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The Relation of Sexual Attitudes to Hypersexuality and Problematic Pornography Use

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Abstract

Previous studies have shown that specific attitudes related to moral convictions can have an important role in the development and maintenance of problematic sexual behavior symptoms. However, although other types of attitudes, like sexual attitudes, are potentially highly relevant, they have not yet been studied in this role. We investigated how four dimensions of sexual attitudes: Permissiveness, Birth Control, Communion and Instrumentality, contribute to problematic pornography use (PPU) and hypersexual disorder (HD) symptoms, controlling for religiosity, sex, age and relationship status. The study was administered through an online questionnaire and based on a representative sample of $n = 1036$ ($M_{\text{age}} = 43.28$, $SD = 14.21$; 50.3% women) Polish adult citizens. When adjusting for other variables, higher sexual Permissiveness positively predicted HD and PPU among both men (HD: $\beta = .26$, $p < .001$; PPU: $\beta = .22$, $p < .001$) and women (HD: $\beta = .44$, $p < .001$; PPU: $\beta = .26$; $p < .001$). Sexual Instrumentality positively, although weakly, contributed to HD severity among men ($\beta = .11$, $p < .05$). Attitudes reflecting higher support for responsible sexuality (Birth Control subscale) negatively and weakly predicted HD among women ($\beta = -.11$, $p < .05$). Permissiveness was also the only sexual attitude dimension that consistently predicted a higher frequency of sexual activity among men and women. Based on the cutoff criteria proposed by the authors of the used screening instruments (≥ 53 points for the Hypersexual Behavior Inventory and ≥ 4 points for the Brief Pornography Screen), the prevalence of being at risk for HD was 10.0% (men: 11.4%, women: 8.7%) and for PPU was 17.8% (men: 26.8%, women: 9.1%). Our results point to a significant contribution of sexual attitudes to problematic sexual behavior symptoms, which was not encapsulated by the previously studied influence of religious beliefs, although most of the obtained relationships were relatively weak. Particularly, a consistent link between permissive attitudes and both HD and PPU among men and women may indicate that permissive attitudes can potentially contribute to the development and maintenance of problematic sexual behavior. The prevalence of being at risk for PPU (and to some degree HD) in the current representative sample was high. Such results raise questions about the appropriateness of the proposed cutoff criteria and the risk of overpathologizing normative sexual activity, if the cutoff thresholds are not tailored adequately. The results have implications for the assessment, diagnosis and theory of problematic sexual behavior.

Keywords Sexual behavior · Sexual attitudes · Hypersexuality · Pornography · Problematic pornography use · Compulsive sexual behavior

Introduction

A recent and strong line of research has shown that personal attitudes, including moral beliefs or religious convictions, are related to and may influence problematic sexual behavior, including problematic pornography use, hypersexuality and/or compulsive sexual behavior (Efrati, 2019; Grubbs, Perry, et al., 2019; Lewczuk et al., 2020; Mestre-Bach et al., 2021). As attitudes can relate to the perception of own behavior as normative or problematic and drive the decision to seek treatment, this subject has crucial implications for accurate

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diagnosis and therapy of problematic sexual behavior (Kraus & Sweeney, 2019). Thus, it has recently received significant attention from researchers (Grubbs et al., 2019). However, previous studies concerning connections between convictions and problematic sexual behavior have focused on religiosity and moral disapproval of pornography use (Grubbs et al., 2019), while excluding other potentially important personal attitudes from the analysis. This is also true for sexual attitudes, which are most closely related to sexual behavior (C. Hendrick et al., 2006). We argue that a broader view of the connections between attitudes and problematic sexual behavior is needed and would be beneficial for a fuller, conceptual understanding of problematic sexual behavior, as well as its therapy and diagnosis.

Sexual Attitudes

Currently, the most prominent conception of sexual attitudes put forward by Hendrick and Hendrick (1987) distinguishes four dimensions (C. Hendrick et al., 2006): Permissiveness, Birth Control, Communion and Instrumentality. High sexual Permissiveness refers to an unconstrained, open, liberal and casual approach to sex as well as engagement in casual sexual practices not accompanied by guilt or shame. Sexual permissiveness was, hitherto, the most heavily studied dimension of sexual attitudes (C. Hendrick et al., 2006). Birth Control reflects attitudes regarding responsible sexuality and the opinion that both partners should care about birth control and share responsibility for contraception. High Communion relates to the spiritual view of sex as an act of sharing and commitment, viewing it as a peak experience and the highest expression of love between two people. Lastly, high Instrumentality reflects a practical, bio-physiological and self-focused orientation toward sex, in which a person views sex mainly as a biological act most strongly driven by and focused on fulfilling their own physiological needs (C. Hendrick et al., 2006).

Previous research has shown that these attitudes significantly relate to many aspects of sexual behavior including frequency of casual sexual activities, lifetime exposure to sexually explicit websites, unwanted sex, sexual aggression or sexual harassment perceptions (Braun-Courville & Rojas, 2009; Dempster et al., 2015; Doornwaard et al., 2015; Grubbs, Wright, et al., 2019; Hendrick et al., 2006; Knapp et al., 2019; Smith et al., 2016). For example, men were shown to display a more permissive and instrumental approach to sex than women, while women scored higher on the Birth Control subscale (C. Hendrick et al., 2006; S. S. Hendrick & Hendrick, 1995). Some studies showed that Permissiveness was connected with using dating apps for sexual encounters (Shapiro et al., 2017) as well as higher pornography consumption. However, there is also contradictory evidence showing mixed results or no clear link between

pornography use and sexual permissiveness (Martyniuk & Stulhofer, 2018). Some research also shows that in college-attending women, but not men, consuming more pornography might be related to a more instrumental attitude toward sex and higher scores on the Birth Control scale (Brown et al., 2017). Moreover, in the referenced study, men who showed less approval for pornography achieved higher scores on the Communion subscale. At the same time, Communion was not connected with the reported frequency of pornography consumption (Brown et al., 2017).

Summing up, despite the potential social significance of these phenomena, the relationship between sexual attitudes and problematic sexual behavior, to the best of our knowledge, has not been investigated in previous studies. Filling this research gap was the main aim of the current analysis.

It is also worth stating that sexual attitudes are distinct from sexual drive, and previous research has shown only moderate correlations between sexual attitude dimensions and sexual desire (Ostovich, 2005; Paxton & Turner, 1978; Purifoy et al., 1992). Sexual attitudes are also related to, but distinct from sexual motivations (Gravel et al., 2016). While sexual attitudes reflect the overall views and stances on sexuality, sexual motivations refer to factors that drive a person to engage in sexual activity, reflecting different degrees of self-determination (Gravel et al., 2016). Recent research has shown that amotivation (which is the opposite of intrinsic motivation) is the only sexual motivation category that positively contributed to CSBD symptoms (Koós et al., 2022). While these constructs are highly distinct, showing how sexual attitudes relate to sexual motivations and how both constructs predict problematic sexual behavior seems to be a worthwhile goal in future studies.

Problematic Pornography Use and Hypersexual Disorder

Previous studies have shown that pornography consumption can have a positive or neutral influence on an individual's life (Bóthe, Potenza, et al., 2020; Bóthe, Tóth-Király, et al., 2020; Dwulit & Rzymiski, 2019; Kohut et al., 2017; Vaillancourt-Morel et al., 2019). However, for some people, pornography use can become problematic and contribute to perceptions of being addicted (Lewczuk et al., 2020; Lewczuk et al., 2021; Lewczuk, Wójcik, et al., 2022) as well as negative consequences in other areas of life. This phenomenon is often studied under the label of problematic pornography use (PPU) (de Alarcón et al., 2019; Gola et al., 2016; Kraus et al., 2020; Lewczuk et al., 2017). However, as PPU is not recognized as a formal diagnostic unit, no universally adopted definition of PPU exists (Fernandez & Griffiths, 2021). Most conceptualizations include increased preoccupation with sexual thoughts, feelings and behavior, distress as well as impairment in functioning due to dysregulated pornography use,

increased craving, general lack of control over pornography consumption or using pornography as a coping strategy (de Alarcón et al., 2019; Fernandez & Griffiths, 2021; Wéry & Billieux, 2017). In contrast, hypersexual disorder (HD) extends these symptoms to other sexual activities (compulsive masturbation, impulsive casual sex, using paid sexual services) and does not solely focus on pornography consumption. In detail, HD was conceptualized as a nonparaphilic sexual behavior disorder, not caused by a direct effect of any exogenous substances, for which the most important symptoms were: (1) sexual behavior interfering with activities in other important spheres of life; (2) repetitive engagement in sexual behavior undertaken as a means of coping with dysphoric mood (3) or coping with stress; (4) numerous and unsuccessful attempts to stop or reduce sexual behavior; (5) engagement in sexual behavior despite the risk of physical and/or emotional harm as well as (6) sexual behavior causing significant distress or impairment in functioning (Kafka, 2010). HD was proposed for, but ultimately not included, in the final version of DSM-V (American Psychiatric Association [APA], 2013; Kafka, 2010, 2013, 2014). More recently, Compulsive Sexual Behavior Disorder was included in the ICD-11 classification (International Classification of Diseases, 11th revision, World Health Organization [WHO], 2020), which is in many ways related to HD. Both disorders stress the importance of negative consequences and distress caused by sexual behavior, as well as excessive preoccupation and loss of control. However, there are also factors specific to HD (using sexual behavior to cope with stress and/or negative emotions) and CSBD (continual engagement in sexual behavior despite deriving little or no pleasure) (Gola et al., 2020; Kafka, 2010; Kraus et al., 2018).

