 10: six or seven times a week. ^b = 0: heterosexual; 1: sexual minority. ^c = 0: single; 1: in a relationship. *df* = degree of freedom.

Table 3
Comparison of the associations between pornography use and sexual functioning problems among males and females.

Model	WLSMV χ^2 (<i>df</i>)	CFI	TLI	RMSEA	90% CI	Comparison	Δ CFI	Δ TLI	Δ RMSEA
M1: Total sample (baseline)	12436.407* (222)	0.973	0.969	0.062	0.061–0.063	—	—	—	—
M2: Grouping by gender (males vs. females)	14731.008* (535)	0.964	0.966	0.060	0.060–0.061	M2–M1	-0.009	-0.003	-0.002
M3: Paths constrained to be equal between males and females	13956.587* (537)	0.966	0.968	0.059	0.058–0.060	M3–M2	+0.002	+0.002	-0.001
M4: Paths constrained to be equal between men and women and control variables included	16867.120* (697)	0.962	0.961	0.057	0.056–0.057	M4–M3	-0.004	-0.007	-0.002

Note. WLSMV = weighted least squares mean- and variance-adjusted estimator; χ^2 = Chi-square; *df* = degrees of freedom; CFI = comparative fit index; TLI = Tucker-Lewis Index; RMSEA = root-mean-square error of approximation; 90% CI = 90% confidence interval of the RMSEA; Δ CFI = change in CFI value compared to the preceding model; Δ TLI = change in the TLI value compared to the preceding model; Δ RMSEA = change in the RMSEA value compared to the preceding model. **p* < .001.

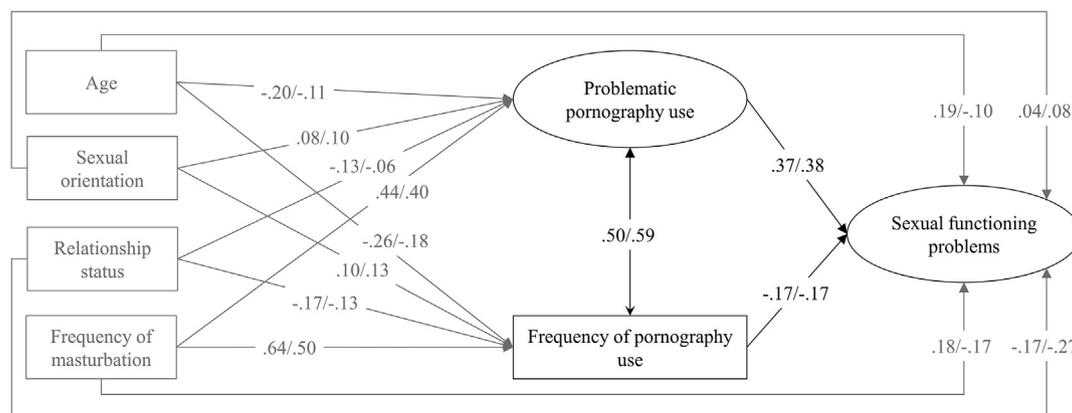


Fig. 1. Associations between pornography use frequency, problematic pornography use, and sexual functioning problems among males and females, controlling for age, relationship status, sexual orientation, and frequency of masturbation (Model 4). Note. One-headed arrows represent standardized regression weights and two-headed arrows represent correlations. Ellipses represent latent variables and rectangles represent observed variables. For the sake of clarity, observed variables related to the latent variables, and correlations between the control variables are not depicted. Control variables and their associations are depicted with grey. The first numbers on the arrows indicate the path coefficients for males, and the second numbers indicate the path coefficients for females. Sexual orientation and relationship status were dummy coded (sexual orientation: 0 = heterosexual; 1 = sexual minority and relationship status: 0 = single; 1 = in a relationship). All depicted paths were significant at *p* < .001.

present largescale cross-sectional study, although FPU and PPU were positively and moderately related, their associations with sexual functioning problems were in opposite directions. Therefore, the results suggest that FPU and PPU represent related yet distinct aspects of pornography use not only in the case of treatment-seeking populations (Gola et al., 2016) but also in community samples, particularly as they relate to sexual functioning problems.

