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Longitudinal Associations Between Problematic Pornography Use and Types of Rumination

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ABSTRACT

Transdiagnostic approaches are considered essential for assessing psychopathology, as they cut across a wide range of mental disorders. These features significantly contribute to the development and maintenance of mental health issues, with rumination being an important transdiagnostic construct. Although previous studies have demonstrated a positive link between problematic online behaviors and rumination, no study has examined the association between problematic pornography use (PPU) and rumination. Hence, we aimed to examine the cross-sectional and longitudinal associations between PPU and two types of rumination (i.e. brooding and reflection) in a sample of Hungarian young adults over a one year period. In the present study, we performed an autoregressive cross-lagged analysis with a multigroup approach among 2,786 adults (M_{age} = 28.00, SD = 4.75; 1,327 men and 1,459 women). Cross-sectionally, a positive and weak association was observed between PPU and both components of rumination (i.e. brooding and reflection) among men and women. Longitudinally, the association between PPU and brooding was bidirectional. Higher T1 PPU was associated with higher T2 brooding and reflection among both men and women. Among women, higher T1 brooding was associated with higher T2 PPU, whereas among men, higher T1 reflective rumination was associated with lower T2 PPU. Our findings emphasize the significant role of PPU in contributing to both components of rumination in both men and women. However, longitudinal associations suggest differential gender effects, with reflective rumination serving as a protective factor for men, potentially contributing to self-regulation, whereas brooding exacerbates PPU over time for women.

In 2023, both Xvideos and XNXX, the most widely visited pornography websites, had more total visits than TikTok, one of the most popular social media platforms worldwide (Wright et al., 2023). People engage in pornography mostly to self-gratify, explore their sexuality, avoid boredom, or reduce stress (Bőthe, Tóth-Király, Bella, et al., 2021; Koós et al., 2024). However, concerns have also been the focus of pornography use research due to the potentially excessive or problematic use of pornography (Kafka, 2010). Problematic pornography use (PPU) is defined as poorly controlled, excessive, and/or compulsive engagement in pornography use, accompanied by significant distress and impairments in life (e.g., job loss) (Kraus et al., 2018; World Health Organization, 2022). Although PPU has not been included as a distinct mental disorder in the Diagnostic and Statistical Manual of Mental Disorders 5th Edition (DSM-5), it has been listed in the 11th edition of the International Classification of Diseases (ICD-11) as one of the common manifestations of Compulsive Sexual Behavior Disorder (CSBD) (World Health Organization [WHO], 2022). A growing body of research indicates that PPU is significantly associated with various mental health issues. Among these, depression (Borgogna et al., 2018; Maddock et al., 2019), anxiety (Grant Weinandy et al., 2023) and body dissatisfaction (Demirgül et al., 2025) have arguably been the most studied constructs and have been positively associated with PPU. Those with greater incongruence between moral beliefs regarding pornography and their own viewing habits reported more depressive symptoms (Perry, 2018), likely due to feelings of guilt and shame (Orth et al., 2006), and such feelings are often linked to rumination, defined as recurrent negative thinking (Leonardi et al., 2020; Wells & Capobianco, 2020). However, a recent systematic review focusing on problematic online behaviors and rumination revealed a lack of studies investigating the association between PPU and rumination, highlighting the need for further research in this area (Castro-Calvo et al., 2022). Thus, the aim of the present study was to examine the associations between PPU and two components of rumination (i.e., brooding and reflection) over time and explore whether these associations differ between men and women.

Pornography Use

Pornography can be defined as material that "(i) creates or elicits sexual feelings or thoughts and (ii) contains explicit exposure or descriptions of sexual acts involving the genitals,

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such as vaginal or anal intercourse, oral sex, or masturbation" (Reid et al., 2011, pp. 359–385). While some studies consider the concept of nudity alone a sufficient indicator of pornography, others propose that pornography must involve sexual acts and induce sexual and behavioral changes (Kohut et al., 2020). According to recent findings, a significant majority of individuals across gender categories have reported using pornography at some point in their lives, with relatively high rates of 60 to 98% among men and 30 to 90% among women (Ballester-Arnal et al., 2021; Rissel et al., 2017; Solano et al., 2018).

PPU is defined based on the CSBD diagnostic criteria, which include intense and poorly controlled pornography use, numerous failed attempts to reduce or modulate pornography use, neglect of important aspects of functioning (e.g., work or relationships), and engaging in pornography use despite its negative effects (WHO, 2022). Although the prevalence of PPU varies across studies due to different definitions, methods, and samples (Kohut et al., 2020), according to a large-scale study conducted across 42 countries, 3.2% to 16.6% of individuals may be at risk of experiencing PPU across different subpopulations, with men reporting greater levels of PPU than women (Bőthe, Nagy, et al., 2024).

Rumination

Rumination was first defined as "repetitively focusing on the fact that one is depressed; on one's symptoms of depression; and on the causes, meanings, and consequences of depressive symptoms" (Nolen-Hoeksema, 1991, p. 569). In a later study, rumination was re-defined as the act of continuously focusing on one's own negative thoughts, feelings, and unpleasant experiences. Experiences of stress due to social and environmental stressors are among the factors that may contribute to these negative thoughts and feelings, resulting in rumination (Monroe, 2008). Rumination comprises two components: brooding and reflection. Brooding is generally regarded as a more maladaptive form of rumination, which is defined as adopting a passive and introspective demeanor that evaluates current circumstances against an unrealized, idealized standard, accompanied by a sense of regret and dissatisfaction (Wells & Capobianco, 2020). Reflection, a purposeful and active cognitive process, involves accepting and understanding distress and feelings to engage in effective coping mechanisms (Satyshur et al., 2018). Compared to brooding, reflection is commonly perceived as a more adaptive problem-solving process (Treynor et al., 2003). Although both brooding and reflection are positively correlated, earlier studies have indicated that brooding might play a more significant role in the emergence and progression of mental disorders such as depression and anxiety (Nolen-Hoeksema, 1991; Takano & Tanno, 2009) than reflection among adults (McEvoy & Brans, 2013). In alignment with this, several studies have demonstrated that brooding is positively associated with negative mental health, while reflection was protective in some contexts (Bastin et al., 2015; D. B. Newman & Nezlek, 2019). For example, one study found that brooding but not reflection was negatively associated with perceived stress, whereas reflection was positively associated with it. Additionally, brooding was negatively related to life satisfaction, while reflection demonstrated a positive association with life satisfaction (Kim & Kang, 2022). Given that PPU has been positively associated with negative mental health outcomes (Altin et al., 2024), it is important to differentiate between the two subtypes of rumination when examining the relationship between PPU and rumination.

The Stress-Reactive Model of Rumination and the Cognitive Behavioral Model of Problematic Internet Use

Two distinct models exist that may explain the association between PPU and the two components of rumination. The stress-reactive model of rumination provides insight into how PPU may predict rumination, while the cognitive behavioral model of problematic internet use explains how rumination may predict PPU. The stress-reactive model of rumination was introduced to explain the occurrence and prolongation of depression (Robinson & Alloy, 2003). It suggests that negative life events may lead to rumination, and if one ruminates more on these negative cognitive inferences, it may prolong depression (Robinson & Alloy, 2003). Although the stress-reactive model primarily focuses on the associations between rumination and depressive symptoms, it also explains how rumination occurs. According to this model, rumination is a cognitive response to stress. In the context of PPU, PPU itself can significantly contribute to stress as it is positively linked to a wide range of negative consequences among individuals (Bőthe et al., 2020; Bőthe, Tóth-Király, Griffiths, et al., 2021; Chen et al., 2022), such as emotional distress, feelings of guilt, shame, aggression, and a sense of inadequacy (Duffy et al., 2016; Kingston et al., 2008). Furthermore, interpersonal problems, social withdrawal, and disputes are also positively associated with PPU (Allen et al., 2017). Additionally, PPU has been linked to significant impairments in academic and work-related issues (Ross et al., 2012; Wéry & Billieux, 2017). Overall, considering the aforementioned negative consequences and stress due to PPU, prior PPU may be related to later rumination.

The cognitive behavioral model of problematic internet use suggests that internet use disorder may be attributable to the interplay between distal risk factors and cognitive precursors of problematic online behaviors, among which rumination is one of the most influential ones (Yang et al., 2020). According to the model, a maladaptive behavior (e.g., problematic internet use) occurs due to maladaptive thoughts, which are closely linked to rumination (Nolen-Hoeksema & Harrell, 2002). Based on this model, people with a greater tendency to ruminate may engage in more maladaptive behaviors (i.e., problematic online behaviors) to distract themselves from their ruminative thoughts, resulting in a hindrance in adopting problem-solving behaviors (Castro-Calvo et al., 2022; Yang et al., 2020). The primary purpose of engaging in maladaptive behavior is to alleviate stress (Davis, 2001). The second component refers to developing problematic internet use because it is less threatening and more convenient (Caplan, 2002; LaRose et al., 2003). The third component involves obsessive thoughts and repetitive maladaptive behaviors associated with internet use as a result of impaired self-regulation (Caplan, 2002, 2010). The fourth one refers to impairments in various areas, such as academic, job, and interpersonal relationships (Davis, 2001). These four

components of the cognitive behavioral model of problematic internet use resemble PPU. For instance, two relatively common motivations for pornography use are the reduction of stress and negative emotions (Koós et al., 2024), which were shown to be associated with PPU (Bőthe, Tóth-Király, Demetrovics, et al., 2021). Furthermore, emotion regulation difficulties have been identified as predictors of PPU (Bőthe, Vaillancourt-Morel, et al., 2024; Cardoso et al., 2022), resulting in significant impairments in individuals' lives (Kraus et al., 2018; WHO, 2022). Overall, these findings highlight potential shared mechanisms between PPU and internet use disorder, making the cognitive behavioral model of problematic internet use a sound model to study PPU and its associations with rumination.