Due to different conceptualizations (e.g., hypersexual disorder, sexual addiction, compulsive sexual behavior disorder) and measures assessing problematic sexual behavior, the prevalence highly varies across studies. Previous research has shown that the prevalence of problematic sexual behavior can be between 2 and 6% (Grubbs, Hoagland, et al., 2020; Grubbs, Kraus, et al., 2020; see: Walton et al., 2017) and is believed to be much higher for men than for women. However, research has mostly concentrated on men, causing knowledge about problematic sexual behavior in women to be insufficient to draw strong conclusions (Kowalewska et al., 2020).

For example, in a sample of students ($n = 1837$), 2.0% reported symptoms meeting the criteria for compulsive sexual behavior, with men (3.0%) reporting clinically relevant levels of symptoms more frequently than women (1.2%) (Odlaug et al., 2013). Another study including a nationally representative sample ($n = 2325$) found that 8.6% of participants (women: 7.0%; men 10.3%) displayed clinically relevant compulsive sexual behavior symptoms (Dickenson et al., 2018). A recent study conducted by our research team

on a sample representative of the Polish adult population ($n = 1541$) found 4.7% (women: 6.25%; men: 3.17%) scored above the diagnostic threshold for CSBD (Lewczuk et al., 2022) on the Compulsive Sexual Behavior Disorder Scale (the CSBD-19; Bóthe, Potenza, et al., 2020; Bóthe, Tóth-Király, et al., 2020). Importantly, the scale reflects the CSBD criteria proposed in ICD-11 (World Health Organization, 2020).

Narrowing problematic sexual behavior down to PPU offers similar methodological considerations when assessing its prevalence. Self-perceived addiction to pornography use (reported as the belief in being somewhat addicted to pornography) among American adults ($N = 2075$) was reported to be at 11% for men and 3% for women (Grubbs, Kraus, et al., 2019). In a study on 3 samples validating the Brief Pornography Screen (the BPS) the prevalence of being at risk for PPU was approximated to be between 11.6 and 13.8% in all participants (Kraus et al., 2020), and between 10.1 and 20.2% for men, with rates for women being consistently lower: between 1.9 and 7.6%.

Despite the quick development of research on problematic sexual behavior in recent years, epidemiological studies are lacking, population studies are scarce, and studies regarding women are underrepresented. Thus, more representative studies are still needed to reliably assess the prevalence of problematic sexual behavior in various populations (Grubbs, Hoagland, et al., 2020; Grubbs, Kraus, et al., 2020).

Present Study

In the present study, we aimed to (1) investigate how four dimensions of sexual attitudes (Permissiveness, Birth Control, Communion, Instrumentality) relate to HD and PPU symptoms, also controlling for sex, age, religiosity and relationship status. We consider this to be the most important goal of the current work and thus prioritize it when presenting the goals of our study, as well as discussing its results.

Permissiveness was connected to risky sexual behavior in previous studies, as well as, in some cases, to a higher frequency of sexual behavior (e.g., Dempster et al., 2015; Doornwaard et al., 2015; Grubbs, Kraus, et al., 2019; Grubbs, Perry, et al., 2019; Grubbs, Wright, et al., 2019; Hendrick et al., 2006; Knapp et al., 2019). Thus, we hypothesized that it will be positively connected to problematic sexual behavior, even when accounting for other predictors, including religiosity. Next, as Instrumentality reflects the utilitarian view of sex, in which sexual activity is used predominantly as a means of achieving short-term gratification, we predicted that it will also contribute to problematic sexual behavior symptoms (e.g., van Oosten & Vandenbosch, 2020). Moreover, as Birth Control encapsulates a cautious approach to sexuality, it may relate to lower engagement in casual sexual relationships and practices (Luquis et al., 2012) and thus be a preventive

factor for problematic sexual behavior. Lastly, we expected the relationship between Communion, PPU and HD to possibly be the most complex. On one side, it may be the case that people high in Communion will be more invested in long-term sexual relationships and dyadic sexual activity in stable relationships, deriving less gratification from both solitary sexual activity and casual sexual relationships (C. Hendrick et al., 2006). By these means, Communion may be, in broad terms, negatively connected to PPU and HD. However, previous studies have shown that high Communion is often tied to religiosity, which can lead to higher perceptions of own sexual behavior as non-normative or problematic (Brelsford et al., 2011; S. S. Hendrick & Hendrick, 1987). Moreover, high Communion may link to very high, even unrealistic standards for sexual activity (e.g., propensity to see every sexual act as sublimation and a higher form of love). Previous studies have shown that this is a tendency often seen in high PPU individuals and is connected to sexual anxiety, seeing oneself as deficient, as well as high levels of shame and guilt (Hook et al., 2015; Lew-Starowicz et al., 2020; Reid et al., 2009; 2011a, b; Sniewski & Farvid, 2020). Thus, we did not form a firm prediction on the relationship between Communion, PPU and HD.

Additional Variables Included in the Analysis

Moreover, as sociodemographic factors like age and gender seem to be connected to the discussed sexual attitudes (Hendrick et al., 2006) as well as to the frequency of normative sexual behavior (e.g., Agardh et al., 2011; Wylie, 2009), and problematic sexual behavior (e.g., Boyer et al., 2000, 2017; Lewczuk et al., 2022; Studer et al., 2019), we also planned to adjust for these variables in our analysis. By doing so, we wanted to see whether or not the potential relationships between sexual attitudes and sexual behavior are encapsulated by these underlying variables. For instance, if sexual Permissiveness, as well as the severity of PPU symptoms, is connected to age, this underlying factor can be responsible for the Permissiveness–PPU relationship. Because of this, we have included gender and age as controlled variables in our analyses (see also “[Method](#)” section for more information on the analytic plan). Moreover, engagement in an intimate relationship is also related to sexual attitudes, including Permissiveness (S. S. Hendrick & Hendrick, 1987). Additionally, although sexual attitudes can be measured independent of the relationship status of the participant, some questions addressing their sexual attitudes refer to their experiences in relationships (see the description of the “[Brief Sexual Attitudes Scale in the Measures](#)” section). Thus, to make our results more reliable, we decided to also include relationship status in our models, as a controlled variable. Lastly, as most of the previous studies focusing on the relationships between attitudes and problematic sexual behavior focused

on religiosity and indicated an important role of this variable in the self-perception of negative symptoms (Grubbs, Kraus, et al., 2019; Grubbs, Perry, et al., 2019; Grubbs, Wright, et al., 2019), we wanted to control for this variable in our models. Additionally, as mentioned before, religiosity is related to sexual attitudes, e.g., Communion (Brelsford et al., 2011; S. S. Hendrick & Hendrick, 1987), and thus we deemed it important to investigate whether the potential relationships between sexual attitudes and problematic sexual behavior are unique and not encapsulated by religiosity. Moreover, as we wanted to explore which sexual attitudes and behavior manifest significant inter-gender differences (Hendrick et al., 2006), we additionally aimed to conduct our analysis for males and females separately. Previous studies have shown that men tend to show a higher level of Permissiveness and Instrumentality (S. S. Hendrick & Hendrick, 1995), while women scored higher on the Birth Control dimension (Hendrick et al., 2006).

Next, we aimed to replicate previous research on the relations between sexual attitudes and sheer frequency of sexual behavior. Previous studies have shown significant relationships between the frequency of normative sexual activity and sexual attitudes, which was discussed above (e.g., Brown et al., 2017; Shapiro et al., 2017). However, these relationships can be potentially significantly different between populations, based on culture-related as well as sociodemographic variables, and investigating them in a Polish nationally representative sample can complement previous research. Moreover, examining the relations between normative sexual activity and sexual attitudes also lets us put the results for HD and PPU in context. Specifically, it allows us to check whether sexual attitudes are connected to problematic sexual activity in the same way as to normative sexual activity, or whether relations specific to problematic sexual activity would also emerge. Moreover, as a secondary goal, we wanted to replicate the results of previous research regarding the differences in the frequency of sexual activity between men and women. Previous research assessing the frequency of sexual behavior has also been based mostly on nonrepresentative samples (Regnerus et al., 2016; Schroder et al., 2003). Recent representative research has shown that, in a representative sample of Americans, around 33% of women and 70% of men reported using pornography at least once in the last year, with 8% of women and 24% of men using pornography at least once a week (Grubbs, Kraus, et al., 2019; Grubbs, Perry, et al., 2019; Grubbs, Wright, et al., 2019). Another study based on a representative sample of Australian adults indicated an average frequency of dyadic sexual activity of 1.44 times per week (Badcock et al., 2014). Overall, regarding differences between men and women, previous research has shown that men engage more frequently in solitary sexual activity (both pornography watching and masturbation), but the differences in dyadic sexual activity are significantly

less pronounced (Regnerus et al., 2016; Træen et al., 2004; Wright, 2013). Representativeness of the sample also allowed us to investigate and discuss the prevalence of HD and PPU in the national population.

