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The Development of the Problematic Pornography Consumption Scale (PPCS)

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To date, no short scale exists with strong psychometric properties that can assess problematic pornography consumption based on an overarching theoretical background. The goal of the present study was to develop a brief scale, the Problematic Pornography Consumption Scale (PPCS), based on Griffiths's (2005) six-component addiction model that can distinguish between nonproblematic and problematic pornography use. The PPCS was developed using an online sample of 772 respondents (390 females, 382 males; M_{age} = 22.56, SD = 4.98 years). Creation of items was based on previous problematic pornography use instruments and on the definitions of factors in Griffiths's model. A confirmatory factor analysis (CFA) was carried out—because the scale is based on a well-established theoretical model—leading to an 18-item second-order factor structure. The reliability of the PPCS was excellent, and measurement invariance was established. In the current sample, 3.6% of the users belonged to the at-risk group. Based on sensitivity and specificity analyses, we identified an optimal cutoff to distinguish between problematic and nonproblematic pornography users. The PPCS is a multidimensional scale of problematic pornography use with a strong theoretical basis that also has strong psychometric properties in terms of factor structure and reliability.

Online pornography consumption is a widespread phenomenon (Edelman, 2009; Haggstrom-Nordin, Hanson, & Tydén, 2005; Hald & Mulya, 2013; Stulhofer, Busko, & Landripet, 2010). Pornography websites are among the top 50 most visited websites worldwide (Alexa.com, 2016; Similarweb.com, 2016), and more than 90% of adults have viewed pornography in their lives (Hald, 2006; Traeen, Spitznogle, & Beverfjord, 2004). In 2016, one of the most popular pornography websites, Pornhub.com, reported that 4.599 billion hours of pornographic videos were watched worldwide. Their statistics also showed that the website was visited approximately 23 billion times, meaning that around 44,000 people visited the site every minute (Pornhub.com, 2017). In most cases, viewing is not problematic and appears to have little or no negative impact in a person's life. However, it can become problematic and can have negative effects, such as problems in romantic relationships or losing a job, as has been reported in previous studies (e.g., Bergner & Bridges, 2002; Bostwick & Bucci, 2008; Ford, Durtschi, & Franklin, 2012). In light of these numbers and findings, it appears to be important to have a multidimensional, theory-driven instrument with strong psychometric properties that can assess individual differences in online pornography use to distinguish between problematic and nonproblematic users and the potential negative consequences of pornography consumption on different groups.

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Pornography may mean different things to both researchers and research participants. Therefore, a working definition of pornography is needed prior to assessment (Ayres & Haddock, 2009). However, according to a relatively recent review by Short, Black, Smith, Wetterneck, and Wells (2012), 84% of the scientific research studies into pornography either did not define pornography and/or did not report whether the research had provided a definition of pornography for their participants. Hald (2006) used a definition that includes the role of pornography in the creation or enhancement of sexual feelings and thoughts while genitals and/or sexual acts are explicitly shown. This definition was used and refined in later research (Hald & Malamuth, 2008; Reid, Li, Gilliland, Stein, & Fong, 2011) and was employed in the present research. According to this definition, "pornography should 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, such as vaginal or anal intercourse, oral sex, or masturbation" (Reid, Li, et al., 2011, p. 364).

The assessment of problematic online pornography use is inconsistent, indicating that findings in the area are not comparable (Wéry & Billieux, 2017). According to a recent systematic review (Short et al., 2012), 95% of researchers used scales and questions that were generated by the authors. Most of the preexisting psychometric scales did not have a strong theoretical underpinning, and they assessed only frequency of pornography use and/or time spent using it (e.g., Lam & Chan, 2007; Lo & Wei, 2005; Meerkerk, Eijnden, & Garretsen, 2006; Stack, Wasserman, & Kern, 2004; Traeen et al., 2004; Yoder, Virden, & Amin, 2005). In the early 2000s, questionnaires and scales were created that included the topic of problematic online pornography use. However, these instruments mainly concentrated on wider concepts such as sexual addiction, cybersex, or the use of Internet for sexual purposes (e.g., Carnes & Wilson, 2002; Delmonico & Miller, 2003; Laier, Pawlikowski, Pekal, Schulte, & Brand, 2013). Furthermore, hypersexuality, compulsive pornography use, and compulsive sexual behavior were assessed using several different scales (e.g., Coleman, Miner, Ohlerking, & Raymond, 2001; Noor, Rosser, & Erickson, 2014; Reid, Garos, & Carpenter, 2011; Womack, Hook, Ramos, Davis, & Penberthy, 2013), and only three instruments focused on the narrower concept of problematic pornography use. The nine-item Cyber Pornography Use Inventory (CPUI-9) was created on the basis of the CPUI-31; therefore, the psychometric properties and the factor structure of the CPUI-9 are the only ones taken into consideration here (Grubbs, Sessoms, Wheeler, & Volk, 2010; Grubbs, Volk, Exline, & Pargament, 2015; Kor et al., 2014; Wéry & Billieux, 2017). The CPUI-9 (Grubbs et al., 2015) has three factors (compulsivity, effort, distress), and the Problematic Pornography Use Scale (PPUS; Kor et al., 2014) has four factors (distress and functional problems, excessive use, control difficulties, and use to escape/avoid negative emotions). Kor et al. (2014) integrated previous problematic pornography, Internet use, and hypersexual disorder questionnaires to identify these factors. However, as a result of the rather inductive research design, neither the CPUI nor the PPUS has a very strong theoretical background in contrast to other forms of behavioral addiction or problematic online behaviors. Furthermore, neither the CPUI nor PPUS included all of the potential dimensions of problematic pornography use (e.g., withdrawal or relapse). The present study aimed to fill this gap by using a deductive strategy and Griffiths's (2005) components model to assess problematic online pornography use because it has been used in the development of many psychometrically robust instruments assessing excessive problematic behavior, including social networking (Bányai et al., 2017), gaming (Lemmens, Valkenburg, & Peter, 2009), exercise (Terry, Szabo, & Griffiths, 2004), shopping (Andreassen et al., 2015), television series watching (Orosz, Bőthe, & Tóth-Király, 2016), work (Andreassen, Griffiths, Hetland, & Pallesen, 2012), and use of Tinder (Orosz, Tóth-Király, Bőthe, & Melher, 2016).