Rumination and Its Association with Problematic Online Behaviors

According to a systematic review of problematic online behaviors, including problematic social network use, problematic online gaming, and problematic gambling, rumination was positively and weakly associated with these behaviors (Castro-Calvo et al., 2022). Among these online problematic behaviors, only one study examined components of rumination. In this study, problematic gambling exhibited a positive and weak association with brooding, but not with reflection (Krause et al., 2018). However, concerning other problematic online behaviors, the reviewed studies did not examine components of rumination separately in a systematic manner. They focused only on overall rumination, limiting the understanding of the complex nature of rumination. Furthermore, only one longitudinal study has been conducted on problematic online behavior and rumination among first-year university students. In this study, baseline rumination predicted later compulsive social media use; however, baseline social media use did not predict later rumination (Yang et al., 2020).

According to above the systematic review of problematic online behaviors and rumination (Castro-Calvo et al., 2022), previous studies on problematic online behaviors and rumination have several limitations. For example, previous studies have predominantly relied on cross-sectional designs, and the only available longitudinal study was conducted with a small sample size (i.e., 219). Additionally, most studies have been conducted among homogeneous samples, limiting the generalizability of the findings (Castro-Calvo et al., 2022). Moreover, except for one study (Krause et al., 2018) most previous studies have not considered the distinct roles of brooding and reflective rumination in problematic online behaviors. These limitations hinder our understanding of the directionality of the associations between problematic online behaviors and rumination. Given the proposition of the stress-reactive model of rumination, the cognitive-behavioral model of problematic Internet use, and the established link between rumination and problematic online behaviors, it is important to examine whether similar patterns exist between PPU and rumination (Kircaburun et al., 2019; Zheng et al., 2021). In particular, since brooding has been shown to have stronger associations with negative outcomes than reflection (Dondzilo et al., 2016; Sirois & Bean, 2016), differentiating between these two types of rumination (i.e., brooding and reflection) in relation to PPU may offer more nuanced insights.

The Present Study

Given the positive association between PPU and substantial impairments, as well as feelings of guilt and self-criticism, it is possible that in the long term, individuals may engage in more ruminative symptoms (Altin et al., 2024; Sassover et al., 2023). Moreover, the stress-reactive model (Robinson & Alloy, 2003) suggests that rumination may occur in response to stress associated with PPU in the short term as well. In contrast, according to the cognitive behavioral model of problematic internet (Davis, 2001), a maladaptive behavior (i.e., PPU) may function as a way to cope with negative emotions in the short and long term as well. Given the conflicting theoretical perspectives, a longitudinal study, including the cross-sectional associations between the variables, is necessary to examine the directionality of these associations and identify potential bidirectional links between PPU and rumination. Based on the aforementioned research findings about problematic online behaviors and the theoretical models, we hypothesized that PPU would be positively associated with both forms of rumination (i.e., brooding and reflection) cross-sectionally and longitudinally. Previous research has demonstrated that rumination negatively predicts sexual desire across both genders. Notably, this effect was significant only in women participants. These findings suggest a potential gender difference in the impact of rumination on sexual desire, with women potentially exhibiting greater vulnerability to diminished sexual desire as a consequence of ruminative thought patterns (Peixoto & Ribeiro, 2022), given that sexual desire is positively associated with sexual activity (Lee, 2018), including pornography use (Prause & Pfaus, 2015). In addition to this, previous studies indicate that men are more likely than women to engage in pornography use (Ballester-Arnal et al., 2021; Rissel et al., 2017; Solano et al., 2018) and report PPU (Bőthe et al., 2024), and that the associations between pornography use and mental health symptoms may differ by gender (Singareddy et al., 2025; Willoughby et al., 2014). Building on these findings, we examined whether associations between PPU and rumination differed by gender.

Method

Participants and Procedure

This study relied on data from the Budapest Longitudinal Study (BLS), encompassing four years. The BLS is a longitudinal study that focuses on various addictions and problematic behaviors, such as gaming disorder, gambling disorder, compulsive sexual behaviors, and other substance addictions (e.g., alcohol and exercise) in young adults (18–34 years) living in Budapest, Hungary. In our study, a random stratified sampling procedure was performed according to age group and neighborhood. The sample consisted of 2786 participants (Mage = 28, SD = 4.75) as they were the only individuals who completed the included measures. Among them, 1336 were men and 1464 were women. The descriptive statistics are presented in Table 1.

Table 1. Sociodemographic characteristics of participants.

Characteristics	*N*	%	*M*	*SD*
Total sample	2786	100		
Gender				
Men	1327	47.7		
Women	1459	52.3		
Marital Status				
Single	1436	51.5		
Married	1281	46		
Widow	5	0.17		
Divorced	38	1.36		
Not identified	26	0.93		
Age				
18–21	456	16.4	28	4.75
22–27	913	32.8		
28–34	1417	50.9		

Note. *M*, mean; *SD*, standard deviation; N, sample size; %, percentage.

The research team collected data using in-person interviews and self-report methods across four waves. During the second and third waves, participants had the additional option of completing interviews and self-report questionnaires online. However, this online alternative was chosen by only a small number of individuals. During the second wave, 57 participants completed the survey online, while seven individuals did so in the third wave. In this study, we excluded the first data wave collected (data collected in 2019) because it did not include our primary variable of interest (i.e., PPU). We used only the second and third waves of the BLS data. Therefore, we refer to the second wave of data collection as time 1(T1) and the third wave of data collection as time 2 (T2) in this paper. The data for time two were collected between June and September 2020, and the data for time three were collected between June and November 2021. Prior to data analyses, we conducted power analysis using the G*Power (Faul et al., 2007) software based on prior studies (Cohen's $f^2 = 0.10$, alpha level = .05, power = .80). The power analysis indicated a minimum required sample size of 228 participants. The sample size in the present study exceeded the value provided by the G*Power software.

We collected data through face-to-face interviews to gather sociodemographic information and data on the main variables (i.e., PPU and both components of rumination). Self-reporting techniques were used to collect information on substance use, problematic behaviors, and psychological factors. T1 included 2786 participants and T2 included 2874 individuals. Participants were provided with a 1000 HUF (3$) shopping voucher and a mug with the study logo as incentive gifts. Given that some participants did not respond, we analyzed the pattern of missing data. We employed Little's Missing Completely at Random (MCAR) test to determine whether imputation was required. The test results were not significant ($\chi^2 = 73027$; $df = 75115$; $p = 1.000$), indicating that the missing data occurred randomly. We provide information about missing data for each variable between T1 and T2 in Table 2. The BLS study protocol received approval from the Research and Ethical Committee of the Medical Research Council (no. 60471–2/2018/EKU). Following open science practices, we uploaded the analysis codes to the Open Science Framework (OSF link). However, given the sensitive nature of the data as well as the fact that participants were not informed about the possibility of sharing their data openly, we did not upload the dataset to OSF. The authors will share the data with researchers upon justified request.

Measures

Sociodemographic Variables

Information on sex/gender,[1] age, highest level of education, and marital status was collected using a researcher-derived questionnaire. Participants responded to a single item that assessed their gender: "Sex of the respondent," age: "In what year were you born?," level of education: "What is your highest level of education?" and marital status: "What is your current official marital status?"

Problematic Pornography Use

The PPCS-6 is the short version of the Problematic Pornography Consumption Scale (PPCS), which measures PPU severity in the past six months with six items, each capturing a feature of PPU: salience, tolerance, mood modification, conflict, withdrawal, and relapse (Bőthe, Tóth-Király, Demetrovics, et al., 2021). Participants were asked to rate their answers on a scale of 1 to 7, where 1 represents never, and 7 represents all the time. The Hungarian version of the PPCS-6 was used in our study, which was validated in previous studies. Participants responded to the following six items: "I felt that porn is an important part of my life," "I released my tension by watching porn," "I neglected other leisure activities as a result of watching porn," "I felt that I had to watch more and more porn for satisfaction," "When I vowed not to watch porn anymore, I could only do it for a short period of time," and "I became stressed when something prevented me from watching." The total score ranges from 6 to 42 points. A score of ≥20 points on the PPCS-6 indicates a risk of PPU. Those participants who had naturally missing data on the PPCS-6 (i.e., those who had not used pornography in the past year; (T1: n = 78.4%; T2: n = 82.6%) were recoded as "never" on all PPCS-6 items for subsequent analyses, as was done in previous studies (e.g., Bőthe et al., 2022). Based on previous findings, this instrument has demonstrated strong reliability and validity in distinguishing between individuals with problematic and non-problematic pornography use among Hungarian samples and in international settings as well (Bőthe et al., 2023; Bőthe, Nagy, et al., 2024; Bőthe, Tóth-Király, Demetrovics, et al., 2021). According to a reliability generalization meta-analysis study of the PPCS, the average Cronbach's alpha score of the PPCS was .91, indicating excellent internal consistency (Demirgül et al., 2024). In our sample, at T1, Cronbach's α was .91, and at T2 it was .92.