Method

Procedure and Sample

The study was conducted online via the Pollster research platform (<https://pollster.pl/>). The data were collected in May 2019 (pre-Covid-19 pandemic) from a sample of 1036 ($M_{\text{age}} = 43.28$, $SD = 14.21$) Polish citizens representative of the adult population in terms of gender, age group, education, size of the place of residence and the region of residence. Representativeness was ensured according to census norms for 2018 for gender and age groups and 2017 for the rest of the sociodemographic variables; the norms were provided by Statistics Poland (*pol.* Główny Urząd Statystyczny). The group included 528 women ($M_{\text{age}} = 42.04$, $SD = 14.28$) and 508 men ($M_{\text{age}} = 44.57$, $SD = 14.04$). 90.3% of the sample declared being exclusively or predominantly heterosexual, while 6.4% reported being predominantly or exclusively homosexual (as assessed by the Polish version of the Kinsey Sexual Orientation Scale, Wierzbna et al., 2015). 78.9% of participants declared being Catholic, 9.6%—atheist or agnostic, 3.6% declared being of other religious alignment, and 7.9% chose the “none of the above” response option.

Participants were instructed to complete a set of online measures regarding their sexuality. Materials and methods (including all measures used in the current work) for this study, sample size, data gathering method and study design were preregistered using the OSF platform and are available online: https://osf.io/qcwxa/?view_only=328495c7e1e94ea7a45000eb74f80ed4. However, we want to note that other analyses, which are not central to the current work, were the focus of the preregistration report and were described in more detail. Data used in the presented analysis are also available using the link: https://osf.io/q7586/?view_only=None. Using the data, the analysis reported here can be replicated and/or extended. Two previous works were published using the dataset (Lewczuk et al., 2020; 2021), but they do not include sexual attitudes or HD analyses.

Note on the sample: Although we devoted significant effort to assuring the representativeness of the sample, the data were provided to us by an external data provider, and at this time we cannot access the information about how many participants were invited to participate in the study but were not interested in participation, or how many participants started the study form, but did not complete it. Although the sample is representative in terms of formal sociodemographic characteristics, it is very likely skewed toward people

who are interested, willing, as well as have the opportunity to participate in psychological surveys on sexuality, such as ours. We received only complete responses from the data provider—which was in line with our agreement. After receiving the dataset, we did not exclude any additional data from the final sample.

Measures

Sexual attitudes were measured using the Polish translation of the Brief Sexual Attitudes Scale (Hendrick et al., 2006). It allows for the assessment of four dimensions reflecting different attitudes toward sexuality: Permissiveness (10 items, e.g., “It is okay to have ongoing sexual relationships with more than one person at a time”; in the current study $\alpha = 0.93$), Birth Control (3 items, e.g., “A woman should share responsibility for birth control”; $\alpha = 0.91$), Communion (5 items, e.g., “At its best, sex seems to be the merging of two souls”; $\alpha = 0.90$) and Instrumentality (5 items, e.g., “Sex is primarily the taking of pleasure from another person”; $\alpha = 0.79$). Answers were expressed using a Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Our analysis is also based on a representative sample, and the analysis presented here also includes participants who reported that they were not engaging in a particular type of sexual activity (e.g., pornography use) or were not currently engaged in an intimate or sexual relationship. The Brief Sexual Attitudes Scale is also fit to assess sexual attitudes in such groups and also contains specific instructions addressing the issue “*If you are not currently dating anyone, answer the questions with your most recent partner in mind. If you have never had a sexual relationship, answer in terms of what you think your responses would most likely be*” (Hendrick et al., 2006).

Frequency of sexual activity Participants answered questions about the frequency of four types of sexual activity in the last year: dyadic sexual intercourse, pornography use, masturbation without watching pornography and masturbation when watching pornography. Response “0” denotes that a person has not engaged in a particular activity in their lifetime. Answers between 0 and 8 denote the frequency of a particular activity (0—never in my life, 1—not once in the last year, 2—once or twice in the last year, 3—a few times in the last year, 4—once a month, 5—two or three times a month, 6—once a week, 7—a few times a week, 8—once a day or more often).

Problematic pornography use was measured using the 5-item ($\alpha = 0.88$) Brief Pornography Screen, sample item: “You continue to use porn even though you feel guilty about it” (Kraus et al., 2020). The answer scale for each item was: 0 (Never), 1 (Sometimes), and 2 (Frequently).

Hypersexual disorder. The severity of HD symptoms was measured using the Polish version of the Hypersexual Behavior Inventory (Reid, et al., 2011a; Reid, et al., 2011b). Problematic sexual activity is conceptualized in this scale

as consisting of three factors: using sexual activity as a maladaptive coping strategy (7 items, e.g., “I use sex to forget about the worries of daily life”; $\alpha = 0.92$), experiencing diminished control over sexual behavior (8 items, e.g., “My sexual behavior controls my life”; $\alpha = 0.93$) and sexual behavior bringing adverse consequences (4 items, e.g., “My sexual thoughts and fantasies distract me from accomplishing important tasks”; $\alpha = 0.87$). Participants answered on a 5-point scale from 1 (Never) to 5 (Very often). The sum of the scores obtained in all the items allows for the calculation of a general score ($\alpha = 0.96$).

Moreover, participants were asked to indicate their age, gender and relationship status. For the current analysis, their answers regarding being in a relationship were coded into two categories: 1 (single) and 2 (in a relationship, formal or informal).

Religiosity was assessed with 3 items: “I consider myself religious,” “Being religious is important to me,” and “I attend religious services regularly” (Grubbs, Kraus, et al., 2019; Grubbs, Perry, et al., 2019; Grubbs, Wright, et al., 2019). Participants chose answers ranging from 1 (strongly disagree) to 7 (strongly agree). The sum of 3 items ($\alpha = 0.94$) was calculated to assess the religiosity of respondents and was used in the current analyses.

Analytic Plan and Preliminary Analysis

In the first step, we presented the descriptive statistics (with the corresponding *U* Mann–Whitney test results, showing the differences between genders in the analyzed variables) and correlation indices. We decided to conduct nonparametric tests as (1) skewness and kurtosis indicators for some of the analyzed variables were elevated (as compared with their standard errors, see Table 1); (2) variables reflecting the frequency of sexual behavior were based on ordinal scales (see *Measures* section for the detailed description of the response categories for these variables). For gender comparisons, the *r* effect size was also reported. Following the available literature, we considered *r* values between 0.1 and 0.3 as indicative of a small effect size, between 0.3 and 0.5 as medium and above 0.5 as a large effect size (Cohen, 1988). *Regression assumptions:* Regarding regression assumptions, we inspected normality indicators (kurtosis and skewness values), which is mentioned above and reported in Table 1. We analyzed the potential outliers, based on the standardized predicted values of error (the value outside of |3.29| indicating that the potential observation can be considered an outlier; Tabachnick et al., 2007). We observed several outliers in our models for problematic sexual activity and none for normative activity (all of the case numbers corresponding to the found outliers, along with the obtained error values are given in the footnote¹). Taking the overall size and character of our representative sample, and the possibility

that the outliers indeed reflect natural variance, not aberrations in the sampling process, we decided not to remove them from our analysis. In the next step, variance inflation factor was analyzed, with values below 5 indicating an acceptable level of multicollinearity (Becker et al., 2015). All tested predictors within our models—for the whole sample, as well as for men and women considered separately—met this assumption. Upon inspection, the scatterplots of standardized residuals showed that the assumptions of homogeneity of error variance were not met for our models. Due to these issues, we decided to conduct a linear regression with robust standard errors, using the recommended heteroscedasticity-consistent estimator (HC4m, Cribari-Neto & da Silva, 2011; see also: Cribari-Neto et al., 2007; Hayes & Cai, 2007; Long & Ervin, 2000). P-values for the inspected effects, as well as 95% confidence intervals presented in the current work, were adjusted accordingly. Lastly, in agreement with the regression assumptions, we also observed nonzero variances for all variables constituting our models, in all analyzed subgroups (gender was naturally not analyzed as a predictor in the models in which men and women were considered separately). All the preliminary analyses described here can be investigated based on our open dataset [DATASET LINK]. In the next step, we conducted hierarchical regression analyses. Six models were created, in which the predicted variables were: (1) frequency of watching pornography, (2) frequency of masturbation when watching porn, (3) and without watching porn, (4) frequency of sexual intercourse, as well as the severity of (5) PPU and (6) HD symptoms. The basic 2-step design of the analysis and independent variables were consistent throughout the models. Age, gender, relationship status and religiosity were introduced in the first step as the controlled variables. Sexual Attitudes (Permissiveness, Birth Control, Communion, Instrumentality) were introduced in the second step as the main predictors of interest.

A statistical analysis was conducted using the R statistical environment (R Core Team, 2021) including the standard “Stats” package (ver. 3.6.2) as well as “Parameters” (ver. 0.17.0; Lüdecke et al., 2020) package, which was used for the estimation of robust standard errors.

¹ Model predicting HD severity: case number: 299 [standardized predicted error value: 4.18], 628 [3.93], 241 [3.83]; model predicted PPU severity: 963 [4.28], 28 [4.13], 187 [4.10], 761 [4.02], 83 [4.00], 363 [3.85], 97 [3.71], 686 [3.63], 993 [3.59], 824 [3.57], 32 [3.37]. Case numbers correspond to our open dataset, and the standardized error values were also included in the dataset [Blinded link]. Values given here are derived from models based on all participants.