These findings resonate with the “high engagement versus problematic engagement” model of potentially addictive behaviors (Billieux, Flayelle, Rumpf, & Stein, 2019; Charlton & Danforth, 2007; Charlton, 2002). According to this model, some characteristics should be considered as “core” symptoms of problematic behaviors, while others represent “peripheral” symptoms that may be present in both frequent but non-problematic use and in problematic use, such as FPU (Billieux et al., 2019; Bóthe, Lonza, Štulhofer, & Demetrovics, 2020; Charlton & Danforth, 2007; Charlton, 2002). In other words, individuals may experience FPU but not necessarily PPU. In contrast, individuals with PPU may also report core and peripheral symptoms (including FPU) (Bóthe et al., 2020). As found here and elsewhere (Billieux et al., 2019; Charlton & Danforth, 2007; Charlton, 2002), when only FPU was present (i.e., a peripheral symptom), no major adverse consequences may be observed. However, when PPU is present (i.e., both core and peripheral symptoms), it is more likely that adverse and harmful consequences will be observed. Similar observations have been reported regarding other online behaviors with respect to measures of quantity/frequency and problematic use, such as internet use (Chak & Leung, 2004), Facebook use (Koc & Gulyagci, 2013), online gaming (Király, Tóth, Urbán, Demetrovics, & Maraz, 2017; Orosz, Zsila, Vallerand, & Bóthe, 2018), and problematic television series watching (Tóth-Király, Bóthe, Tóth-Fáber, Hága, & Orosz, 2017; Tóth-Király, Bóthe, Márki, Rigó, & Orosz, 2019).

Taking findings together, while quantities of the aforementioned activities were often unrelated to maladaptive states and conditions, problematic engagement in these online behaviors has been related to maladaptive or harmful measures. Therefore, thorough examinations are needed when effects of potentially problematic online behaviors are investigated, taking into consideration not only the quantity of behaviors but also quality levels of engagement.

4.2. Differentiated roles for quantity and severity of pornography use in sexual functioning problems among males and females

While FPU had a weak, negative association with sexual functioning problems, PPU had a positive and moderate association, suggesting that FPU may be associated with fewer sexual functioning problems in some cases (Landripet & Štulhofer, 2015). Nevertheless, males reported using pornography significantly more frequently, and reported higher levels of PPU, compared to females. However, females reported significantly higher levels of sexual functioning problems than males.

Differentiated relationships with FPU and PPU may relate to several underlying biopsychosocial factors. Speculatively, FPU may stem from stronger sexual desire and relate to lower levels of sexual functioning problems, perhaps due to variety in pornographic material that could lead to easier and quicker responses to different offline sexual stimuli (Prause & Pfaus, 2015). FPU may facilitate sexual thoughts, which, in turn, may lead to quicker sexual responses in and thus not lead to sexual functioning problems assessed here (Watson & Smith, 2012). Another possible explanation concerning the negative association between FPU and sexual functioning problems could reflect familiarity generated from viewing pornographic materials (Griffiths, 2000; Kohut, Fisher, & Campbell, 2017; Watson & Smith, 2012), whereby individuals with FPU may feel more sexual comfort when engaging in offline sexual activities because given pornography-related familiarity with sexual activities (Kohut et al., 2017). Based on qualitative analysis of males and females, the most frequently reported effect of pornography use was “no negative impacts”, followed by using pornography as an information source,

for sexual experimentation, and for sexual comfort. Thus, higher levels of sexual comfort and self-acceptance, and lower levels of anxiety, shame, and guilt concerning sexual behaviors may be related to FPU. Increased arousal and orgasm response, interest in sex, and more acceptance towards different sexual activities and more sexual experimentation were also reported as positive effects of pornography use (Kohut et al., 2017). Alternate explanations include that individuals with poor sexual functioning may be less likely to engage in FPU, individuals may not be fully aware of pornography-use-related sexual problems and some sexual problems may not have been captured by the assessment instrument. Nevertheless, FPU explained only a very small amount of the variance related to sexual functioning problems in the present study, indicating that other factors are likely to play a more important role in the development and maintenance of sexual functioning (McCabe et al., 2016).

PPU may be associated with increased masturbation and pornography “binges” (i.e., using pornography multiple times or hours per day), based on results from a ten-week long diary study with treatment-seeking males (Wordecha et al., 2018). Therefore, males who excessively view pornographic materials may be more likely to be in a refractory period when trying to engage in sexual activities with their partner, potentially leading to sexual functioning problems (Ley et al., 2014). For some, sexual intercourse with one’s partner may not be as stimulating as online pornographic material (e.g., it may not provide as much novelty as online pornography). Furthermore, clinical and case reports suggest that pornography use may alter arousal templates (Brand, Blycker, & Potenza, 2019). These potential impacts should be considered in future studies. Additional possible explanations exist. For example, among men seeking treatment for compulsive sexual behaviors, severity of PPU was associated positively with sexual anxiety and negatively with sexual satisfaction (Kowalewska, Kraus, Lew-Starowicz, Gustavsson, & Gola, 2019); as these factors may impact sexual dysfunction, further study is warranted.