Rumination

Rumination was assessed using a short 10-item version of the Ruminative Response Scale (Treynor et al., 2003). The Ruminative Response Scale consists of two components: brooding and reflection. Brooding involves a passive focus

[1]The survey was conducted in Hungarian, a language which does not include a clear differentiation between sex and gender (i.e., the word used in the Hungarian survey was "*nem*").

Table 2. Reliability indices, comparisons of men's and men's problematic pornography use, brooding and reflection.

	Range	α	Valid Cases	*M* (SD)	(1) Men *M* (SD)	(2) Women *M* (SD)	*t*	Cohen's d	*p*
1. Problematic pornography use T1[a]	1–7	.91	2786	6.32 (1.86)	6.68 (2.68)	6.23 (1.57)	5.43	0.20	<.001**
2. Problematic pornography use T2[a]	1–7	.92	2786	6.29 (1.86)	6.47 (2.11)	6.29 (2.10)	2.27	0.08	.023*
3. Brooding T1[b]	0–5	.88	2774	7.20 (2.89)	7.24 (2.96)	7.16 (2.86)	0.73	0.02	.462
4. Brooding T2[b]	0–5	.84	2830	7.06 (2.72)	7.21 (2.76)	7.03 (2.72)	1.68	0.06	.092
5. Reflection T1[b]	0–5	.88	2754	7.50 (3.10)	7.51 (3.08)	7.48 (3.12)	0.24	0.09	.805
6. Reflection T2[b]	0–5	.86	2830	7.20 (2.76)	7.42 (2.80)	7.20 (2.79)	1.95	0.07	.050*

Note. a = 1 = never, 2 = rarely, 3 = occasionally, 4 = sometimes, 5 = often, 6 = very often, 6 = all the time; b = 0 = never, 1 = rarely, 2 = sometimes, 3 = often, 4 = usually, 5 = always, *M* = mean; *SD* = standard deviation, *t* = t test value, *p* = significance test value; α = Cronbach's alpha; *$p < .05$. **$p < .001$.

on negative thoughts, often blaming oneself for distress. Participants responded to five items that assessed brooding, which is the first subscale of the Ruminative Response Scale: "What am I doing to deserve this?," "Why do I always react this way?," "Why do I have problems other people don't have?" "Why can't I handle things better. Reflection or reflective pondering is considered as a more adaptive form of rumination, focusing on solving problems associated with distress and depressive mood and participants responded to five items that assessed reflection, which is the second subscale of the Ruminative Response Scale: "Analyze recent events to try to understand why I am depressed" "Go away by myself and think about why I feel this way?," "Write down what I am thinking and analyze it" "Analyze my personality to try to understand why I am depressed ?," "Go someplace alone to think about my feeling," Items are rated on a four-point Likert-type scale ranging from 1 (never) to 4 (always). Higher scores indicate a greater prevalence of these thoughts. The original questionnaire was developed in English; in the present study, we used the Hungarian-adapted version (Kokonyei et al., 2016). The internal consistency of both the original version (Cronbach's α = 0.92) and its adapted Hungarian counterpart (Cronbach's α = 0.90) was excellent (Kokonyei et al., 2016). In our sample, Cronbach's α for brooding at T1 was .88, whereas the reflection subdimension demonstrated a value of .88. At T2, Cronbach's α for brooding was .84 and was .86 for reflection.

Statistical Analysis

Preliminary Analysis: Evaluation of Measurement Invariance

To ensure that gender-based differences derived from true differences between the groups and not measurement biases, we performed multigroup measurement invariance tests between men and women for the rumination and PPU scales, using MPlus 8.7 (Byrne, 2013; Muthén & Muthén, 2017). To determine what level of measurement invariance was achieved, we calculated the chi-square difference test, as well as goodness of fit indices such as the comparative fit index (CFI), Tucker–Lewis's index (TLI), and root mean square error of approximation (RMSEA), including differences in them. To check the models, we evaluated goodness-of-fit indices based on the following criteria: the Comparative Fit Index (CFI) ≥ 0.90 adequate, Tucker Lewis Index (TLI) ≥ 0.90 adequate, and Root-Mean-Square Error of Approximation (RMSEA) with its 90% confidence interval (CI) ≤ 0.10 acceptable (Browne & Cudeck, 1992; Kenny et al., 2015). We tested three hierarchical levels of measurement invariance: (1) configural, (2) metric (or weak), and (3) scalar (or strong).

Main Analyses

We computed descriptive statistics, Cronbach's alphas, independent sample t-tests, and correlations using SPSS 26. In the present study, we measured the reliability using Cronbach's alpha. Before the main analysis, we examined the normal distribution of all study variables by examining skewness and kurtosis, considering values within the range of −2 to +2 for skewness and −7 to +7 for kurtosis as indicative of an acceptable level of normality. According to Bryne (2010), the normality assumption is fulfilled when the skewness coefficient is within the range of ±2, and the kurtosis coefficient is within the range of ±7 (see Table 2). During the initial phase of our analysis, we conducted a series of Spearman correlations to examine the intercorrelations between the primary study variables. The main analyses were conducted using structural equation modeling (SEM) software on MPlus 8.7 (Byrne, 2013; Muthén & Muthén, 2017). The Robust Maximum Likelihood Estimator (MLR) was used to conduct auto-regressive cross-lagged models to investigate the relationship between PPU and the two components of rumination, and FIML was used to handle missing data (Enders & Bandalos, 2001; D. A. Newman, 2014). To test the adequacy of the model fit, we used the commonly used goodness of fit indices, including the CFI (≥0.90 for acceptable; ≥0.95 for excellent), RMSEA (≤0.06 for good, ≤0.08 for acceptable), and TLI (≥0.95 for good, ≥0.90 for acceptable) (Brown, 2015). We used manifest variables (i.e., mean scores on the scales) in the analyses, resulting in fully saturated models. Importantly, when these fully saturated models are interpreted, the aforementioned model fit indices are not informative as they tend to be "perfect" (i.e., the CFI and TLI values are 1, and the RMSEA value is 0).

Following the procedure of previous work in the field of sex research (Girouard et al., 2021; Paquette et al., 2022), we first examined the association between PPU and both components of rumination, including brooding and reflection in a fully-saturated model in the total sample (Model 1).[2] Next, we incorporated gender as a grouping variable (i.e., men vs. women) into the model. We used a multigroup analysis to examine whether there were any differences across genders (i.e., men vs. women) in the association between PPU and the two components of rumination (Model 2). Following this, we tested the path coefficients between PPU and both components of rumination and constrained them to be equal across the groups (Model 3). Finally, we compared the differences between Models 2 and 3 (i.e., unconstrained and constrained models) to explore whether gender differences were significant by examining changes in chi-square, CFI, TLI, and RMSEA values.

Results

Results of the Preliminary Measurement Invariance Tests

We first calculated measurement invariance of PPU and rumination in separate models. For both scales, the fit indices suggested an acceptable model fit. Second, we assessed metric invariance by constraining the factor loadings to be equal across the groups and the model fit remained acceptable. Finally, we assessed scalar invariance by constraining the factor loadings and intercepts of the items to be equal across the groups, which also yielded acceptable fit. Fit indices for the models and the differences between the models are presented in Table 3. These results suggest that both scales measuring PPU and rumination function equivalently across groups (i.e., men and women), thereby allowing for meaningful comparisons between men and women.

Descriptive Statistics of PPU, Brooding, and Reflection and Gender Differences

To examine gender differences in the study variables, we conducted independent-sample t-tests. For brooding, we did not observe significant gender differences. Concerning reflection, we only observed significant gender differences at T2, with men reporting greater reflection symptoms than women. Moreover, we observed significant gender differences in PPU at T1 and T2, with men reporting greater PPU than women. Gender differences are presented in Table 3. Spearman correlation coefficients revealed significant relationships between PPU and both components of rumination at T1 and T2. These results demonstrated small to moderate positive associations between PPU and both components of rumination. All correlations between the study variables are presented in Table 4. A total of 0.6% of the participants at T1 and 0.8% at T2 scored above the pre-established cutoff score on the PPCS-6 (≥20 points), suggesting they might have been at risk for experiencing PPU.