Building on the previous problematic use conceptualizations and scales, the multidimensional Problematic Pornography Consumption Scale (PPCS) was developed on the theoretical basis of Griffiths's addiction components model (Griffiths, 2001, 2005). However, it is important to note that the PPCS was established to assess problematic pornography use, not addiction, because addiction cannot be assessed on the basis of self-report alone without an in-depth clinical interview (Ross, Mansson, & Daneback, 2012). Accordingly, problematic pornography use included six core elements. The first element is *salience*, referring to the high importance of pornography in the person's life, such that it dominates his or her thinking, feelings, and behaviors. The second component refers to *mood modification* as a subjective experience that users report as a consequence of viewing pornography. This experience can be either arousing or relaxing depending on the desired emotional state. The third dimension is *conflict*, including interpersonal conflicts between problematic users and their significant others, occupational or educational conflicts (depending upon the individual's age), and intrapsychic conflicts (e.g., knowing the activity is causing problems but feeling unable to cut down or cease). The fourth dimension is *tolerance* and refers to the process whereby increasing amounts of the activity are required to achieve the same mood-modifying effects. In the present study, similarly to other arousal behavioral addictions, the quantitative and qualitative aspects of tolerance were our focus. The quantitative dimension refers to the growing amount of pornography use over time, whereas the qualitative aspect refers to consuming more diverse and extreme pornographic content. According to Zimbardo and Duncan (2012), this qualitative aspect of arousal-based behavioral addictions is related to seeking constantly novel and surprising content. In the case of pornography this can be related to moving from soft-core pornography toward its more extreme, hard-core forms. The fifth dimension is related to *relapse* and is the tendency for repeated reversions to earlier patterns of pornography use

and returning to it quickly after abstinence or control. The sixth factor is *withdrawal*, referring to unpleasant feelings and emotional states that occur when the particular activity is discontinued or suddenly reduced.

As withdrawal and tolerance are usually understood as a consequence of "dependence" (O'Brien, Volkow, & Li, 2006), addiction is a broader construct involving all six components described, in line with diagnostic addiction criteria employed in modern psychiatric nosology (American Psychiatric Association, 2013; World Health Organization, 1992). As dependence and addiction are usually viewed as different constructs, the frequency of pornography use and time spent engaging in the activity alone cannot be considered as a satisfactory definition of pornography addiction. It is probable that some individuals visit online pornography websites on a very regular basis, but they can stop the activity when it is necessary and they experience few, if any, negative or detrimental effects (Kor et al., 2014). Recent research has confirmed this, because the relationship between the frequency and duration of pornography use and problematic behavior itself is positive but only moderate (e.g., Brand et al., 2011; Grubbs et al., 2015; Twohig, Crosby, & Cox, 2009). Addiction and problematic use are overlapping concepts along the same continuum. However, it is more appropriate to use the term *problematic use* instead of *addiction*, when clinical evidence of an actual addiction cannot be provided with the use of self-reported data (Ross et al., 2012).

Considering (a) the pervasive presence of pornography use, (b) the lack of a strongly theory-driven psychometric scale regarding problematic pornography use, and (c) the lack of potentially important components of problematic pornography use in previous instruments, the goal of the present study was to create a comprehensive psychometric scale that addresses the weakness of previous instruments. Consequently, the aim of the present study was to develop a short, valid, reliable, multidimensional scale that encompasses the most important aspects of problematic pornography use based on the most extensively tested model of behavioral addictions and problematic online behaviors.

Method

Participants and Procedure

The study was conducted in accordance with the Declaration of Helsinki and with the approval of the institutional review board of the research team's university. The research was conducted via an online questionnaire, and completing it took approximately 15 minutes. Data collection occurred in June 2016 on a public, topic-irrelevant Facebook page that has approximately 217,000 members. Therefore, the collected data were not representative of the population of Hungary. Before starting the questionnaire, participants received detailed information about the study. Subsequently, participants read and approved the informed consent, and they also had to indicate that they were 18 years or older.