Table 1 Descriptive statistics and gender comparisons (using the Mann–Whitney U test as indicated by the standardized test statistics Z) for analyzed variables along with corresponding effect sizes (r)

	All			Men			Women			Z	r			
	M (SD)	Mdn	Skewness (SE = .08)	Kurtosis (SE = .15)	M (SD)	Mdn	Skewness (SE = .11)	Kurtosis (SE = .22)	M (SD)			Mdn	Skewness (SE = .11)	Kurtosis (SE = .21)
	BSAS Permissiveness	2.50 (1.00)	2.60	.15	-.73	2.87 (0.96)	3.00	-.20	-.39			2.15 (0.90)	2.10	.48
BSAS Birth Control	3.89 (1.04)	4.00	-1.06	.79	3.91 (0.97)	4.00	-1.02	.95	3.88 (1.10)	4.00	-1.07	.60	-.42	
BSAS Communion	4.10 (0.85)	4.20	-1.44	2.49	4.09 (0.79)	4.20	-1.24	2.08	4.11 (0.90)	4.20	-1.57	2.65	-1.62	
BSAS Instrumentality	3.16 (0.84)	3.20	-.21	.20	3.09 (0.80)	3.00	-.04	.11	3.22 (0.87)	3.20	-.37	.33	-3.02*	
Frequency of watching pornography	3.13 (2.45)	3.00	.40	-1.12	4.18 (2.31)	4.00	-.09	-1.18	2.12 (2.15)	1.00	1.04	.12	13.90**	
Frequency of masturbation without watching pornography	2.14 (2.29)	1.00	.94	-.30	2.70 (2.43)	2.00	.60	-.93	1.60 (2.01)	1.00	1.33	.92	8.11**	
Frequency of masturbation when watching pornography	2.26 (2.50)	1.00	.83	-.73	3.14 (2.64)	3.00	.29	-1.39	1.41 (2.04)	1.00	1.55	1.43	11.45**	
Frequency of sexual intercourse	4.95 (2.32)	6.00	-.85	-.50	4.96 (2.30)	6.00	-.87	-.43	4.94 (2.34)	6.00	-.83	-.56	-.07	
HD symptoms (HBI General Score)	30.97 (13.66)	26.00	1.38	1.50	33.51 (13.83)	30.00	1.05	.72	28.53 (13.05)	23.00	1.84	3.13	7.46**	
PPU symptoms (BPS General Score)	1.43 (2.24)	.00	1.68	2.29	2.10 (2.45)	1.00	1.14	.73	.79 (1.81)	.00	2.69	7.20	11.24**	
Religiosity	11.42 (5.51)	12.00	-.08	-1.04	10.92 (5.56)	12.00	-.02	-1.11	11.91 (5.43)	12.00	-.13	-.96	-2.83*	

BSAS Brief Sexual Attitudes Scale, HD Hypersexual disorder, HBI Hypersexual Behavior Inventory, PPU Problematic Pornography Use, BPS Brief Pornography Screen; Frequency of ... (0=never in my life, 1=not once in the last year, 2=once or twice in the last year, 3=a few times in the last year, 4=once a month, 5=two or three times a month, 6=once a week, 7=a few times a week, 8=once a day or more often)

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

Results

Descriptive Statistics, Gender Comparisons and Correlations

Descriptive Statistics and Gender Comparisons

Table 1 shows descriptive statistics with the corresponding comparisons between men and women. Conducted analyses yielded significant gender differences in sexual attitudes, frequency of sexual activity, as well as problematic sexual behavior (Table 1). Men displayed more permissive attitudes toward sexual functioning ($Z = 11.93$, $p < 0.001$, medium effect size: $r = 0.36$), but viewed sexual activity less instrumentally than women ($Z = -3.02$, $p < 0.05$, small effect size: $r = 0.08$). There were no significant differences for the Birth Control ($Z = -0.42$, $p = 0.672$) and Communion ($Z = -1.62$, $p = 0.106$) subscales. Moreover, men reported engagement in solitary sexual activity: watching pornography ($Z = 13.90$, $p < 0.001$, medium effect size: $r = 0.42$), as well as masturbation with pornography watching ($Z = -11.45$, $p < 0.001$, medium effect size: $r = 0.34$) and without watching pornography ($Z = 8.11$, $p < 0.001$, small effect size: $r = 0.24$) more frequently than women. No differences were found for dyadic sexual activity (sexual intercourse) ($Z = -0.07$, $p = 0.947$). When it comes to problematic sexual behavior, men reported a higher severity of HD symptoms as measured by the HBI ($Z = 7.46$, $p < 0.001$, small effect size: $r = 0.18$) and severity of PPU as measured by the BPS ($Z = 11.24$, $p < 0.001$, small effect size: $r = 0.29$). On the other hand, women reported higher religiosity than men ($Z = -2.83$, $p < 0.05$, small effect size: $r = 0.09$) (Table 1).

Correlations

Table 2 presents correlation indices between the analyzed variables, both in the whole sample, as well as for men and women separately. The results show that Permissiveness was significantly moderately related to HD ($r = 0.34$; $p < 0.001$), PPU ($r = 0.29$; $p < 0.001$) and frequency of solitary (pornography watching: $r = 0.45$; $p < 0.001$; masturbation: $r = 0.33$; $p < 0.001$; masturbation with pornography watching: $r = 0.41$; $p < 0.001$), but not dyadic sexual activity ($r = -0.04$; $p = 0.228$) in the whole sample. The Birth Control subscale, reflecting responsible attitudes toward contraception, was positively and weakly related to the frequency of pornography use ($r = 0.14$, $p < 0.001$), masturbation ($r = 0.13$, $p < 0.001$) and pornography watching with masturbation ($r = 0.16$, $p < 0.001$). For Communion, we found weak correlations across the board, with no significant relationships in the whole sample. Instrumentality was positively, although weakly related to the frequency of solitary sexual

activity: pornography watching ($r = 0.11$, $p < 0.001$), masturbation ($r = 0.08$, $p < 0.001$), masturbation when watching pornography ($r = 0.11$, $p < 0.001$), as well as HD ($r = 0.15$, $p < 0.001$) and PPU ($r = 0.12$, $p < 0.001$) (see Table 2). For brevity, above we have only described the most important correlations (between sexual attitudes and sexual behavior indices) obtained in the whole sample—other correlations, including the results for men and women considered separately, are presented in Table 2.

Prevalence

Based on the diagnostic cutoff score for the HBI (≥ 53) (Reid, Garos, et al., 2011; Reid, Stein, et al., 2011), 10.0% of participants ($n = 104$ out of $n = 1036$) could be classified as at high risk for HD. The number of men at risk for HD was higher (11.4%; $n = 58$ out of $n = 508$) than the number of women at risk of experiencing HD (8.7%; $n = 48$ out of $n = 528$). Based on the cutoff score derived for the BPS (Kraus et al., 2020), the prevalence of being at risk for PPU in the Polish population could be estimated at 17.8% ($n = 184$ out of $n = 1036$ study participants). Potential PPU was also more prevalent among men (26.8%; $n = 136$ out of $n = 508$ male participants) than women (9.1%; $n = 48$ out of $n = 528$ female participants).

Sexual Attitudes Predicting Frequency of Sexual Activity

Next, in line with our study aims, we conducted a hierarchical regression analysis in which controlled variables: gender, age, relationship status and religiosity (introduced in Step 1) and sexual attitudes: Permissiveness, Birth Control, Communion and Instrumentality (introduced in Step 2), predicted the frequency of sexual activity (Table 3). Results obtained for the model in Step 1 showed that the male gender was a positive predictor of the frequency of solitary (pornography watching: $\beta = 0.42$, $p < 0.001$; masturbation: $\beta = 0.23$, $p < 0.001$; masturbation when watching porn: $\beta = 0.34$, $p < 0.001$) and dyadic sexual activity ($\beta = 0.06$, $p < 0.05$). Age was negatively related to solitary sexual activity, both among men (pornography watching: $\beta = -0.23$, $p < 0.001$; masturbation: $\beta = -0.21$, $p = 0.003$; masturbation when watching porn: $\beta = -0.31$, $p < 0.001$) and women (pornography watching: $\beta = -0.21$, $p < 0.001$; masturbation: $\beta = -0.12$, $p < 0.05$; masturbation when watching porn: $\beta = -0.21$, $p < 0.001$). Regarding dyadic sexual activity, age was a negative predictor of the frequency of sexual intercourse for women ($\beta = -0.27$, $p < 0.001$), but not for men ($\beta = 0.02$, $p = 0.704$). Reporting being in an intimate relationship was a negative predictor of masturbation with ($\beta = -0.15$, $p < 0.05$) and without pornography use among men ($\beta = -0.23$, $p < 0.001$) and a positive predictor of dyadic sexual activity for both genders

Table 2 Correlation Indices (Pearson’s r) Estimating the Strengths of Relationships Between Variables