Cross-Sectional and Longitudinal Associations Between PPU and Brooding and Reflection

The baseline model demonstrated an excellent fit to the data for brooding and reflection due to being a fully saturated model (see Table 5 for details). To determine whether the association between PPU and the rumination components (i.e., brooding and reflection) differed between genders (i.e., men and women), we compared Model 3 to Model 2 and examined the differences in the fit indices. Although the corrected chi-square difference test was not significant ($\Delta\chi^2$ = 19.383; p = .197), the change in the fit indices (ΔCFI = −0.001; ΔTLI = −0.002-; ΔRMSEA = +0.014) showed a significant difference between Models 2 and 3, suggesting significant gender differences in the strength of the associations. Therefore, we report Model 2's findings.

Among men, higher levels of T1 PPU were associated with higher levels of T1 brooding (r = .15, 95% CI [.10, .21], p < .001). Higher levels of T1 PPU were associated with higher levels of T1 reflection as well (r = .17, 95% CI [.10, .23], p < .001). Higher levels of T2 PPU were associated with higher levels of T2 brooding (r = .27, 95% CI [.22, .33], p < .001). Higher levels of T2 PPU were associated with higher levels of T2 reflection (r = .27, 95% CI [.22, .34], p < .001). Longitudinally, higher levels of T1 PPU were associated with higher levels of T2 PPU (β = .13, 95% CI [.08, .18], p < .001). Higher levels of T1 reflection were associated with lower levels of T2 PPU (β = −.11, 95% CI [−.22, < −.01], p = .046). Higher levels of T1 brooding were associated with higher levels of T2 PPU (β = .24, 95% CI [.13, .35], p < .001). Higher levels of T1 PPU were associated with higher levels of T2 brooding (β = .12, 95%CI [.07, .17], p < .001). T1 brooding was not significantly associated with T2 brooding (β = .08, 95% CI [−.02, .19], p = .128). Higher levels of T1 reflection were associated with higher levels of T2 brooding (β = .15, 95% CI [.04, .27], p = .006). Higher levels of T1 PPU were associated with higher levels of T2 reflection (β = 0.10, 95% CI [.05, .14], p < .001). Higher levels of T1 brooding were associated with higher levels of T2 reflection (β = 0.12, 95% CI [.01, .23], p = .023). T1 reflection was not significantly associated with T2 reflection (β = .10, 95% CI [−.01, .20], p = .078). All significant associations were weak to moderate in terms of effect size.

Among women, higher levels of T1 PPU were associated with higher levels of T1 brooding (r = .17, 95% CI [.11, .23], p < .001). Higher levels of T1 PPU were associated with higher levels of T1 reflection (r = .21, 95% CI [.14, .27], p < .001). Higher levels of T1 brooding were associated with higher levels of T1 reflection (r = .83, 95% CI [.81, .86], p < .001) Higher levels of T2 PPU were associated with higher levels of T2 brooding (r = .24, 95% CI [.18, .29], p < .001). Higher levels of T2 PPU were associated with higher levels of T2 reflection (r = .23, 95% CI [.17, .28], p < .001). Higher levels of T2 brooding were associated with higher levels of T2 reflection (r = .92, 95% CI [.91, .93], p < .001). Longitudinally, higher levels of T1 PPU were associated

[2]The association between rumination's brooding and reflection components was positive and strong, which may suggest multicollinearity. We report these correlations between brooding and reflection and other variables in Table 3 for complete transparency. Thus, we tested the models described in the statistical analyses section separately for brooding and reflection, and the results were almost the same as in the models including both components of rumination together. Therefore, for the sake of simplicity, we report the results of the models which included the two components together.

Table 3. Problematic pornography use and ruminative response scale baseline model fit results and test of measurement invariance.

Models	CFI	TLI	*Df*	RMSEA	Model Comp	χ2 *p* value significance comparison	ΔCFI	ΔTLI	ΔRMESEA
T1 PPU									
MI 1 Configural	0.999	0.998	18	0.037					
MI 2 Metric	0.998	0.998	23	0.034	MI 2 vs MI 1	.0953	−0.001	0.000	−0.003
MI 3 Scalar	0.998	0.999	41	0.026	MI 3 vs MI 2	.0185	0.000	0.001	−0.008
T2 PPU									
MI 1 Configural	0.998	0.997	18	0.045					
MI 2 Metric	0.998	0.997	23	0.042	MI 2 vs MI 1	.0699	0.000	0.000	−0.003
MI 3 Scalar	0.999	0.999	41	0.027	MI 3 vs MI 2	.3074	0.001	0.002	−0.015
T1 Rumination									
MI 1 Configural	0.978	0.971	68	0.116					
MI 2 Metric	0.978	0.974	76	0.111	MI 2 vs MI 1	.2784	0.000	0.003	−0.005
MI 3 Scalar	0.982	0.983	94	0.089	MI 3 vs MI 2	.7534	0.004	0.012	−0.027
T2 Rumination									
MI 1 Configural	0.982	0.976	94	0.106					
MI 2 Metric	0.982	0.979	68	0.101	MI 2 vs MI 1	.0967	0.006	0.003	−0.005
MI 3 Scalar	0.986	0.987	76	0.079	MI 3 vs MI 2	.7374	0.004	0.004	−0.022

Note. Δ = change in value, CFI = comparative fit index; TLI = Tucker and Lewis index; RMSEA = root mean square error of approximation, Df = Degrees of freedom.

Table 4. Descriptive statistics, correlation between problematic pornography use brooding and reflection.

Variables	(Skew) (SE)	Kurt. (SE)	Range	*M* (*SD*)	1	2	3	4	5	6
1. Problematic pornography use T1	8.10 (0.03)	75.2 (0.07)	1–7	6.32 (1.86)	1.00	.28**	.11**	.11**	.14**	.13**
2. Problematic pornography use T2	8.71 (0.03)	83.8 (0.07)	1–7	6.29 (1.86)	.28**	1.00	.07**	.13**	.12**	.14**
3. Brooding T1	1.27 (0.04)	1.02 (0.09)	0–4	7.20 (2.89)	.11**	.07**	1.00	.31**	.81**	.26**
4. Brooding T2	1.13 (0.04)	0.41 (0.09)	0–4	7.06 (2.72)	.11*	.13**	.31**	1.00	.29**	.81**
5. Reflection T1	1.49 (0.04)	1.76 (0.09)	0–4	7.50 (3.10)	.13**	.12*	.81**	.29**	1.00	.30**
6. Reflection T2	1.23 (0.04)	0.66 (0.09)	0–4	7.20 (2.76)	.13**	.14**	.27**	.82**	.31**	1.00

Note. a = 1 = never, 2 = rarely, 3 = occasionally, 4 = sometimes, 5 = often, 6 = very often, 6 = all the time; b = 0 = never, 1 = rarely, 2 = sometimes, 3 = often, 4 = usually, 5 = always, *M* = mean; *SD* = standard deviation, *t* = t test value, *p* = significance test value; α = Cronbach's alpha; *$p < .05$.**$p < .001$.

with higher levels of T2 PPU (β = .13, 95% CI [.09, .16], $p <$ .001). Higher levels of T1 brooding were associated with higher levels of T2 PPU (β = .13, 95% CI [.03, .23], p = .009). T1 reflection was not significantly associated with T2 PPU (β = .06, 95% CI [−.037, .29], p = .201). T1 brooding was not significantly associated with T2 brooding (β = .03, 95% CI [−.07, .14], p = .546). Higher levels of T1 PPU were associated with higher levels of T2 brooding (β = .19, 95% CI [.05, .18], $p <$ .001). Higher levels of T1 reflection were associated with higher levels of T2 brooding (β = .27, 95% CI [.16, .38], $p <$ .001). Higher levels of T1 reflection were associated with higher levels of T2 reflection (β = .20, 95% CI [.09, .30], $p <$ .001). Higher levels of T1 PPU were associated with higher levels of T2 reflection (β = .12, 95% CI [.07, .17], $p <$ .001). T1 brooding was not significantly associated with T2 reflection (β = .08, 95% CI [−.01, .19], p = .091). Higher levels of T1 reflection were associated with higher levels of T2 reflection (β = .20, 95% CI [.09, .30], $p <$ .001). All significant associations were weak to moderate in terms of effect size. Longitudinal findings for men and women are presented in Figure 1.

In addition to Model 2, we examined whether controlling for baseline pornography use frequency would change the results to explore whether PPU was associated with rumination beyond the effects of general pornography use. To test this, we included baseline pornography use frequency as a control variable in the model. For men, the associations remained stable regardless of whether pornography use frequency was statistically controlled. However, for women, T1 PPU no longer significantly predicted T2 brooding, and its prediction of T2 reflection was attenuated (β = .072). These results suggest that the associations between types of rumination and PPU among women are somewhat sensitive to the inclusion of pornography use frequency as a control variable. The full results, including models with and without the control variable, are available on OSF (OSF link).

Discussion

According to the stress-reactive model of rumination (García et al., 2017), rumination tends to occur after a stressful event, while the cognitive behavioral model of

Table 5. Examination of the relationship between problematic pornography use and rumination across men and women.