A total of 1,102 participants were recruited for this research using this online sampling method. Before the analyses, the data were screened and participants were removed for the following reasons: They did not wish to participate in this study (37 individuals); they were underage (30 participants); or they had the same answer to every questionnaire item (15 individuals). In addition, those individuals were also excluded who indicated that they had not used pornography in the past six months (248 individuals).

Therefore, a total of 772 participants (females = 390, 50.5%; males = 382, 45.5%) were retained for further analyses who were between ages 18 and 54 (M_{age} = 22.58, SD_{age} = 4.89). Of these participants, 279 lived in a capital city (36.1%), 89 in county towns (11.5%), 286 in towns (37.0%), and 118 in villages (15.3%). Regarding their level of education, 91 had a primary school degree (11.8%), 532 had a high school degree (68.9%), and 149 of them had a degree in higher education (i.e., bachelor's, master's, or doctorate) (19.3%). Regarding their relationship status, 394 were single (51.0%), 360 were in a relationship (46.6%), and 18 were married (2.3%). Regarding sexual orientation, 621 respondents were heterosexual (80.4%), 82 were heterosexual with homosexuality to some extent (10.6%), 37 were bisexual (4.8%), 10 were homosexual with heterosexuality to some extent (1.3%), 13 were homosexual (1.7%), two were asexual (0.3%), and seven were unsure about their sexual orientation (0.9%). In the past six months, the average frequency of viewing online pornographic videos was weekly, and the average time spent viewing pornography per occasion was 16 to 30 minutes.

Measures

Problematic Pornography Consumption Scale. To match Griffiths's (2005) components, the definitions of each component were taken into account. Following this, previous pornography addiction items were considered as potential items in the new instrument (i.e., Grubbs et al., 2010; Kor et al., 2014). However, the strategy of pooling the preexisting items and analyzing them was not chosen, because the available items (i.e., Grubbs et al., 2010; Grubbs et al., 2015; Kor et al., 2014) did not include two important components (withdrawal and relapse) and other components were also underrepresented. Finally, to have similar wording to other specific and psychometrically robust problematic behavior scales (e.g., Andreassen et al., 2012; Orosz, Bőthe, et al., 2016, Orosz, Tóth-Király, et al., 2016), the items of these scales were considered as a basis of the items of the PPCS. On the basis of these guidelines, a focus group of psychologists (two men and two women, M_{age} = 27.5 years, SD_{age} = 4.65) created four items per component. To minimize group decision-making biases, an iterative approach was applied. Members first discussed their thoughts in pairs and then in the focus group. Each item had to be (a) close to the everyday language used when

talking about pornography; (b) easy to understand; (c) concise; (d) clearly belonging to the given dimension but not to the others; (e) not double-barreled; (h) not suggestive; and (i) adjusted to the scaling. To include items that matched Griffiths's (2005) components, no previous items from alternative problematic pornography instruments remained unchanged. In addition, no previous items in the Griffiths's model kept the original wording because the subject of the items was replaced with the word *porn*, but all other content in the items remained the same. After the focus group created the items, two experts in the addictive behavior field refined the items. In the final step of item creation, six individuals (young men and women, not psychologists) pretested the items to determine whether they were understandable and close to everyday language use. The final items of the PPCS can be seen in the appendix.

Subjective Well-Being Scale. The Subjective Well-Being (SWB) scale (Diener, Emmons, Larsen, & Griffin, 1985) is a five-item, one-factor scale assessing overall satisfaction with life on a 4-point Likert scale, ranging from 1 = *Not true to me at all* to 4 = *Absolutely true to me* (α = .82).

UCLA Loneliness Scale Version Three. The Revised UCLA Loneliness scale (Russell, 1996) includes 20 items (nine items are reverse-coded) and assesses feelings of social isolation, lack of connectedness, and subjective feelings of loneliness (e.g., "How often do you feel that you are no longer close to anyone?"). In the present study, a pretested shortened version of eight items—including reverse-coded items as well—with acceptable validity was used (comparative fix index [CFI] = .973; Tucker-Lewis index [TLI] = .962; root mean square error of approximation [RMSEA] = .074 [90% confidence interval (CI) = .060 to .089]) and reliability (α = .90) (Bőthe, 2016). Respondents rated each item on a 4-point scale (1 = *Never*; 4 = *Always*). Higher scores on the scale indicate higher levels of loneliness-related feelings (α = .91).

Relationship Satisfaction. Relationship satisfaction was assessed using a single item ("In general, how satisfied are you with your relationship?") of the Relationship Assessment Scale (Hendrick, 1988; Martos, Sallay, Szabó, Lakatos, & Tóth-Vajna, 2014). Participants responded using a 5-point scale (1 = *Not satisfied*; 5 = *Very satisfied*). This item showed strong positive correlation with the summed score of the Relationship Assessment Scale in previous samples (correlations ranged between .84 and .86); therefore, the use of this one item was deemed sufficient. (For further information, contact the corresponding author.)