	1	2	3	4	5	6	7	8	9	10	11	12
1. BSAS Permissiveness	–											
2. BSAS birth control												
All	.31**											
Men	.38**	–										
Women	.29**											
3. BSAS communion												
All	.07*	.55**										
Men	.13**	.49**	–									
Women	.03	.58**										
4. BSAS instrumentality												
All	.26**	.24**	.36**									
Men	.35**	.16**	.20**	–								
Women	.29**	.31**	.48**									
5. Frequency of watching pornography												
All	.45**	.14**	.01	.11**								
Men	.36**	.19**	.02	.16**	–							
Women	.34**	.11*	.01	.15**								
6. Frequency of masturbation without watching pornography												
All	.33**	.13**	.01	.08**	.59**							
Men	.22**	.10*	–.03	.10*	.50**	–						
Women	.33**	.17**	.06	.11*	.64**							
7. Frequency of masturbation when watching pornography												
All	.41**	.16**	.00	.11**	.78**	.73**						
Men	.30**	.17**	–.01	.16**	.74**	.69**	–					
Women	.36**	.16**	.03	.13**	.76	.75**						
8. Frequency of sexual intercourse												
All	–.04	–.05	.03	.05	.13**	–.03	.02					
Men	–.07	–.11*	–.01	–.03	.08	–.09	–.07	–				
Women	–.01	.00	.07	.11*	.21**	.04	.13**					
9. HD symptoms (HBI General Score)												
All	.34**	.01	–.04	.15**	.36**	.34**	.35**	.08*				
Men	.25**	.06	.03	.21**	.24**	.33**	.30**	–.03	–			
Women	.36**	–.04	–.11*	.12**	.39**	.30**	.33**	.18**				
10. PPU symptoms (BPS General Score)												
All	.29**	.05	.03	.12**	.47**	.36**	.49**	.00	.61**			
Men	.20**	.08	.09*	.19**	.39**	.30**	.41**	–.09*	.63**	–		
Women	.22**	.02	–.02	.10*	.42**	.34**	.46**	.12**	.57**			
11. Religiosity												
All	–.33**	–.24**	.04	–.03	–.25**	–.21**	–.24**	–.01	.02	.06*		
Men	–.29**	–.23**	.09*	.01	–.17**	–.07	–.15**	.04	.11*	.18**	–	
Women	–.34**	–.24**	.00	–.09*	–.31**	–.34**	–.32**	–.06	–.03	–.02		
12. Age												
All	.03	.01	.14**	–.04	–.18**	–.17**	–.24**	–.12**	–.17**	–.14**	.04	
Men	–.06	–.02	.18	–.12	–.26**	–.26**	–.35**	.10*	–.17**	–.20**	.08	–
Women	.04	.03	.11*	.04	–.22**	–.13*	–.22**	–.33**	–.21**	–.14**	.02	

BSAS Brief Sexual Attitudes Scale, HD Hypersexual Disorder, HBI Hypersexual Behavior Inventory, PPU Problematic Pornography Use, BPS Brief Pornography Screen

* $p < .05$. ** $p < .001$

Table 3 Results of multivariable linear regression analysis predicting the frequency of sexual behavior in the whole sample, as well as for men and women separately (with 95% robust confidence intervals)

	All						Men						Women					
	Step 1		Step 2		Step 1		Step 2		Step 1		Step 2		Step 1		Step 2			
	β	[95% CI]	p	β	[95% CI]	p	β	[95% CI]	p	β	[95% CI]	p	β	[95% CI]	p			
Frequency of watching pornography																		
Gender	.42	[.36, .47]	<.001	.33	[.27, .38]	<.001	-.23	[-.32, -.14]	<.001	-.23	[-.32, -.14]	<.001	-.21	[-.28, -.13]	<.001	-.22	[-.29, -.15]	
Age	-.21	[-.26, -.15]	<.001	-.21	[-.26, -.16]	<.001	-.08	[-.17, .01]	.454	-.04	[-.13, .05]	.360	.05	[-.03, .13]	.229	.09	[.02, .17]	
Relationship status	-.02	[-.08, .03]	.436	.02	[-.03, .07]	.436	-.15	[-.23, -.06]	<.001	-.05	[-.14, .03]	.230	-.31	[-.38, -.23]	<.001	-.21	[-.30, -.13]	
Religiosity	-.21	[-.26, -.15]	<.001	-.12	[-.18, -.07]	<.001	-.15	[-.23, -.06]	<.001	-.01	[-.14, .03]	.230	-.31	[-.38, -.23]	<.001	-.21	[-.30, -.13]	
BSAS Permissiveness				.29	[.22, .35]	<.001				.30	[.21, .38]	<.001				.29	[.19, .40]	
BSAS Birth Control				.00	[-.06, .06]	.991				.05	[-.06, .15]	.360				-.05	[-.14, .05]	
BSAS Communion				.01	[-.05, .08]	.671				.01	[-.10, .11]	.889				.02	[-.08, .13]	
BSAS Instrumentality				.04	[-.02, .09]	.197				.02	[-.07, .10]	.723				.05	[-.04, .14]	
F	93.24	(<.001)		65.23	(<.001)		18.06	(<.001)		16.95	(<.001)		29.05	(<.001)		21.24	(<.001)	
R^2_{adj}	.263			.332			.092			.180		.138				.212		
R^2 change	F(4,1027) = 27.59, p < .001			F(4,500) = 14.64, p < .001			F(4,500) = 13.31, p < .001			F(4,520) = 10.01, p < .001								
Frequency of masturbation without watching pornography																		
Gender	.23	[.17, .29]	<.001	.16	[.10, .22]	<.001	-.21	[-.30, -.12]	<.001	-.21	[-.30, -.12]	<.001	-.12	[-.20, -.04]	<.001	-.14	[-.21, -.06]	
Age	-.18	[-.23, -.12]	<.001	-.18	[-.24, -.13]	<.001	-.03	[-.12, .05]	.427	-.02	[-.07, .11]	.668	-.34	[-.42, -.25]	<.001	-.25	[-.34, -.15]	
Relationship status	-.14	[-.20, -.08]	<.001	-.11	[-.17, -.04]	<.001	-.23	[-.32, -.13]	<.001	-.20	[-.30, -.11]	<.001	-.02	[-.10, .06]	.694	.03	[-.06, .11]	
Religiosity	-.17	[-.23, -.11]	<.001	-.11	[-.17, -.04]	<.001	-.03	[-.12, .05]	.427	.02	[-.07, .11]	.668	-.34	[-.42, -.25]	<.001	-.25	[-.34, -.15]	
BSAS Permissiveness				.21	[.14, .29]	<.001				.18	[.08, .28]	<.001				.26	[.16, .37]	
BSAS Birth Control				.01	[-.06, .09]	.711				.02	[-.10, .13]	.790				.01	[-.09, .10]	
BSAS Communion				.03	[-.05, .11]	.440				.00	[-.11, .12]	.939				.08	[-.03, .19]	
BSAS Instrumentality				.01	[-.05, .07]	.801				-.01	[-.11, .08]	.772				-.03	[-.12, .06]	
F	43.21	(<.001)		28.94	(<.001)		22.27	(<.001)		12.34	(<.001)		25.87	(<.001)		17.57	(<.001)	
R^2_{adj}	.140			.178			.112			.135		.124				.180		
R^2 change	F(4,1027) = 12.71, p < .001			F(4,500) = 4.44, p = 0.002			F(4,500) = 10.01, p < .001			F(4,520) = 10.01, p < .001								

Table 3 (continued)

	All						Men						Women					
	Step 1		Step 2		Step 1		Step 2		Step 1		Step 2		Step 1		Step 2			
	β	[95% CI]	p	β	[95% CI]	p	β	[95% CI]	p	β	[95% CI]	p	β	[95% CI]	p	β	[95% CI]	p
Frequency of masturbation when watching pornography																		
Gender	.34	[.29, .40]	<.001	.26	[.21, .32]	<.001	—	—	—	—	—	—	—	—	—	—	—	—
Age	-.26	[-.31, -.20]	<.001	-.26	[-.31, -.21]	<.001	-.31	[-.40, -.22]	<.001	-.31	[-.39, -.22]	<.001	-.21	[-.28, -.13]	<.001	-.22	[-.29, -.15]	<.001
Relationship status	-.09	[-.15, -.04]	.002	-.05	[-.11, .00]	.069	-.15	[-.24, -.06]	.001	-.12	[-.21, -.03]	.011	.01	[-.07, .08]	.928	.06	[-.02, .13]	.130
Religiosity	-.19	[-.25, -.14]	<.001	-.11	[-.17, -.05]	<.001	-.11	[-.20, -.02]	.012	-.04	[-.12, .05]	.410	-.32	[-.40, -.24]	<.001	-.21	[-.30, -.13]	<.001
BSAS Permissiveness			<.001	.25	[.18, .32]	<.001	—	—	—	.22	[.13, .32]	<.001	—	—	—	.30	[.19, .40]	<.001
BSAS Birth Control			.245	.04	[-.03, .10]	.245	—	—	—	.06	[-.04, .16]	.268	—	—	—	.02	[-.07, .12]	.668
BSAS Communion			.994	.00	[-.07, .07]	.994	—	—	—	.00	[-.10, .10]	.975	—	—	—	.01	[-.10, .13]	.792
BSAS Instrumentality			.233	.04	[-.02, .09]	.233	—	—	—	.02	[-.07, .11]	.647	—	—	—	.02	[-.07, .10]	.664
<i>F</i>	80.45	(<.001)		54.60	(<.001)		31.45	(<.001)		19.77	(<.001)		30.52	(<.001)		22.31	(<.001)	
<i>R</i> ² _{adj}	.235		.293		.153		.206		.144		.221							
<i>R</i> ² change	F(4,1027)=22.15, <i>p</i> <.001			F(4,500)=9.43, <i>p</i> <.001			F(4,520)=13.90, <i>p</i> <.001											
All																		
Frequency of sexual intercourse																		
Gender	.06	[.01, .11]	.019	.05	[-.01, .11]	.079	—	—	—	—	—	—	—	—	—	—	—	—
Age	-.14	[-.20, -.08]	<.001	-.14	[-.20, -.08]	<.001	.02	[-.07, .10]	.704	.03	[-.06, .12]	.554	-.27	[-.34, -.19]	<.001	-.28	[-.35, -.20]	<.001
Relationship status	.52	[.46, .58]	<.001	.52	[.46, .59]	<.001	.46	[.37, .56]	<.001	.47	[.37, .56]	<.001	.53	[.45, .62]	<.001	.54	[.45, .62]	<.001
Religiosity	-.04	[-.09, .02]	.180	-.04	[-.09, .02]	.188	.00	[-.08, .08]	.948	-.01	[-.09, .07]	.831	-.08	[-.15, -.01]	.024	-.06	[-.13, .02]	.132
BSAS Permissiveness			.197	.04	[-.02, .11]	.197	—	—	—	.02	[-.08, .12]	.695	—	—	—	.09	[.01, .17]	.025
BSAS Birth Control			.083	-.06	[-.14, .01]	.083	—	—	—	-.08	[-.19, .03]	.137	—	—	—	-.05	[-.15, .05]	.300
BSAS Communion			.490	.03	[-.05, .10]	.490	—	—	—	-.03	[-.13, .07]	.531	—	—	—	.07	[-.03, .17]	.178
BSAS Instrumentality			.103	.05	[-.01, .11]	.103	—	—	—	.04	[-.05, .13]	.368	—	—	—	.05	[-.04, .13]	.264
<i>F</i>	101.00	(<.001)		51.87	(<.001)		46.59	(<.001)		20.93	(<.001)		112.00	(<.001)		50.69	(<.001)	
<i>R</i> ² _{adj}	.279		.282		.213		.216		.387		.398							
<i>R</i> ² change	F(4,1027)=2.25, <i>p</i> =0.062			F(4,500)=1.54, <i>p</i> =0.190			F(4,520)=3.24, <i>p</i> =0.012											