Models	χ^2 ;(df)	CFI	TLI	RMSEA	RMSEA (90% CI)
Model 1: Fully saturated model (total sample)	0.000 (0)	1.000	1.000	0.000	0.000–0.000
Model 2: Fully saturated model, grouping by gender	0.000 (0)	1.000	1.000	0.000	0.000–0.000
Model 3: Same as Model 2, parameters constrained to be equal between groups	0.000 (0)	0.999	0.998	0.014	0.000 0.031

χ2 = Chi-square test; 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 RMSEA.

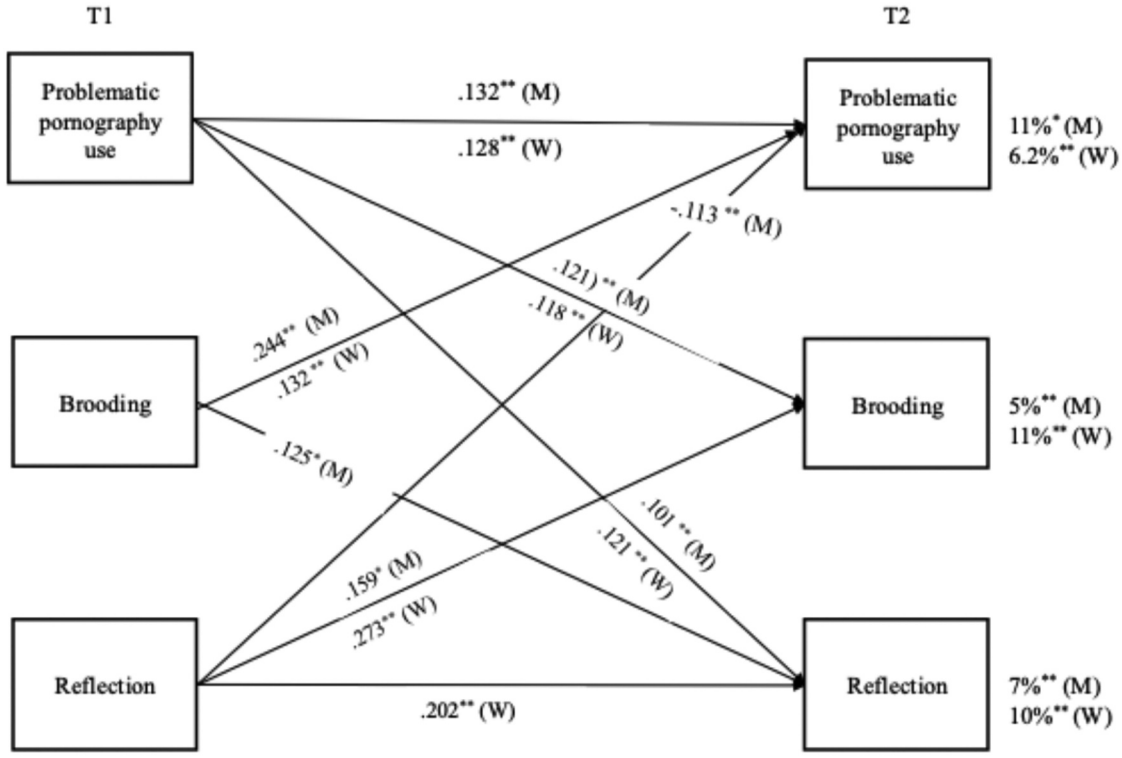

Figure 1. Associations between problematic pornography use and brooding/reflection among men and women. *Note.* Correlations between the variables are not presented. Only the significant associations between T1 problematic pornography use, brooding, and reflection as well as between T2 problematic pornography use, reflection, and brooding, are presented for the sake of clarity. The coefficients are standardized regression coefficients. Explained variances of the outcomes are presented on the right side of each variable. W represents results for women, while M represents results for men. T1 represents the first data collection wave and T2 represents the second data collection wave, $*p < .05$, $**p < .01$.

problematic internet use posits that problematic online behaviors stem from problematic cognitions, which are combined with behaviors that either escalate or perpetuate maladaptive responses (e.g., PPU) (Davis, 2001). Thus, in the cognitive-behavioral model of problematic internet use, individuals with a greater tendency to ruminate are more likely to exhibit problematic internet usage patterns. These theoretical notions suggest that bidirectional associations between rumination and problematic online behaviors may be hypothesized. Aligning with these two theories, prior studies have highlighted a potential link between problematic online behaviors, such as excessive online gaming (Zheng et al., 2021), gambling (Krause et al., 2018), and rumination. To the best of our knowledge, no prior studies specifically examined the role of rumination in developing PPU (Borgogna et al., 2018; Guidry et al., 2020).

Cross-sectionally, our findings suggested that in both genders, higher levels of PPU were significantly associated with higher levels of both components of rumination (i.e., brooding and reflection). These findings suggest that men and women would experience both brooding and reflective rumination symptoms associated with their PPU in the short term, showing similarities with the results of previous studies examining the associations between problematic online behaviors and rumination (Castro-Calvo et al., 2022; Krause et al., 2018; Mitra & Rangaswamy, 2019). In a previous study, brooding and reflection were positively associated with problematic smartphone use, with reflection showing lower strength (Gao et al., 2022). In another study, only brooding was positively associated with gambling, but not reflection (Krause et al., 2018). However, in contrast to these studies, in the present study, both for women and men, brooding and reflection were positively associated with PPU in the short term. A possible explanation for these findings might be that individuals who engage in PPU may experience greater brooding, and as a result of negative consequences associated with problematic behavior, they may switch to problem-solving-oriented rumination (i.e., reflection) (Leonardi et al., 2020; Sassover et al., 2023).

Concerning the longitudinal findings of the present study, higher levels of PPU were associated with greater levels of brooding and reflection in both men and women over time. Particularly among men, the findings indicated that prior PPU exhibited a positive association with brooding and reflective rumination, and the strength of the association between PPU and brooding was stronger one year later compared to reflection. In addition, baseline ruminative reflection was associated with lower PPU over time, indicating a bidirectional association between PPU and reflective rumination. In women, as in men, prior PPU was positively associated with both brooding and reflective rumination one year later. However, unlike in men, the association between PPU and reflection was stronger in women. Baseline brooding was associated with greater PPU over time. These longitudinal findings concurred with the cross-sectional findings, as PPU was significantly and positively associated with brooding and reflection in both genders.

However, in contrast to the positive association observed in the short term, reflective rumination predicted PPU negatively for men over time. In the literature focusing on problematic online behaviors and rumination, only one study examined problematic online behaviors (i.e., compulsive social media use) and rumination (Yang et al., 2020) longitudinally. However, this previous longitudinal study did not consider both components of rumination (Yang et al., 2020), limiting our ability to fully compare both components of rumination with problematic online behavior. In the previous longitudinal study, prior rumination predicted later compulsive social media use, not vice versa, indicating a unidirectional association between the variables (Yang et al., 2020).

Both cross-sectional and longitudinal findings are consistent with the stress-reactive model of rumination for women and men (García et al., 2017). Based on the stress-reactive model of rumination a potential explanation may be that due to repetitive and uncontrollable urges for pornography use, individuals may face various psychological impairments such as academic difficulties and job loss (WHO, 2022) along with sexual functioning problems (Bőthe, Tóth-Király, Griffiths, et al., 2021), which may be associated with greater rumination regardless of gender differences. Given that previous studies used cross-sectional designs employing rumination as a predictor, it limits our ability to compare our findings to them based on the stress-reactive model of rumination (Castro-Calvo et al., 2022). Moreover, as mentioned above, only one study used a longitudinal design to study rumination and problematic online behavior (i.e., compulsive social media use). However, our findings do not align with this study, as problematic online behavior in that study did not predict rumination, providing no evidence for the stress-reactive model of rumination (Yang et al., 2020).

On the other hand, considering PPU as a potential form of problematic internet use, the present study's findings do not completely resonate with the cognitive behavioral model of problematic internet use (Davis, 2001). Significant gender differences were observed in the directionality of the association between components of rumination and PPU. Specifically, increased levels of brooding in women were associated with increased PPU over time. In contrast, higher levels of reflective rumination in men were associated with decreased PPU over time, indicating that the cognitive-behavioral model of problematic internet use may apply to women but not men.

These findings also indicate that brooding may function as a potential risk factor for PPU, while reflective rumination may be a potentially protective factor against PPU in some cases in the long run. Aligned with this, a previous (Gao et al., 2022) reported that brooding components of rumination predicted problematic smartphone use, while reflective rumination did not. Several potential explanations exist for these gender differences. Firstly, brooding may contribute to higher levels of PPU among women, which could be attributed to their greater tendency to engage in maladaptive forms of rumination (i.e., brooding). Consequently, this tendency may exacerbate negative emotions, such as anxiety and stress, associated with increased PPU (Davis, 2001; Johnson & Whisman, 2013), to cope with stress. Second, due to the higher estimates of PPU among men (Baranowski et al., 2019; Borgogna et al., 2022), they may experience more significant impairments in their lives (Borgogna et al., 2022; Bőthe et al., 2020; Bőthe, Tóth-Király, Griffiths, et al., 2021; Ince et al., 2021), accompanied by increased feelings of shame and guilt (Sassover et al., 2023; Sniewski & Farvid, 2020). As a result, men may be motivated to disrupt this pattern and regain control over their problematic behavior (i.e., PPU). Such a response could potentially be associated with engaging in a more problem-solving-focused type of rumination (i.e., reflective rumination), resulting in reduced PPU.