Sexuality- and Pornography-Related General Questions. In addition to standard demographic variables, some topic-relevant questions were asked. Sexual satisfaction was asked with one item: "In general how satisfied with your sexual life?" (5-point Likert scale, 1 = *Not satisfied*; 5 = *Very satisfied*). Frequency of masturbation was asked with one item: "How often do you masturbate?" (9-point Likert scale, 1 = *Never*; 9 = *Several times a day*). In addition, they were asked: "How often do you watch pornography when you masturbate?" (5-point Likert scale, 1 = *Never*; 5 = *Very often*). Respondents were also asked about the age of their first sexual and pornographic experience. Finally, they were asked about the frequency of reading sexuality-related online stories, viewing pictures, and watching videos (9-point Likert scale, 1 = *Never*; 9 = *Several times a day*).

Statistical Analysis

For the statistical analysis, SPSS 21 and Mplus 7.3 (Muthén & Muthén, 1998–2012) were used. The initial version of the PPCS comprised 24 items. Each of these items was examined based on three criteria (Fahlman, Mercer-Lynn, Flora, & Eastwood, 2013): (a) corrected item-total correlations, (b) skewness and kurtosis values for normality, and (c) content validity compared to other items and the definitions of each problematic use dimension.

After the item selection, confirmatory factor analysis (CFA) was used to assess the dimensionality of the scale. Because the items had severe floor effects in terms of skewness and kurtosis, they were treated as categorical indicators, and the mean- and variance-adjusted weighted least squares estimator (WLSMV) was used (Finney & DiStefano, 2006). In the structural assessment, commonly used goodness of fit indices (Brown, 2015; Kline, 2011) were observed with their acceptable or good cutoff values (Bentler, 1990; Brown, 2015; Browne & Cudeck, 1993; Hu & Bentler, 1999; Schermelleh-Engel, Moosbrugger, & Müller, 2003; Tabachnick & Fidell, 2013): the CFI (≥ .95 for good, ≥ .90 for acceptable), the TLI (≥ .95 for good, ≥ .90 for acceptable), and the RMSEA (≤ .06 for good, ≤ .08 for acceptable) with a 90% CI. Reliability was assessed using Cronbach's alpha (Nunnally, 1978).

To test structural invariance between gender groups (male versus female), several multigroup CFAs were carried out (Meredith, 1993; Vandenberg, 2002; Vandenberg & Lance, 2000). First, the models were estimated freely for both male and female subgroups. Second, four nested models with increasingly constrained parameters were estimated: (a) factor loadings and thresholds were freely estimated (configural invariance), (b) factor loadings were set to be equal (metric invariance), (c) factor loadings and thresholds were set to be equal (scalar invariance), and (d) factor loadings, thresholds, and residual variances were constrained to be equal (residual invariance). Achieving this latter level of invariance is a prerequisite to group-based comparisons based on aggregated manifest scores. When comparing the increasingly constrained models, relative change in fit indices was observed

(Chen, 2007; Cheung & Rensvold, 2002; Marsh et al., 2009): ΔCFI ≤ .010; ΔTLI ≤ .010; ΔRMSEA ≤ .015.

To identify possible groups of pornography users whose activity could be considered problematic, latent profile analysis (LPA) was used. LPA is a person-centered mixture modeling technique that can classify subgroups of people who gave similar responses to the six dimensions (Collins & Lanza, 2010). The analysis was performed with two to four classes on the full sample. To determine the number of latent classes, several indices were used: the Akaike information criterion (AIC), the Bayesian information criterion (BIC), and the sample-size-adjusted Bayesian information criterion (SSABIC), where lower values indicate more parsimonious models. Entropy was also examined, indicating the accuracy of the classification process. Higher values indicate higher accuracy, with .40 being low, .60 being medium, and .80 being high entropy (Clark & Muthén, 2009). Finally, the Lo-Mendell-Rubin adjusted likelihood ratio test (L-M-R test) was also used, which compares the estimated model (e.g., three classes) with a model having one less class (e.g., two classes). A statistically significant p value ($p < .05$) suggests that the model with more classes fits the data better (Muthén & Muthén, 1998–2012). These groups were then compared along several key variables with analysis of variance (ANOVA) and the Bonferroni post hoc test.

To determine the cutoff point for the PPCS, a sensitivity analysis was carried out based on membership in the at-risk group in the LPA. Considering the membership in this group as a gold standard, the sensitivity, specificity, positive predictive value, negative predictive value, and accuracy values for all PPCS cutoff points were calculated. Sensitivity was defined as the proportion of true positives belonging to the most problematic group based on the LPA, while specificity was defined as the proportion of the true negatives (Altman & Bland, 1994a; Glaros & Kline, 1988). Positive predictive value was defined as the proportion of the individuals with positive test results correctly diagnosed as problematic users, while negative predictive value was defined as the proportion of participants with negative test results correctly diagnosed as nonproblematic users (Altman & Bland, 1994b; Glaros & Kline, 1988).

Results

Dimensionality and Structural Validity

In the first part of the analysis, each of the initial 24 items were examined based on (a) their corrected item-total correlations, (b) normality in terms of skewness and kurtosis, and (c) content validity compared to the other items and pornography viewing in general. Three items per factor were chosen in order to have a concise and nonrepetitive item set. The final items were chosen as a result of high item-total correlation and relatively low kurtosis and skewness values. Furthermore, the aim was to keep the diversity of wording.