Bold values indicate statistically significant effects (*p*<.05)

BSAS Brief Sexual Attitudes Scale

Gender (0—woman, 1—man); relationship status (0—not in a relationship; 1—in a relationship)

(men: $\beta = 0.46$, $p < 0.001$; women: $\beta = 0.53$, $p < 0.001$). Lastly, higher religiosity was a negative predictor of solitary (pornography watching: $\beta = -0.31$, $p < 0.001$; masturbation without watching pornography: $\beta = -0.34$, $p < 0.001$; masturbation when watching pornography: $\beta = -0.32$, $p < 0.001$) as well as dyadic sexual activity ($\beta = -0.08$, $p < 0.05$) among women. For men, the relationships between religiosity and watching pornography ($\beta = -0.15$, $p < 0.05$) and masturbation when watching pornography ($\beta = -0.11$, $p < 0.05$) were also negative and significant, although weak in strength.

In Step 2, after four dimensions reflecting sexual attitudes were introduced to the model, men and women who displayed more permissive attitudes toward sexual activity more frequently engaged in watching pornography (men: $\beta = 0.30$, $p < 0.001$; women: $\beta = 0.29$, $p < 0.001$) as well as masturbation with pornography use (men: $\beta = 0.22$, $p < 0.001$; women: $\beta = 0.30$, $p < 0.001$). Higher permissiveness was predictive of a greater frequency of masturbation without pornography use for both genders (men: $\beta = 0.18$, $p < 0.001$; women: $\beta = 0.26$, $p < 0.001$), while it was predictive of a higher frequency of sexual intercourse only among women ($\beta = 0.09$, $p < 0.05$) but not among men ($\beta = 0.02$, $p = 0.695$). When the controlled variables were adjusted for, there were no significant relationships between Birth Control, Communion or Instrumentality and the frequency of any type of sexual activity among men or women. Moreover, after introducing sexual attitudes into the model, the relationship between certain kinds of solitary sexual activity and religiosity became nonsignificant in the group of men (pornography watching: $\beta = -0.05$, $p = 0.230$; masturbation when watching pornography: $\beta = -0.04$, $p = 0.410$). Similarly, the relationship between religiosity and dyadic sexual activity ($\beta = -0.06$, $p = 0.132$) lost significance for women. On the other hand, the relationship between staying in an intimate relationship and the frequency of watching pornography gained significance for women in Step 2 ($\beta = 0.09$; $p < 0.05$) (Table 3).

Moreover, a comparison of the standardized regression indices (using the 95% robust CI) between genders showed a stronger negative predictive power of relationship status for the frequency of masturbation when watching pornography for men ($\beta = -0.12$ [$-0.21, -0.03$], $p < 0.05$) than for women ($\beta = 0.06$ [$-0.02, 0.13$], $p = 0.130$). The same trend was observed for relationship status predicting the frequency of masturbation without pornography watching (men: $\beta = -0.20$ [$-0.30, -0.11$], $p < 0.001$; women: $\beta = 0.03$ [$-0.06, 0.11$], $p = 0.507$). No significant differences between genders in the strength of the relations between sexual attitudes and the frequency of sexual behavior emerged.

The change in the amount of explained variance (R^2 change) between Step 1 and Step 2 of our models was significant for all models (pornography use, masturbation with and without pornography use) except for the model predicting the frequency of dyadic sexual activity (see Table 3).

Sexual Attitudes Predicting Problematic Sexual Behavior

In the next step, we conducted a corresponding hierarchical regression analysis, in which severity of HD and PPU was the predicted variables, while age, gender, religiosity and relationship status (Step 1), as well as sexual attitudes (Step 2), were placed as the predictors (Table 4). In Step 1, the male gender was a positive predictor of both HD ($\beta = 0.20$, $p < 0.001$) and PPU ($\beta = 0.31$, $p < 0.001$) symptoms. Age was negatively related to both HD ($\beta = -0.19$, $p < 0.05$) and PPU ($\beta = -0.17$, $p < 0.001$) in the whole sample, as well as in men (HD: $\beta = -0.17$, $p < 0.001$; PPU: $\beta = -0.21$, $p < 0.001$) and women (HD: $\beta = -0.20$, $p < 0.001$; PPU: $\beta = -0.13$, $p < 0.05$) separately. Religiosity was positively related to HD ($\beta = 0.12$, $p < 0.05$) and PPU ($\beta = 0.20$, $p < 0.001$) among men. Relationship status did not predict HD ($\beta = 0.01$, $p = 0.621$) or PPU ($\beta = -0.02$, $p = 0.564$) symptoms significantly.

After introducing sexual attitudes to the model, results showed that both men and women who displayed more HD symptoms scored higher on the Permissiveness dimension (men: $\beta = 0.26$; $p < 0.001$, women: $\beta = 0.44$; $p < 0.001$). Birth Control was a negative predictor of HD in the group of women ($\beta = -0.11$; $p < 0.05$), but not men ($\beta = -0.01$; $p = 0.825$). In contrast, Instrumentality significantly predicted higher HD symptom severity among men ($\beta = 0.11$; $p < 0.05$), but not women ($\beta = 0.08$; $p = 0.094$). Regarding the PPU, men ($\beta = 0.22$; $p < 0.001$) and women ($\beta = 0.26$; $p < 0.001$) who were characterized by more permissive attitudes displayed higher severity of symptoms (Table 4). Moreover, the relationship between religiosity and HD symptoms among women gained significance after introducing additional predictors in the second step ($\beta = 0.10$; $p < 0.05$). Interestingly, positive relationships between being in a relationship on one side, and HD ($\beta = 0.14$; $p < 0.001$) and PPU ($\beta = 0.09$; $p < 0.05$) on the other, also gained significance in the group of women.

Additionally, a comparison of the standardized regression indices (95% robust CI) between genders showed that religiosity was a stronger predictor of PPU for men ($\beta = 0.26$ [$0.17, 0.35$], $p < 0.001$) than women ($\beta = 0.06$ [$-0.04, 0.15$], $p = 0.198$). No significant differences between genders in the strength of relationships between sexual attitudes and problematic sexual behavior emerged.

The change in the amount of explained variance R^2 change between Step 1 and Step 2 of the analyzed models was significant both for models predicting HD and PPU (see Table 4).