Overall, it is important to note that these findings are preliminary and require further investigation. Yet, mental health professionals might consider informing their clients that impairments associated with PPU may be related to rumination, and that employing more maladaptive types of rumination (i.e., brooding) may exacerbate PPU, while employing more adaptive forms of rumination (i.e., reflective rumination) may potentially relate to lower levels of PPU, especially among men.

Limitations, Strengths and Future Directions

This study is the first to examine the association between PPU and rumination both cross-sectionally and longitudinally, as well as considering gender differences in a sample of Hungarian young adults. Previous studies on problematic online behaviors and rumination have all been cross-sectional (i.e., 42 studies, Castro-Calvo et al., 2022)., However, when interpretating the results, the study's limitations should be considered. First, this study did not examine the specific genres of pornographic material consumed by participants, and rumination levels may vary between professional and amateur content, which could contribute to rumination severity. Second, even though the study had a longitudinal design, it is not possible to establish causal relationships between the study variables. Third, this study was based on self-reported data, which could be subject to bias due to the participants' responses (e.g., under- or over reporting, recall biases). This concern is particularly relevant for questions pertaining to sensitive topics often associated with feelings of shame and stigma, such as PPU. Fourth, participants' sexual orientation was not assessed. Future studies should include gender minority individuals as well as a greater sample size with different cultural backgrounds, as the study's sample recruited adults from a Western, educated, industrialized, rich, and democratic (WEIRD) country, which limits the generalizability of the findings to other populations (Bőthe, Koós, et al., 2021). Fifth, although we observed significant associations, they should be interpreted with caution, as the data for the present study were collected during the COVID-19 pandemic. Given that COVID-19 had a significant negative impact on individuals' mental well-being, it may have increased feelings of loneliness and stress, both of which are known to influence pornography use and rumination. Sixth, the solitary or partnered nature of pornography use was not assessed in the present study. Further research is necessary to better understand how and why reflective rumination may reduce PPU over time among men.

Conclusion

Higher baseline levels of PPU predicted increased brooding and reflective rumination in both genders over a year, though effect

sizes were weak. In women, brooding rumination and PPU showed a bidirectional positive association, while in men, baseline reflective rumination had a negative association with PPU over time. We extend the current literature by testing the stress-reactive model of rumination (García et al., 2017), whereas previous research focused solely on the cognitive behavioral model of problematic internet use (Davis, 2001). The findings have raised important questions about the nature of rumination in relation to PPU, with brooding types of rumination and reflective types of rumination functioning potentially differently among men and women. Reflective rumination played a buffering role in PPU among men over time, indicating the unique contribution of different types of rumination to PPU, with significant gender differences. These findings might have important implications for future practice. Clinicians working with individuals exhibiting ruminative symptoms and PPU may incorporate inquiries regarding their clients' pornography use and types of rumination they engage in during therapeutic sessions to potentially mitigate rumination or reduce their PPU levels.

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References

Allen, A., Kannis-Dymand, L., & Katsikitis, M. (2017). Problematic internet pornography use: The role of craving, desire thinking, and metacognition. *Addictive Behaviors*, *70*, 65–71. https://doi.org/10.1016/j.addbeh.2017.02.001

Altin, M., De Leo, D., Tribbia, N., Ronconi, L., & Cipolletta, S. (2024). Problematic pornography use, mental health, and suicidality among young adults. *International Journal of Environmental Research and Public Health*, *21*(9), 1228. https://doi.org/10.3390/ijerph21091228

Ballester-Arnal, R., Castro-Calvo, J., García-Barba, M., Ruiz-Palomino, E., & Gil-Llario, M. D. (2021). Problematic and non-problematic engagement in online sexual activities across the lifespan. *Computers in Human Behavior*, *120*, 106774. https://doi.org/10.1016/j.chb.2021.106774

Baranowski, A. M., Vogl, R., & Stark, R. (2019). Prevalence and determinants of problematic online pornography use in a sample of German women. *The Journal of Sexual Medicine*, *16*(8), 1274–1282. https://doi.org/10.1016/j.jsxm.2019.05.010

Bastin, M., Mezulis, A. H., Ahles, J., Raes, F., & Bijttebier, P. (2015). Moderating effects of brooding and co-rumination on the relationship between stress and depressive symptoms in early adolescence: A multi-wave study. *Journal of Abnormal Child Psychology*, *43*(4), 607–618. https://doi.org/10.1007/s10802-014-9912-7

Borgogna, N. C., Duncan, J., & McDermott, R. C. (2018). Is scrupulosity behind the relationship between problematic pornography viewing and depression, anxiety, and stress? *Sexual Addiction & Compulsivity*, *25*(4), 293–318. https://doi.org/10.1080/10720162.2019.1567410

Borgogna, N. C., Griffin, K. R., Grubbs, J. B., & Kraus, S. W. (2022). Understanding differences in problematic pornography use: Considerations for gender and sexual orientation. *The Journal of Sexual Medicine*, *19*(8), 1290–1302. https://doi.org/10.1016/j.jsxm.2022.05.144

Bőthe, B., Demirgül, S. A., & Demetrovics, Z. (2023). Problematic Pornography Consumption Scale (PPCS). In C. U. Krägeloh, M. Alyami, & O. N. Medvedev (Eds.), *International handbook of behavioral health assessment* (pp. 1–16). Springer. https://doi.org/10.1007/978-3-030-89738-3_47-2

Bőthe, B., Koós, M., Nagy, L., Kraus, S. W., Potenza, M. N., & Demetrovics, Z. (2021). International Sex Survey: Study protocol of a large, cross-cultural collaborative study in 45 countries. *Journal of Behavioral Addictions*, *10*(3), 632–645. https://doi.org/10.1556/2006.2021.00063

Bőthe, B., Lonza, A., Štulhofer, A., & Demetrovics, Z. (2020). Symptoms of problematic pornography use in a sample of treatment considering and treatment non-considering men: A network approach. *The Journal of Sexual Medicine*, *17*(10), 2016–2028. https://doi.org/10.1016/j.jsxm.2020.05.030

Bőthe, B., Nagy, L., Koós, M., Demetrovics, Z., Potenza, M. N., International Sex Survey Consortium, Kraus, S. W., Demirgül, S. A., Gaudet, É., & Ballester-Arnal, R. (2024). Problematic pornography use across countries, genders, and sexual orientations: Insights from the International Sex Survey and comparison of different assessment tools. *Addiction*, *119*(5), 928–950. https://doi.org/10.1111/add.16431

Bőthe, B., Tóth-Király, I., Bella, N., Potenza, M. N., Demetrovics, Z., & Orosz, G. (2021). Why do people watch pornography? The motivational basis of pornography use. *Psychology of Addictive Behaviors*, *35*(2), 172–186. https://doi.org/10.1037/adb0000603

Bőthe, B., Tóth-Király, I., Demetrovics, Z., & Orosz, G. (2021). The short version of the Problematic Pornography Consumption Scale (PPCS-6): A reliable and valid measure in general and treatment-seeking populations. *The Journal of Sex Research*, *58*(3), 342–352. https://doi.org/10.1080/00224499.2020.1716205

Bőthe, B., Tóth-Király, I., Griffiths, M. D., Potenza, M. N., Orosz, G., & Demetrovics, Z. (2021). Are sexual functioning problems associated with frequent pornography use and/or problematic pornography use? Results from a large community survey including males and females. *Addictive Behaviors*, *112*, 106603. https://doi.org/10.1016/j.addbeh.2020.106603

Bőthe, B., Vaillancourt-Morel, M.-P., Bergeron, S., Hermann, Z., Ivaskevics, K., Kraus, S. W., & Grubbs, J. B. (2024). Uncovering the most robust predictors of problematic pornography use: A large-scale machine learning study across 16 countries. *Journal of Psychopathology and Clinical Science*, *133*(6), 489–502. https://doi.org/10.1037/abn0000913

Bőthe, B., Vaillancourt-Morel, M.-P., Dion, J., Paquette, M.-M., Massé-Pfister, M., Tóth-Király, I., & Bergeron, S. (2022). A longitudinal study of adolescents' pornography use frequency, motivations, and problematic use before and during the COVID-19 pandemic. *Archives of Sexual Behavior*, *51*(1), 139–156. https://doi.org/10.1007/s10508-021-02282-4

Brown, T. A. (2015). *Confirmatory factor analysis for applied research*. Guilford Press.

Browne, M. W., & Cudeck, R. (1992). Alternative ways of assessing model fit. *Sociological Methods & Research*, *21*(2), 230–258. https://doi.org/10.1177/0049124192021002005

Byrne, B. M. (2010). *Structural equation modeling with AMOS: Basic concepts, applications, and programming*. Routledge.

Byrne, B. M. (2013). *Structural equation modeling with AMOS: Basic concepts, applications, and programming*. Routledge. https://doi.org/10.4324/9780203807644

Caplan, S. E. (2002). Problematic internet use and psychosocial well-being: Development of a theory-based cognitive-behavioral measurement instrument. *Computers in Human Behavior*, *18*(5), 553–575.