As males and females with compulsive-pornography-use profiles (likely PPU) reported lower levels of sexual functioning problems than individuals with a highly distressed non-compulsive profile (Vaillancourt-Morel et al., 2017), stress may impact sexual functioning problems (McCabe et al., 2016). Stress reduction and emotion regulation are frequently reported motivations in PPU, and interventions involving training in emotion regulation (e.g., mindfulness) may be effective in reducing PPU (Bóthe, Tóth-Király, Potenza, Demetrovics, & Orosz, 2020; Levin, Lillis, & Hayes, 2012; Wéry & Billieux, 2016; Sniewski and Farvid, 2019). Individuals experiencing high levels of stress may engage in PPU, leading to sexual functioning problems, which, in turn, could result in further stress. Further studies should examine this possibility and relationships between stress, PPU and sexual functioning problems generally.

In sum, different mechanisms may underlie FPU and PPU. Such mechanisms may both directly and indirectly relate to sexual functioning problems in complex manners. When assessing relationships between pornography use and sexual functioning problems, future research should consider both FPU and PPU and other aspects of pornography and specific aspects of sexual functioning problems.

4.3. Limitations and future studies

Study findings should be considered alongside limitations. Self-report methods have biases (e.g., underreporting and overreporting). Causality cannot be inferred from cross-sectional studies. The internal consistency of the SFS was less than optimal (perhaps related to diversity of the 4 domains assessed), and this may have affected findings, as could have the limited number of domains and lack of specificity. For example, context specificity is not detailed in the SFS (e.g., partnered versus solitary sexual activities), and individuals with hypersexuality have reported sexual functioning problems during partnered sex but not during pornography use (Voon et al., 2014).

Moral incongruence and religiosity were not assessed, which may limit generalizability. Moral incongruence and religiosity may relate to PPU (Grubbs & Perry, 2019; Grubbs et al., 2019a, 2020b, 2020c; Lewczuk et al., 2020), with individuals with higher levels of morality and religiosity perhaps showing stronger associations between FPU and PPU than those with lower levels of morality and religiosity (Grubbs, Lee, Hoagland, Kraus, & Perry, 2020). As such, future studies should include assessments of moral incongruence in relation to pornography content (e.g., aggressive sexual behaviors often targeted towards women (Bridges, Wosnitzer, Scharrer, Sun, & Liberman, 2010), particularly Black women (Fritz, Malic, Paul, & Zhou, 2020), and rape, incest and other pornography genres (Rothman, Kaczmarek, Burke, Jansen, & Baughman, 2015) and other domains in which people may experience morality-related conflicts. The present study examined a general, community sample. Given that stronger associations may be present between FPU and PPU in treatment-seeking and clinical populations (Bóthe et al., 2018, 2020; Brand et al., 2011; Gola et al., 2016, 2017; Grubbs et al., 2015, 2019; Lewczuk et al., 2017; Twohig et al., 2009; Voon et al., 2014), the findings of the present study concerning the associations between FPU, PPU, and sexual functioning problems may not generalize to treatment-seeking or clinical populations.

Longer-term longitudinal studies are needed to examine further the nature of the relationships and how they may change over time among both males (Grubbs & Gola, 2019) and females. Individuals who may have developed sexual functioning problems that could have been related to prior pornography viewing (before past-year) may potentially contribute to weakening relationships between FPU and sexual functioning problems. Also, individuals with sexual functioning problems may fear performance failure. Consequently, they may choose online pornography viewing instead of engaging in offline sexual behaviors with their partners (Miner et al., 2016). Additionally, while quantity and FPU are typically related, they are not equivalent and may relate differently to clinically relevant aspects of pornography use (e.g., when trying to abstain; (Fernandez, Tee, & Fernandez, 2017). Qualitatively analyzing narratives of the development and maintenance of one's PPU (Wordecha et al., 2018) and sexual functioning problems may be fruitful in identifying possible mediator and moderator variables such as moral incongruence (Brand et al., 2019; Grubbs & Perry, 2019), accessibility of pornography (Rissel et al., 2017), and other factors (Vaillancourt-Morel et al., 2019).

5. Conclusions

Although FPU and PPU exhibited positive, moderate associations, they should be assessed and considered separately when examining relationships with sexual functioning problems and other measures (Vaillancourt-Morel et al., 2019). PPU appears more strongly associated with problems in sexual function in both community and clinical samples. When considering both PPU and FPU, FPU had a weak negative association with sexual functioning problems in the community. Therefore, in both research and clinical endeavors, it is important to consider both PPU and FPU in relation to sexual functioning problems.

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CRedit authorship contribution statement

Beáta Bóthe: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Writing - original draft, Writing - review & editing. **István Tóth-Király:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Writing - review & editing. **Mark D. Griffiths:** Investigation, Writing - review & editing. **Marc N. Potenza:** Investigation, Writing - review & editing. **Gábor Orosz:** Conceptualization, Investigation, Supervision, Writing - review & editing. **Zsolt Demetrovics:** Conceptualization, Funding acquisition, Investigation, Project administration, Resources, Supervision, Writing - review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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