Next, CFA was performed on the selected items due to the well-established theoretical model. The CFA results showed that the theory-based hierarchical model with six factors and a superordinated problematic use dimension (CFI = .977, TLI = .973, RMSEA = .064 [90% CI .059 to .070]) had adequate fit. Factor loadings were high (ranging from .69 to .96), and the six components loaded strongly on the general factor (ranging from .83 to .92) (see Figure 1). This 18-item, six-factor model provides the opportunity to investigate the role of each factor in the development and maintenance of problematic use.

Measurement Invariance

To ensure that group-based comparisons are meaningful, measurement invariance was employed to examine the factor structure of the scale across two subgroups. The results of the invariance analysis are shown in Table 1. In step zero, the baseline models were estimated for both males and females, showing good fit. Then, parameters were gradually constrained and changes in fit indices were observed. In the configural model (model 1), all parameters were freely estimated and the fit indices were within the range of acceptability (CFI = .975, TLI = .970, RMSEA = .065 [90% CI .059 to .071]). In the metric model (model 2), factor loadings were constrained to be equal, resulting in negligible differences in fit indices (ΔCFI = −.002; ΔTLI = .000; ΔRMSEA = .000). In the scalar invariance model (model 3), factor loadings and thresholds were set to be equal in both groups, again showing adequacy in terms of fit index changes (ΔCFI = .001; ΔTLI = .008; ΔRMSEA = −.009). In the last step, strict invariance model (model 4), residual variances were constrained to be equal, and there was no significant deterioration of fit indices compared to the preceding model (ΔCFI = .003; ΔTLI = .003; ΔRMSEA = −.005). Fit indices incorporating a control for parsimony (TLI and RMSEA) even resulted in improvements when equality constraints were added, supporting the comparability of the PPCS across gender groups.

Gender, Age, Educational Level, and Place of Residence Differences

The descriptive statistics of the PPCS are shown in Table 2. PPCS scores weakly correlated with the time spent viewing pornography per occasion (r (770) = .14, $p < .01$). PPCS correlated with the frequency of reading online pornographic stories (r (770) = .13, $p < .01$), online pornography picture viewing (r (770) = .27, $p < .01$), and online pornography video viewing (r (770) = .47, $p < .01$). The frequency of masturbation positively correlated with PPCS scores (r (770) = .38, $p < .01$), and the frequency of pornography consumption