Caplan, S. E. (2010). Theory and measurement of generalized problematic internet use: A two-step approach. *Computers in Human Behavior*, *26* (5), 1089–1097.

Cardoso, J., Ramos, C., Brito, J., & Almeida, T. C. (2022). Predictors of pornography use: Difficulties in emotion regulation and loneliness. *The Journal of Sexual Medicine*, *19*(4), 620–628. https://doi.org/10.1016/j.jsxm.2022.01.005

Castro-Calvo, J., Beltrán-Martínez, P., Flayelle, M., & Billieux, J. (2022). Rumination across internet use disorders (IUDs): A systematic review. *Current Addiction Reports*, *9*(4), 540–570. https://doi.org/10.1007/s40429-022-00442-7

Chen, L., Jiang, X., Luo, X., Kraus, S. W., & Bőthe, B. (2022). The role of impaired control in screening problematic pornography use: Evidence from cross-sectional and longitudinal studies in a large help-seeking male sample. *Psychology of Addictive Behaviors*, *36*(5), 537. https://doi.org/10.1037/adb0000714

Davis, R. A. (2001). A cognitive-behavioral model of pathological internet use. *Computers in Human Behavior*, *17*(2), 187–195. https://doi.org/10.1016/S0747-5632(00)00041-8

Demirgül, S. A., Demetrovics, Z., Czakó, A., Paksi, B., Kökönyei, G., & Bőthe, B. (2025). Bidirectional positive associations between problematic pornography use and body dissatisfaction in women and men: Findings among Hungarian young adults in a one-year longitudinal study. *Body Image*, *54*, 101940. https://doi.org/10.1016/j.bodyim.2025.101940

Demirgül, S. A., Sancar, I. V., Demetrovics, Z., & Bőthe, B. (2024). A Cronbach's alpha generalization meta-analysis study of the problematic pornography consumption scale. *Sexual Health & Compulsivity*, *31*(2), 101–122. https://doi.org/10.1080/26929953.2024.2317743

Dondzilo, L., Rieger, E., Palermo, R., Byrne, S., & Bell, J. (2016). Association between rumination factors and eating disorder behaviors in young women. *Advances in Eating Disorders*, *4*(1), 84–98. https://doi.org/10.1080/21662630.2015.1118642

Duffy, A., Dawson, D. L., & Das Nair, R. (2016). Pornography addiction in adults: A systematic review of definitions and reported impact. *The Journal of Sexual Medicine*, *13*(5), 760–777. https://doi.org/10.1016/j.jsxm.2016.03.002

Enders, C. K., & Bandalos, D. L. (2001). The relative performance of full information maximum likelihood estimation for missing data in structural equation models. *Structural Equation Modeling*, *8*(3), 430–457. https://doi.org/10.1207/S15328007SEM0803_5

Faul, F., Erdfelder, E., Lang, A. G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, *39*(2), 175–191. https://doi.org/10.3758/BF03193146

Gao, L., Yang, C., Yang, X., Chu, X., Liu, Q., & Zhou, Z. (2022). Negative emotion and problematic mobile phone use: The mediating role of rumination and the moderating role of social support. *Asian Journal of Social Psychology*, *25*(1), 138–151. https://doi.org/10.1111/ajsp.12471

García, F. E., Duque, A., & Cova, F. (2017). The four faces of rumination to stressful events: A psychometric analysis. *Psychological Trauma: Theory, Research, Practice, & Policy*, *9*(6), 758. https://doi.org/10.1037/tra0000289

Girouard, A., Dion, J., Bőthe, B., O'Sullivan, L., & Bergeron, S. (2021). Bullying victimization and sexual wellbeing in sexually active heterosexual, cisgender and sexual/gender minority adolescents: The mediating role of emotion regulation. *Journal of Youth & Adolescence*, *50*(11), 2136–2150. https://doi.org/10.1007/s10964-021-01471-7

Grant Weinandy, J. T., Lee, B., Hoagland, K. C., Grubbs, J. B., & Bőthe, B. (2023). Anxiety and compulsive sexual behavior disorder: A systematic review. *The Journal of Sex Research*, *60*(4), 545–557. https://doi.org/10.1080/00224499.2022.2066616

Guidry, R., Floyd, C. G., Volk, F., & Moen, C. E. (2020). The exacerbating impact of moral disapproval on the relationship between pornography use and depression, anxiety, and relationship satisfaction. *Journal of Sex & Marital Therapy*, *46*(2), 103–121. https://doi.org/10.1080/0092623X.2019.1654579

Ince, C., Yucel, M., Albertella, L., & Fontenelle, L. F. (2021). Exploring the clinical profile of problematic pornography use. *CNS Spectrums*, *26*(6), 648–657. https://doi.org/10.1017/S1092852920001686

Johnson, D. P., & Whisman, M. A. (2013). Gender differences in rumination: A meta-analysis. *Personality & Individual Differences*, *55*(4), 367–374. https://doi.org/10.1016/j.paid.2013.03.019

Kafka, M. P. (2010). Hypersexual disorder: A proposed diagnosis for DSM-V. *Archives of Sexual Behavior*, *39*(2), 377–400. https://doi.org/10.1007/s10508-009-9574-7

Kenny, D. A., Kaniskan, B., & McCoach, D. B. (2015). The performance of RMSEA in models with small degrees of freedom. *Sociological Methods & Research*, *44*(3), 486–507. https://doi.org/10.1177/0049124114543236

Kim, B.-N., & Kang, H. S. (2022). Differential roles of reflection and brooding on the relationship between perceived stress and life satisfaction during the COVID-19 pandemic: A serial mediation study. *Personality & Individual Differences*, *184*, 111–169. https://doi.org/10.1016/j.paid.2021.111169

Kingston, D. A., Fedoroff, P., Firestone, P., Curry, S., & Bradford, J. M. (2008). Pornography use and sexual aggression: The impact of frequency and type of pornography use on recidivism among sexual offenders. *Aggressive Behavior*, *34*(4), 341–351. https://doi.org/10.1002/ab.20250

Kircaburun, K., Griffiths, M. D., & Billieux, J. (2019). Trait emotional intelligence and problematic online behaviors among adolescents: The mediating role of mindfulness, rumination, and depression. *Personality & Individual Differences*, *139*(2), 208–213. https://doi.org/10.1016/j.paid.2018.11.024

Kohut, T., Balzarini, R. N., Fisher, W. A., Grubbs, J. B., Campbell, L., & Prause, N. (2020). Surveying pornography use: A shaky science resting on poor measurement foundations. *The Journal of Sex Research*, *57*(6), 722–742. https://doi.org/10.1080/00224499.2019.1695244

Kokonyei, G., Szabo, E., Kocsel, N., Edes, A., Eszlari, N., Pap, D., Magyar, M., Kovacs, D., Zsombok, T., Elliott, R., Anderson, I. M., William Deakin, J. F., Bagdy, G., & Juhasz, G. (2016). Rumination in migraine: Mediating effects of brooding and reflection between migraine and psychological distress. *Psychology & Health*, *31*(12), 1481–1497. https://doi.org/10.1080/08870446.2016.1235166

Koós, M., Nagy, L., Kraus, S. W., Demetrovics, Z., Potenza, M. N., Gaudet, É., Ballester-Arnal, R., Batthyány, D., Bergeron, S., Billieux, J., Briken, P., Burkauskas, J., Cárdenas-López, G., Carvalho, J., Castro-Calvo, J., Chang, Y.-H., Chen, L., Ciocca, G., Corazza, O., … Van Hout, M. C. (2024). Why do people watch pornography? Cross-cultural validation of the Pornography Use Motivations Scale (PUMS) and its short form (PUMS-8). *The Journal of Sex Research*, *62*(6), 1049–1065. https://doi.org/10.1080/00224499.2024.2359641

Kraus, S. W., Krueger, R. B., Briken, P., First, M. B., Stein, D. J., Kaplan, M. S., Voon, V., Abdo, C. H., Grant, J. E., & Atalla, E. (2018). Compulsive sexual behavior disorder in the ICD-11. *World Psychiatry*, *17*(1), 109. https://doi.org/10.1002/wps.20499

Krause, K., Bischof, A., Lewin, S., Guertler, D., Rumpf, H.-J., John, U., & Meyer, C. (2018). Explaining the relation between pathological gambling and depression: Rumination as an underlying common cause. *Journal of Behavioral Addictions*, *7*(2), 384–391. https://doi.org/10.1556/2006.7.2018.38

LaRose, R., Lin, C. A., & Eastin, M. S. (2003). Unregulated internet usage: Addiction, habit, or deficient self-regulation? *Media Psychology*, *5*(3), 225 253. https://doi.org/10.1207/S1532785XMEP0503_01

Lee, E. (2018). *Sexual desire and sexual activity among individuals in romantic relationships: A longitudinal perspective* [Master's thesis, Northern Illinois University]. Graduate Research Theses & Dissertations. https://huskiecommons.lib.niu.edu/allgraduate-theses dissertations/4896