Discussion

The main goal of the present study was to investigate whether and how attitudes toward sexuality (the dimensions of Permissiveness, Birth Control, Communion and Instrumentality)

Table 4 Results of multivariable linear regression analysis predicting Hypersexual Disorder and Problematic Pornography Use symptoms in the whole sample, as well as for men and women separately (with 95% robust confidence intervals)

	All						Men						Women					
	Step 1		Step 2		Step 1		Step 2		Step 1		Step 2		Step 1		Step 2			
	β	95% CI	p	β	95% CI	p	β	95% CI	p	β	95% CI	p	β	95% CI	p			
HBI General Score																		
Gender	.20	[.15, .26]	<.001	.09	[.02, .15]	.007	-.07	[-.14, .01]	.070	-.01	[-.12, .10]	.825	-.11	[-.21, -.02]	.022			
Age	-.19	[-.25, -.13]	<.001	-.18	[-.24, -.13]	<.001	-.17	[-.26, -.09]	<.001	-.16	[-.25, -.07]	<.001	-.20	[-.29, -.12]	<.001			
Relationship status	.01	[-.04, .07]	.621	.07	[.02, .13]	.002	-.03	[-.12, .05]	.446	.01	[-.08, .09]	.855	.07	[-.01, .14]	.098			
Religiosity	.05	[-.01, .10]	.119	.14	[.08, .20]	<.001	.12	[.04, .21]	.005	.19	[.10, .28]	<.001	-.03	[-.11, .05]	.435			
BSAS Permissiveness				.37	[.30, .45]	<.001				.26	[.16, .35]	<.001						
BSAS Birth Control				-.07	[-.14, .01]	.070				-.01	[-.12, .10]	.825						
BSAS Communion				-.05	[-.12, .03]	.214				-.01	[-.11, .10]	.935						
BSAS Instrumentality				.09	[.02, .16]	.008				.11	[.01, .21]	.032						
F	19.53	(<.001)		30.61	(<.001)		7.85	(<.001)		10.90	(<.001)		8.94	(<.001)				
R^2_{adj}	.067			.186			.039			.120			.043					
R^2_{change}	F(4,1027)=38.82, p<.001			F(4,1027)=12.65, p<.001			F(4,500)=12.65, p<.001			F(4,520)=31.56, p<.001			F(4,520)=31.56, p<.001					
BPS General Score																		
Gender	.31	[.26, .37]	<.001	.24	[.18, .30]	<.001	-.07	[-.14, .01]	.070	-.01	[-.12, .10]	.825	-.11	[-.21, -.02]	.022			
Age	-.17	[-.23, -.11]	<.001	-.17	[-.23, -.12]	<.001	-.21	[-.30, -.13]	<.001	-.21	[-.30, -.13]	<.001	-.13	[-.22, -.05]	.002			
Relationship status	-.02	[-.07, .04]	.564	.02	[-.04, .08]	.483	-.05	[-.14, .04]	.250	-.02	[-.11, .06]	.635	.05	[-.02, .12]	.170			
Religiosity	.10	[.04, .16]	.001	.17	[.11, .23]	<.001	.20	[.11, .29]	<.001	.26	[.17, .35]	<.001	-.02	[-.11, .06]	.577			
BSAS Permissiveness				.25	[.18, .33]	<.001				.22	[.12, .32]	<.001						
BSAS Birth Control				-.01	[-.09, .06]	.692				.01	[-.09, .12]	.800						
BSAS Communion				.02	[-.05, .09]	.579				.06	[-.04, .16]	.231						
BSAS Instrumentality				.07	[.00, .13]	.041				.07	[-.02, .16]	.117						
F	35.82	(<.001)		28.93	(<.001)		15.31	(<.001)		13.15	(<.001)		3.86	(<.05)				
R^2_{adj}	.119			.178			.078			.144			.016					
R^2_{change}	F(4,1027)=19.47, p<.001			F(4,1027)=10.65, p<.001			F(4,500)=10.65, p<.001			F(4,520)=9.32, p<.001			F(4,520)=9.32, p<.001					

Bold values indicate statistically significant effects ($p < .05$)

BSAS Brief Sexual Attitudes Scale, HBI/Hypersexual Behavior Inventory, BPS Brief Pornography Screen, gender (0—woman, 1—man); relationship status (0—not in a relationship; 1—in a relationship)

can predict problematic sexual behavior (severity of HD and PPU symptoms). As previous studies focused on the connection of religiosity to problematic sexual behavior (Efrati, 2019; Grubbs et al., 2020; 2019, 2020; Grubbs et al., 2019; Grubbs et al., 2019; Mestre-Bach et al., 2021), in the current work we also adjusted for this variable, to investigate whether the contribution of sexual attitudes to HD and PPU symptom severity is indeed unique and not captured by underlying religious beliefs. To ensure that the depicted associations are reliable, age, gender and relationship status were also accounted for. Other aims included showing the relations between sexual attitudes and sheer frequency of sexual behavior, as well as verifying the differences between men and women in sexual attitudes, frequency of sexual behavior as well as the prevalence of HD and PPU and their symptoms' severity in a nationally representative sample.

Sexual Attitudes Predicting Problematic Sexual Behavior

Broadly, our results pointed to a significant contribution of sexual attitudes (predominantly Permissiveness) to problematic sexual behavior symptoms, which was not encapsulated by the previously studied predictive power of religious beliefs (Grubbs et al., 2020; Grubbs et al., 2019, 2020; Grubbs et al., 2019; Grubbs et al., 2019). As attitudes can shape decisions to seek treatment for problematic sexual behavior, our research provided evidence that other attitude-related variables are worth studying within the context of problematic sexual behavior.

In more detail, our results showed that participants who displayed a more unrestricted, permissive attitude toward sexuality also experienced higher severity of both HD and PPU symptoms, when other important predictors were adjusted for. This was true for the whole sample as well as for both genders analyzed separately. Permissiveness was the strongest and most consistent positive predictor of HD and PPU out of the four analyzed sexual attitude dimensions. Moreover, permissiveness was the only sexual attitude dimension that was significantly and positively related to the frequency of sexual behavior among men and women. The abovementioned results are in line with previous findings showing that permissiveness can be connected to a higher willingness to engage in sexual activities, including casual and risky sexual activities (Leonhardt & Willoughby, 2018; Wright & Vangeel, 2019), which can potentially contribute to the development of problematic sexual behavior symptoms.

Previous studies have shown that more sexually conservative individuals who disapprove of certain forms of sexual expression may decide to seek treatment, feel significant guilt regarding their sexual behavior and self-label as a pornography or sex addict even when not displaying dysregulated sexual behavior and not fulfilling objective criteria for

diagnostic entities like CSBD (Grubbs et al., 2020; Grubbs, Kraus, et al., 2019, 2020; Grubbs et al., 2019; Grubbs et al., 2019; Lewczuk et al., 2017, 2020). It is at least worth wondering whether, on the other side, highly permissive individuals can potentially be at risk of delaying, ignoring or neglecting the need to seek treatment when the criteria of harm, preoccupation, negative consequences and lack of control over sexual behavior are met (WHO, 2020). Further research is needed to answer this question. Such research should aim to deliver scientific conclusions about a broader scope of personal attitudes as well as their associations with problematic sexual activity, and not only single-mindedly focusing on religiosity and morality-related attitudes.

What is more, Birth Control, an attitude associated with safe and responsible sexual practices turned out to be a negative, protective factor for HD symptoms, but only for women. No such relationship for PPU emerged. This is not surprising as (a) women tend to be more concerned about contraception than men (Hendrick et al., 2006) and (b) contraception is directly relevant for dyadic sexual behavior, but not for pornography use. Thus, the relationship between birth control and HD should indeed be stronger than the same relation between birth control and PPU.

Moreover, men who treated sexuality more instrumentally were also characterized by more severe HD symptoms. This result is consistent with previous works proposing that instrumentality, characterized by the self-focused and physiological view of sex, may lead to greater and possibly problematic involvement in sexual activity in an attempt to increase one's pleasure (Brown et al., 2017). Differences between men and women in this relationship require further investigation (see also section below). However, they may stem from the fact that men are more prone to developing HD (the results of the current study also provided supporting evidence for this trend), and due to this, the potential contribution of sexual instrumentality to these symptoms falls on more fertile ground among men than women.

Inter-gender Differences in Sexual Attitudes

In line with previous research, men displayed more permissive attitudes toward sexual activity than women (Hendrick et al., 2006). There were no significant differences between men and women for Communion and Birth Control dimensions. Surprisingly, in contrast to existing research (Hendrick et al., 2006; S. S. Hendrick & Hendrick, 1995), in our study women reported treating sex more instrumentally than men. This result might be evidence of the changes in the sexual double standard which "implies that male and female sexual behaviors should be judged by different standards, such as the belief that casual sex is acceptable for men but not for women" (Petersen & Hyde, 2010, p. 26). This explains traditionally less permissive attitudes among women, as well as

a restrictive influence on their decision making in this field of life (Klein et al., 2019). In recent years sexual scripts have undergone changes and some studies report that young men already display both attitudes connected with the traditional male script, as well as the less popular “sex-positive woman script.” This script highlights the importance of both partners’ pleasure and their mutual enjoyment, as well as undermines the notion of sexual instrumentality, agency and self-focus as exclusively male characteristics (Morrison et al., 2015). Despite possible roots in the changing nature of the dominant sexual scripts, this phenomenon needs replication in future studies before strong conclusions can be drawn.

We have also investigated whether the predictive power of sexual attitudes, as well as other variables, differs between men and women. Although some relationships turned out to be significant only for one gender, but not the other (as was discussed above), when comparing the relationship strength directly (using the 95% robust CI for standardized regression estimates) we found that the pattern of relationships between sexual attitudes and sexual behavior is consistent across both genders. As mentioned in the paragraph above, this may be a result of the fact that traditional male and female scripts with regard to sexuality became less influential, to some degree diminishing differences between genders in this respect (Morrison et al., 2015). However, further studies replicating these results are needed before any strong claims can be made. With regard to other variables, religiosity was a stronger positive predictor of PPU among men ($\beta = 0.26$ [0.17, 0.35], $p < 0.001$) than among women ($\beta = 0.06$ [−0.04, 0.15], $p = 0.198$). This is especially interesting as the current result is inconsistent with at least one clinical study, showing that religiosity can contribute to seeking treatment for PPU more strongly among women than among men (Lewczuk et al., 2017). However, in contrast to the mentioned clinical study, in which the level of PPU symptoms among participants was high for both genders (Lewczuk et al., 2017), in our study women reported decidedly lower levels of PPU symptoms than men, and decidedly lower frequency of pornography watching. As a decidedly larger subset of men reported watching pornography, it is possible that among this group, religious beliefs (which are sometimes connected with low acceptance of pornography use, or thinking of it as a sinful activity, e.g., Grubbs et al., 2019; Grubbs et al., 2019; Grubbs et al., 2019) more often found fertile ground to elevate perceptions of pornography use as being problematic. This, however, should also be replicated in future studies, especially as the relationships between religiosity and sexual behavior were not at the center of interest in the current study.