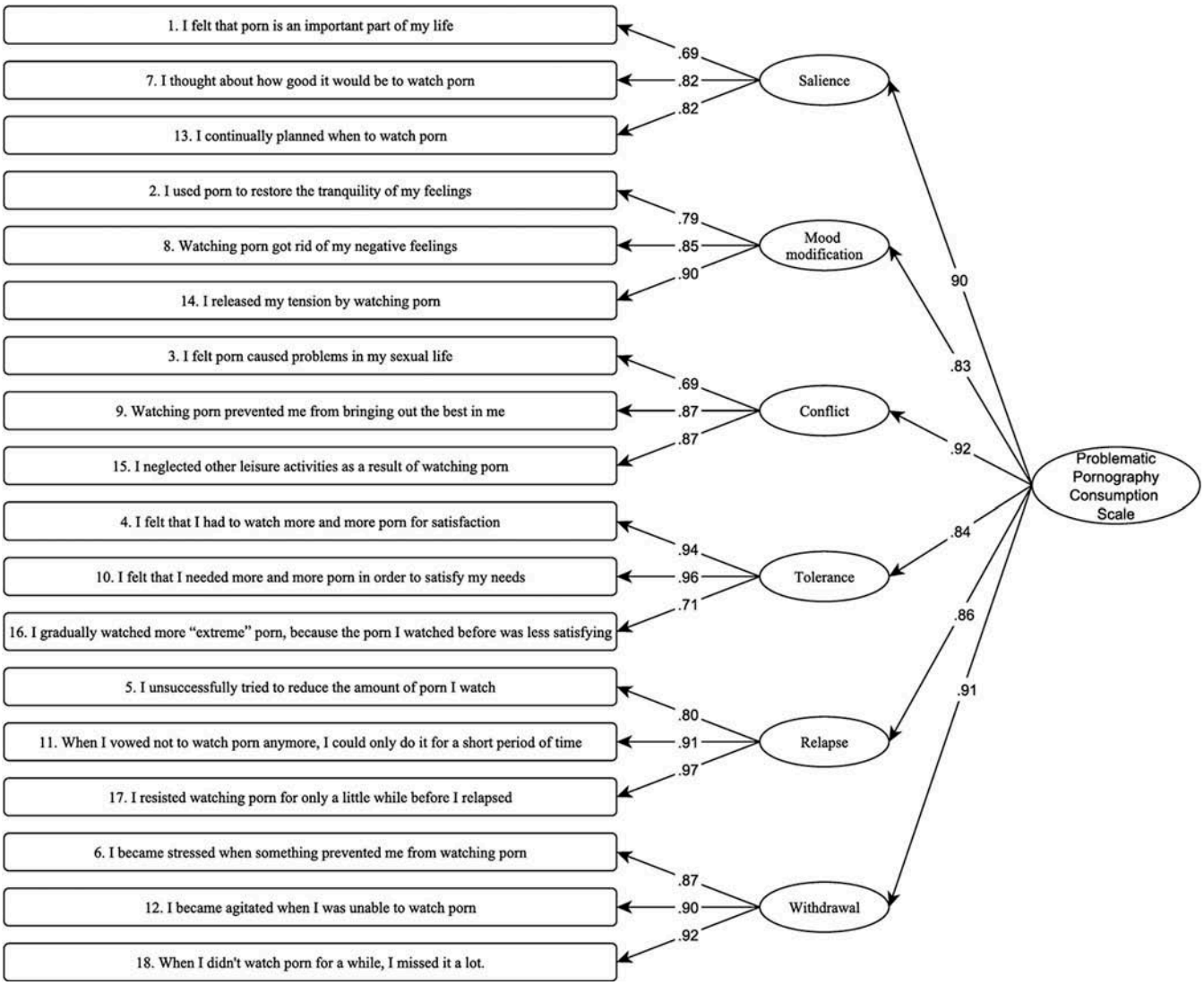

Figure 1. The factor structure of the Problematic Pornography Consumption Scale (PPCS). *Note*. Standardized loadings are indicated on the arrows. All loadings are significant at p < .001.

Table 1. *Tests of Gender Invariance on the Problematic Pornography Consumption Scale*

Model	WLSMV χ^2	*df*	CFI	TLI	RMSEA	90% CI	Model Comparison	ΔCFI	ΔTLI	ΔRMSEA
Baseline male	395.016*	129	.983	.979	.055					
Baseline female	286.645*	129	.981	.977	.057					
1: configural	679.104*	258	.975	.970	.065	.059–.071				
2: metric (weak)	718.544*	270	.973	.970	.065	.060–.071	M2–M1	−.002	.000	.000
3: scalar (strong)	786.415*	354	.974	.978	.056	.051–.062	M3–M2	+.001	+.008	−.009
4: residual (strict)	750.792*	372	.977	.981	.051	.046–.057	M4–M3	+.003	+.003	−.005

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

during masturbation also positively related with PPCS scores (r (770) = .27, $p < .01$). Satisfaction with sexual life was weakly and negatively correlated with PPCS scores (r (372) = −.22, $p < .01$). One-way ANOVA was used to assess differences in sexual orientation regarding the five larger groups (excluding asexual and unsure respondents as a result of low proportion N_{sum} = 8). According to the results, no differences in PPCS scores

Table 2. *Descriptive Statistics, Reliability Indices, and Interfactor Correlation Between Dimensions of the Problematic Pornography Consumption Scale*

Scales	α	Skewness (*SD*)	Kurtosis (*SD*)	Range	*M*	*SD*	1	2	3	4	5	6
1. PPCS total	.93	1.70 (0.09)	3.10 (0.18)	1–7	1.95	1.02	—					
2. Salience	.77	0.77 (0.09)	0.12 (0.18)	1–7	2.71	1.47	.81*	—				
3. Mood modification	.84	1.32 (0.09)	1.11 (0.18)	1–7	2.26	1.48	.81*	.61*	—			
4. Conflict	.71	3.40 (0.09)	14.30 (0.18)	1–7	1.35	0.80	.73*	.45*	.53*	—		
5. Tolerance	.78	2.20 (0.09)	5.20 (0.18)	1–7	1.77	1.20	.78*	.53*	.51*	.56*	—	
6. Relapse	.86	2.16 (0.09)	4.10 (0.18)	1–7	1.70	1.28	.78*	.49*	.50*	.63*	.60*	—
7. Withdrawal	.86	1.83 (0.09)	2.77 (0.18)	1–7	1.93	1.41	.85*	.69*	.63*	.51*	.58*	.59*

Note. PPCS = Problematic Pornography Consumption Scale; α = Cronbach's alpha; *M* = mean; *SD* = standard deviation.
*$p < .001$.

were found regarding sexual orientation. However, gender differences were found, as women (M_{female} = 1.66, SD_{female} = 0.87) had lower scores [t (729.77) = 8.52, $p < .01$] than men (M_{male} = 2.26, SD_{male} = 1.07).

Latent Profile Analysis

LPA was performed on the six PPCS factors. The AIC, BIC, and SSABIC values continuously decreased as more latent classes were added. Regarding entropy, all solutions had high levels of accuracy. The nonsignificant p value of the L-M-R test suggested that the four-class solution should be rejected in favor of the three-class solution (see Table 3). Based on the these criteria, the three-class solution was selected.