Leonardi, J., Fimiani, R., Faccini, F., Gorman, B. S., Bush, M., & Gazzillo, F. (2020). An empirical investigation into pathological worry and rumination: Guilt, shame, depression, and anxiety. *Psychology Hub*, *37*(3), 31–42. https://doi.org/10.13133/2724-2943/17229

Maddock, M. E., Steele, K., Esplin, C. R., Hatch, S. G., & Braithwaite, S. R. (2019). What is the relationship among religiosity, self-perceived problematic pornography use, and depression over time? *Sexual Addiction & Compulsivity*, *26*(3–4), 211 238. https://doi.org/10.1080/10720162.2019.1645061

McEvoy, P. M., & Brans, S. (2013). Common versus unique variance across measures of worry and rumination: Predictive utility and

mediational models for anxiety and depression. *Cognitive Therapy and Research*, *37*(1), 183–196. https://doi.org/10.1007/s10608-012-9448-5

Mitra, R., & Rangaswamy, M. (2019). Excessive social media use and its association with depression and rumination in an Indian young adult population: A mediation model. *Journal of Psychosocial Research*, *14* (1), 223–23. https://doi.org/10.32381/JPR.2019.14.01.24

Monroe, S. M. (2008). Modern approaches to conceptualizing and measuring human life stress. *Annual Review of Clinical Psychology*, *4*(1), 33–52. https://doi.org/10.1146/annurev.clinpsy.4.022007.141207

Muthén, B., & Muthén, L. (2017). Mplus. In W. J. van der Linden (Ed.), *Handbook of item response theory* (Vol. 3, pp. 507–518). Chapman and Hall/CRC.

Newman, D. A. (2014). Missing data: Five practical guidelines. *Organizational Research Methods*, *17*(4), 372–411. https://doi.org/10.1177/1094428114548590

Newman, D. B., & Nezlek, J. B. (2019). Private self-consciousness in daily life: Relationships between rumination and reflection and well-being and meaning in daily life. *Personality & Individual Differences*, *136*, 184–189. https://doi.org/10.1016/j.paid.2017.06.039

Nolen-Hoeksema, S. (1991). Responses to depression and their effects on the duration of depressive episodes. *Journal of Abnormal Psychology*, *100*(4), 569. https://doi.org/10.1037/0021-843X.100.4.569

Nolen-Hoeksema, S., & Harrell, Z. A. (2002). Rumination, depression, and alcohol use: Tests of gender differences. *Journal of Cognitive Psychotherapy*, *16*(4), 391–403. https://doi.org/10.1891/jcop.16.4.391.52526

Orth, U., Berking, M., & Burkhardt, S. (2006). Self-conscious emotions and depression: Rumination explains why shame but not guilt is maladaptive. *Personality & Social Psychology Bulletin*, *32*(12), 1608–1619. https://doi.org/10.1177/0146167206292958

Paquette, M.-M., Dion, J., Bőthe, B., Girouard, A., & Bergeron, S. (2022). Heterosexual, cisgender and gender and sexually diverse adolescents' sexting behaviors: The role of body appreciation. *Journal of Youth & Adolescence*, *51*(2), 278–290. https://doi.org/10.1007/s10964-021-01568-z

Peixoto, M. M., & Ribeiro, V. (2022). Repetitive negative thinking and sexual functioning in Portuguese men and women: A cross-sectional study. *International Journal of Sexual Health*, *34*(4), 567–576. https://doi.org/10.1080/19317611.2022.2084201

Perry, S. L. (2018). Pornography use and depressive symptoms: Examining the role of moral incongruence. *Society and Mental Health*, *8*(3), 195–213. https://doi.org/10.1177/2156869317728373

Prause, N., & Pfaus, J. (2015). Viewing sexual stimuli associated with greater sexual responsiveness, not erectile dysfunction. *Sexual Medicine*, *3*(2), 90–98. https://doi.org/10.1002/sm2.58

Reid, R. C., Li, D. S., Gilliland, R., Stein, J. A., & Fong, T. (2011). Reliability, validity, and psychometric development of the Pornography Consumption Inventory in a sample of hypersexual men. *Journal of Sex & Marital Therapy*, *37*(5), 359–385. https://doi.org/10.1080/0092623X.2011.607047

Rissel, C., Richters, J., De Visser, R. O., McKee, A., Yeung, A., & Caruana, T. (2017). A profile of pornography users in Australia: Findings from the second Australian study of health and relationships. *The Journal of Sex Research*, *54*(2), 227–240. https://doi.org/10.1080/00224499.2016.1191597

Robinson, M. S., & Alloy, L. B. (2003). Negative cognitive styles and stress-reactive rumination interact to predict depression: A prospective study. *Cognitive Therapy and Research*, *27*(3), 275–291. https://doi.org/10.1023/A:1023914416469

Ross, M. W., Månsson, S.-A., & Daneback, K. (2012). Prevalence, severity, and correlates of problematic sexual internet use in Swedish men and women. *Archives of Sexual Behavior*, *41*(2), 459–466. https://doi.org/10.1007/s10508-011-9762-0

Sassover, E., Abrahamovitch, Z., Amsel, Y., Halle, D., Mishan, Y., Efrati, Y., & Weinstein, A. (2023). A study on the relationship between shame, guilt, self-criticism and compulsive sexual behavior disorder. *Current Psychology*, *42*(10), 8347–8355. https://doi.org/10.1007/s12144-021-02188-3

Satyshur, M. D., Layden, E. A., Gowins, J. R., Buchanan, A., & Gollan, J. K. (2018). Functional connectivity of reflective and brooding rumination in depressed and healthy women. *Cognitive, Affective & Behavioral Neuroscience*, *18*(5), 884–901. https://doi.org/10.3758/s13415-018-0611-7

Singareddy, C., Shrestha, S., Zheng, A., Harlow, B. L., Barrington-Trimis, J. L., & Harlow, A. F. (2025). Prospective association of symptoms of depression and anxiety with pornography viewing frequency among young adults. *Archives of Sexual Behavior*, *54*(2), 749–759. https://doi.org/10.1007/s10508-024-03024-y

Sirois, F., & Bean, M. (2016). Rumination and health behaviours: A self-regulation resource perspective. *The European Health Psychologist*, *2*, 218–222. https://doi.org/10.1016/j.pmedr.2015.03.006

Sniewski, L., & Farvid, P. (2020). Hidden in shame: Heterosexual men's experiences of self-perceived problematic pornography use. *Psychology of Men & Masculinities*, *21*(2), 201–212. https://doi.org/10.1037/men0000232

Solano, I., Eaton, N. R., & O'Leary, K. D. (2018). Pornography consumption, modality and function in a large internet sample. *The Journal of Sex Research*, *57*(1), 92–103. https://doi.org/10.1080/00224499.2018.1532488

Takano, K., & Tanno, Y. (2009). Self-rumination, self-reflection, and depression: Self-rumination counteracts the adaptive effect of self-reflection. *Behaviour Research and Therapy*, *47*(3), 260–264. https://doi.org/10.1016/j.brat.2008.12.008

Treynor, W., Gonzalez, R., & Nolen-Hoeksema, S. (2003). Rumination reconsidered: A psychometric analysis. *Cognitive Therapy and Research*, *27*(3), 247–259. https://doi.org/10.1023/A:1023910315561

Wells, A., & Capobianco, L. (2020). Rumination. In V. Zeigler-Hill (Ed.), *Encyclopedia of personality and individual differences* (pp. 4527–4532). Springer. https://doi.org/10.1007/978-3-319-24612-3_854

Wéry, A., & Billieux, J. (2017). Problematic cybersex: Conceptualization, assessment, and treatment. *Addictive Behaviors*, *64*, 238–246. https://doi.org/10.1016/j.addbeh.2015.11.007

Willoughby, B. J., Carroll, J. S., Nelson, L. J., & Padilla-Walker, L. M. (2014). Associations between relational sexual behaviour, pornography use, and pornography acceptance among US college students. *Culture, Health & Sexuality*, *16*(9), 1052–1069. https://doi.org/10.1080/13691058.2014.927075

World Health Organization. (2022). *International statistical classification of diseases and related health problems: Alphabetical index* (Vol. 3).

Wright, P. J., Tokunaga, R., & Herbenick, D. (2023). But do porn sites get more traffic than TikTok, OpenAI, and Zoom? *The Journal of Sex Research*, *60*(6), 763–767. https://doi.org/10.1080/00224499.2023.2220690

Yang, C., Carter, M. D. K., Webb, J. J., & Holden, S. M. (2020). Developmentally salient psychosocial characteristics, rumination, and compulsive social media use during the transition to college. *Addiction Research & Theory*, *28*(5), 433–442. https://doi.org/10.1080/16066359.2019.1682137

Zheng, X., Chen, H., Wang, Z., Xie, F., & Bao, Z. (2021). Online violent video games and online aggressive behavior among Chinese college students: The role of anger rumination and self-control. *Aggressive Behavior*, *47*(5), 514–520. https://doi.org/10.1002/ab.21967