Relationship Strength and Explained Variance

Moreover, the variance explained by our models was limited. Our regression models explained between

$R^2_{adj} = 17.8\%$ (masturbation without pornography watching) and 33.2% (pornography use) of variance in normative sexual behavior frequency, as well as 18.6% of variance in HD severity and 17.8% in PPU (taking the models for the whole sample into account, see Tables 3 and 4). This is because our study was targeted specifically at the relationships between sexual attitudes and sexual behavior and testing specific hypotheses with respect to those variables—not at maximizing the predictive value of the regression models, which would require a broader range of predictors to be included (including, among others, frequency of sexual activity predicting HD and PPU). Secondly, we obtained only weak or weak-to-moderate relationships between sexual attitudes and normative and problematic sexual behavior, even on the level of sheer bivariate correlations. In this case, only Permissiveness revealed some moderate relationships with sexual behavior (correlations with the frequency of solitary sexual behavior between $r = 0.33$ and $r = 0.45$ among all participants), with relationships for other attitudes being only weak in strength. However, the strength of the obtained relations is not very different from previous studies investigating this topic (Brown et al., 2017; Martyniuk & Štulhofer, 2018; Shapiro et al., 2017). This may be reflective of the complex structure of determinants of sexual behavior, which can be influenced by attitudes and convictions, as well as both state (e.g., mood) and trait-level factors (personality and temperamental traits), sociodemographic and culture-related characteristics (age, gender, race) or even abilities (e.g., emotion regulation ability), variables related to one’s social environment (social support) and other factors (like sexual partner availability) (see: Briken, 2020; de Alarcón et al., 2019; Grubbs et al., 2020; Grubbs et al., 2020; Lew-Starowicz et al., 2020; Walton et al., 2017).

Prevalence of Problematic Sexual Behavior Symptoms Among Men and Women

The results of our study show that the frequency of dyadic sexual activity did not differ between sexes. However, men participated in solitary sexual activity more frequently than women. Higher reported pornography use and masturbation among men is consistent with much previous research (Gmeiner et al., 2015; Grubbs, Kraus, et al., 2019; Grubbs et al., 2019; Grubbs et al., 2019; Lewczuk et al., 2021; Lewczuk, et al., 2021; Petersen & Hyde, 2010; Price et al., 2016). The prevalence of potential HD (10.0% in the general population; 11.4% among men; 8.7% for women) and potential PPU (17.8% in the general population; 26.8% in men; 9.1% in women) based on the proposed cutoff criteria for the HBI and the BPS questionnaires was also higher for men. Although screening measures provide only provisional and initial criteria that cannot replace, but only complement

expert diagnoses, the obtained indices certainly seem high—especially the more than 25% of men at high risk of PPU. Some previous research estimated the prevalence of problematic sexual behavior to be smaller (Dickenson et al., 2018; Ley et al., 2014; Odlaug et al., 2013), but not many representative studies on this subject are available. Kraus and colleagues (2020) reported that in one of the validation samples, the diagnostic threshold of the BPS identifying individuals at high risk for PPU was crossed by 13.8% (7.6% of women; 20.2% of men). This result is quite close to the indices obtained in the current study—it seems that high estimates of potential PPU may stem from a liberal diagnostic threshold established for the BPS scale—clinical trials should determine whether a more restrictive criterion is indeed more appropriate. Moreover, there is evidence that the diagnostic threshold for the Hypersexual Behavior Inventory may not be appropriate or reliable for all populations (Bóthe et al., 2019). The obtained results once more raise long-standing questions about the possible overestimation of problematic sexual behavior symptoms in nonclinical samples by the available measures (Walton et al., 2017). In light of the discussed results, it is crucially important to note that it is not appropriate to use declarative measures of symptom severity to diagnose individuals without expert clinical assessment. Screening instruments pertaining to problematic sexual behavior have only a very brief history of research behind them, and the scores provided by these questionnaires cannot be solely treated as conclusive evidence of symptom severity. Treating the discussed self-report measures as self-sufficient diagnostic tools, without the context of the proper clinical diagnosis and sufficient caution, can lead to the issues described above (i.e., overpathologization of nonpathologic activities). Moreover, it is also important to note that the currently available measures do not allow for proper assessment of moral incongruence-related distress which is considered to be an exclusionary criterion for CSBD and related behavior (WHO, 2020)—this can be an additional factor leading to elevated prevalence rates in the current study.

Future studies based on a similar design (i.e., representative samples) should provide more evidence regarding the prevalence of problematic sexual behavior in populations as well as about the validity and reliability of the instruments focused on the self-assessment of problematic sexual behavior.

Limitations

The present work is based on a cross-sectional study. Thus interpreting the causal influence should be done with caution. Sexual attitudes and sexual behavior probably exert mutual influences that should be disentangled in longitudinal studies. The study was based on Polish participants (78.9% of participants declared being Christian). Importantly, future

research should extend our analysis to other cultural and religious spheres. Moreover, HBI was used as a measure of HD. With the inclusion of CSBD in the International Classification of Diseases 11th Revision (WHO, 2020), newer measures (e.g., the Compulsive Sexual Behavior Disorder Scale [CSBD-19]; Bóthe et al., 2020; Bóthe et al., 2020) that more adequately assess this symptom cluster should be used in future studies. Next, the study is based on self-report measures, and—if possible—using objective measures for assessing sexual behavior or expert clinical assessment in future studies should increase the reliability of the findings. Future studies should also investigate the role of solitary vs. partner-based pornography use as related to sexual attitudes (Efrati & Mikulincer, 2018) and problematic sexual behavior. As was already discussed, numerous other factors that were not included in the analysis can be predictive of HD and PPU. This includes descriptors of sexual behavior habits (Lewczuk et al., 2021), other personal attitudes as well as intraindividual characteristics like personality, emotion regulation and/or attachment styles. Lastly, in our study we employed indicators of frequency of sexual activity based on ordinal scales, and some of the assumptions of linear regression analysis were not met by our data—thus, additional caution should be taken when interpreting the data.

Implications and Conclusions

Summing up, the current study provides supporting evidence for a significant association between sexual attitudes and both normative as well as dysregulated sexual behavior—the association is unique and not explained by religious attitudes, which were previously studied in this context—this is the most important theoretical contribution of the current study. Permissiveness was positively related to HD and PPU, and the relationships were weak to moderate in strength (standardized regression coefficients between 0.22 and 0.44). Sexual Instrumentality positively and weakly contributed to HD severity among men. Attitudes reflecting higher support for responsible sexuality (Birth Control subscale) negatively and weakly predicted HD among women. Future research should concentrate on further investigation of the connections between personal attitudes and problematic sexual behavior, and our research implies that this investigation should not be constrained to religiosity and related variables. Further investigation into this topic is especially important in the face of the inclusion of CSBD in the ICD-11 and the ongoing discussion surrounding its central features and fitting diagnostic criteria (Gola et al., 2020; World Health Organization, 2020). Formal recognition of CSBD as a psychiatric disorder creates a need for more detailed knowledge about determinants of symptom severity and treatment-seeking, among which personal and sexual attitudes can have a prominent presence. Thus, further scientific examination of the

relationships between personal attitudes and problematic sexual behavior can, in the future, facilitate accurate diagnosis of CSBD. Also, as was already mentioned, previous studies have shown that religious and morality-related attitudes can significantly contribute to the decision to seek treatment for problematic sexual behavior (Grubbs, et al., 2020; Grubbs, et al., 2019, 2020; Grubbs, et al., 2019; Grubbs, et al., 2019; Lewczuk et al., 2017, 2020). It is worth considering if permissive attitudes can also influence this sphere. Subsequent research should investigate whether highly permissive individuals may possibly be at a risk of delaying or neglecting the need to seek treatment, even when experiencing negative consequences and/or distress associated with their own sexual behavior or fulfilling other criteria for CSBD (World Health Organization, 2020). Moreover, previous research showed that changes in attitudes and cognitions can be an effective therapeutic means to change clinical symptoms and behaviors (e.g., Fitzpatrick et al., 2020; Garratt et al., 2007). As our research points to significant relationships between attitudes and problematic sexual behavior, affecting attitudes can—potentially—be a therapeutic route via which CSBD-like symptoms can be addressed. Future clinical studies should address this possibility.

Author's Contribution Karol Lewczuk and Mateusz Gola formulated the main research aim. Karol Lewczuk designed the study. Karol Lewczuk was responsible for funding acquisition. Karol Lewczuk and Magdalena Wizła conducted the statistical analysis and wrote the first draft of the manuscript. All authors contributed to and have approved the final manuscript.

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Declarations

Conflict of 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.

Ethical Approval The study procedures were carried out in accordance with the Declaration of Helsinki. The Institutional Review Board of the Cardinal Stefan Wyszyński University in Warsaw approved the study.

Informed Consent All subjects were informed about the study and all provided informed consent.

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