The three latent classes with their respective relationship patterns are shown in Figure 2. The first class represented nonproblematic pornography users (614 individuals, 79.5%). The second class represented low-risk pornography users (130 individuals, 16.8%). The third class represented at-risk pornography users (28

Table 3. *Fit Indices for the Latent Profile Analysis on the Problematic Pornography Consumption Scale*

Classes	AIC	BIC	SSABIC	Entropy	L-M-R Test	*p*
2	23343	23432	23371	.961	1999	< .001
3	**22720**	**22841**	**22758**	**.964**	**624**	**.006**
4	22364	22518	22413	.943	361	.104

Note. Classes = number of latent classes; AIC = Akaike information criterion; BIC = Bayesian information criterion; SSABIC = sample-size-adjusted Bayesian information criterion; L-M-R test = The Lo-Mendell-Rubin adjusted likelihood ratio test; p = p value associated with the L-M-R test. Bold text indicates that the three-class solution was selected as the final model.

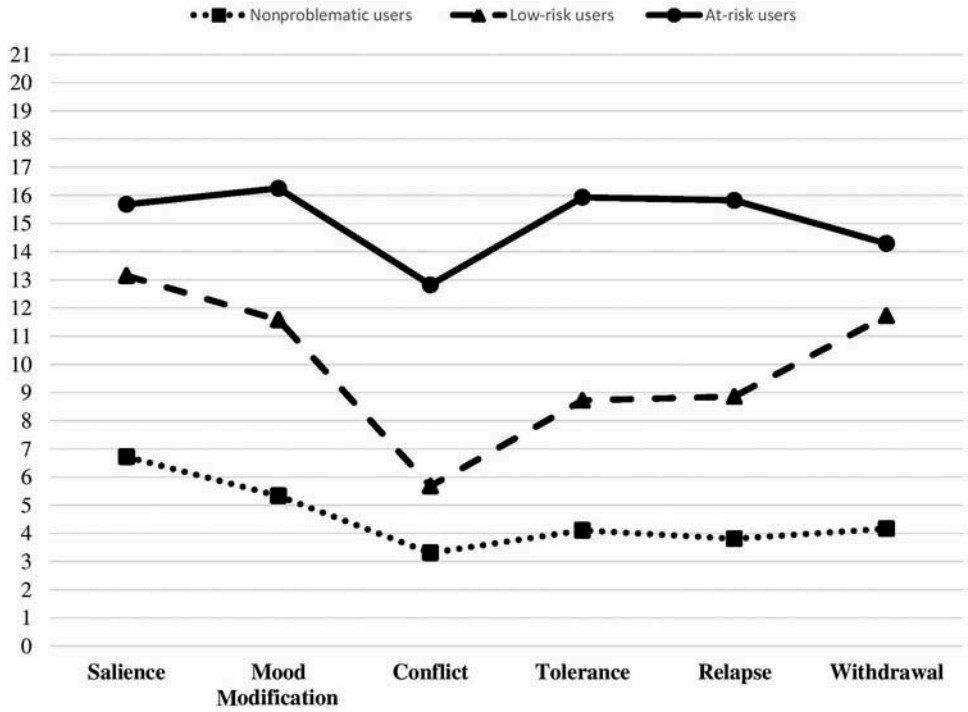

Figure 2. Latent classes based on the dimensions of the Problematic Pornography Consumption Scale.

Table 4. *Comparison of the Three Latent Classes Based on the Problematic Pornography Consumption Scale*

	Range	(a) Nonproblematic Users (N = 614)	(b) Low-Risk Users (N = 130)	(c) At-Risk Users (N = 28)	ANOVA	
					F	p
PPCS	1–7	$1.52\ (0.43)_{bc}$	$3.32\ (0.58)_{ac}$	$5.04\ (0.83)_{ab}$	1369.22	< .001
Time spent with pornography	1–6*	$2.82\ (0.94)_{b\dagger}$	$3.10\ (1.00)_{a}$	$3.21\ (1.03)_{\dagger}$	6.32	.002
Frequency of pornography viewing	0–8#	$4.47\ (1.94)_{bc}$	$6.09\ (1.46)_{a}$	$6.36\ (1.66)_{a}$	50.47	< .001
Loneliness	1–4	$2.10\ (0.71)_{bc}$	$2.38\ (0.73)_{a\dagger}$	$2.70\ (0.67)_{a\dagger}$	16.64	< .001

Note. PPCS = Problematic Pornography Consumption Scale; subscript letters indicate mean differences between the classes; # = 0: never; 1: a few times a year; 2: every few months; 3: monthly; 4: half-monthly; 5: weekly; 6: more than once a week; 7: daily; 8: more than once a day; * = 1: less than 5 minutes; 2: 5 to 15 minutes; 3: 16 to 30 minutes; 4: 31 to 60 minutes; 5: 1 to 2 hours; 6: more than 2 hours; †= this difference was only a trend, $p < .10$.

individuals, 3.6%). The three latent classes and their characteristics can be seen in Table 4.

Determination of a Potential Cutoff Score to Be Classified as a Problematic Pornography User: Sensitivity and Specificity Analysis

Based on the membership in the third class (i.e., at-risk group) as a gold standard, the sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and the accuracy of the PPCS at all possible cutoff points was calculated (Table 5). Based on this analysis, a cutoff score of 76 points was suggested as an optimal cutoff to be classified as problematic pornography user. In this case, sensitivity was 93%, while specificity was 99%. This means that practically 1% of the negative (i.e., nonproblematic) cases were considered problematic, while 7% of the true problematic cases were not recognized. At this value, PPV was 70% and NPV was 100%. This means that 30% of the individuals with a positive test result were identified mistakenly, while all individuals with negative test results were identified correctly. The accuracy of the PPCS was 98%. Increasing the cutoff score would lead to more false-negative cases (i.e., problematic pornography users mistakenly diagnosed as nonproblematic users), while decreasing the cutoff score would have resulted in more false-positive cases (i.e., nonproblematic users mistakenly diagnosed as problematic pornography users).

Discussion

The present study aimed to develop a problematic pornography consumption scale that is strongly based on theory alongside robust psychometric properties. Previous scales assessing problematic pornography use either did not have very strong psychometric properties or they had acceptable model fit, but the content of the factors raised theoretical questions (Grubbs et al., 2015; Kor et al., 2014). As seen from our results, based on theory (Griffiths, 2001, 2005), the PPCS had good factor structure and reliability. This six-factor, second-order model provides the opportunity for future research to compare the role of each component in various theoretical frameworks such as obsessive versus harmonious passion toward pornography use (Vallerand, 2015), reward deficiency syndrome (Blum, Cull, Braverman, & Comings, 1996), or motivations regarding pornography use (Reid, Li, et al., 2011).

High levels of invariance (Meredith, 1993; Vandenberg, 2002; Vandenberg & Lance, 2000) were demonstrated across

Table 5. *Calculation of Cutoff Thresholds for Problematic Pornography Consumption Scale*

Cutoff Score	True Positive	True Negative	False Positive	False Negative	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	Accuracy (%)
69	27	716	28	1	96.4	96.5	49.1	99.9	96.2
70	26	721	23	2	92.9	96.9	53.1	99.7	96.8
71	26	723	21	2	92.9	97.2	55.3	99.7	97.0
72	26	726	18	2	92.9	97.6	59.1	99.7	97.4
73	26	729	15	2	92.9	98.0	63.4	99.7	97.8
74	26	729	15	2	92.9	98.0	63.4	99.7	97.8
75	26	730	14	2	92.9	98.1	65.0	99.7	97.9
76	**26**	**733**	**11**	**2**	**92.9**	**98.5**	**70.3**	**99.7**	**98.3**
77	24	734	10	4	85.7	98.7	70.6	99.5	98.2
78	24	735	9	4	85.7	98.8	72.7	99.5	98.3
79	23	736	8	5	82.1	98.9	74.2	99.3	98.3
80	23	737	7	5	82.1	99.1	76.7	99.3	98.4
81	22	737	7	6	78.6	99.1	75.9	99.2	98.3
82	19	737	7	9	67.9	99.1	73.1	98.8	97.9

Note. Bolded text row indicates suggested cutoff threshold. PPV = positive predictive value; NPV = negative predictive value.

groups formed on the basis of gender (invariance of factor loadings, thresholds, and residual variances). The PPCS has strong psychometric properties in terms of factor structure, reliability, and model invariance. According to the latent class analysis, three groups could be reliably distinguished: a nonproblematic group, a low-risk group, and an at-risk group. No differences were found regarding sexual orientation. Similar to previous studies, males had higher scores on the PPCS than females (Haggstrom-Nordin et al., 2005; Svedin, Åkerman, & Priebe, 2011; Traeen et al., 2006).

According to the descriptive statistics, the average participant in the present study viewed pornography-related videos weekly, and he or she spent 16 to 30 minutes viewing pornographic material on each occasion. PPCS scores were weakly related to the time spent viewing pornography but moderately related to the frequency of viewing pornographic videos. As both time and frequency were asked as categorical variables, it is difficult to calculate a composite score including both. However, the present results suggest that problematic pornography use is more related to the frequency of viewing pornographic videos than the time spent engaged on each occasion. Despite the fact that frequent use of pornography is an essential part of problematic pornography use, frequency alone cannot be considered a satisfactory definition of this phenomenon. It is possible that individuals visit online pornography websites on a regular basis, but they can stop this activity when it is necessary (Kor et al., 2014). Recent research has confirmed this notion, because the relationship between the frequency and duration of use and problematic behavior itself is positive but only moderate (e.g., Brand et al., 2011; Grubbs et al., 2015; Twohig et al., 2009). Therefore, labeling people as problematic pornography users based only on the duration or the frequency of their pornography consumption is not appropriate.

Furthermore, regarding the form of the pornographic material, the frequency of pornographic video viewing was more strongly related to PPCS scores than viewing pornographic pictures or reading pornographic stories and thus in accordance with previous results (Brand et al., 2011). The frequency of masturbation was also moderately related to problematic pornography use. The strength of this relationship appeared to be even stronger than the association between PPCS scores and the frequency of viewing pornography during masturbation. In line with previous results (e.g., Reid, Li, et al., 2011; Reid et al., 2012; Womack et al., 2013), the present results also highlight the relevance of hypersexuality in problematic pornography consumption. More specifically, a high level of sexual behavior might be a precursor of problematic pornography use, and it is assumed that both problematic pornography use and frequent masturbation are both consequences of hypersexuality. Therefore, problematic pornography use can appear under the umbrella of hypersexuality similarly to frequent masturbation, going to strip clubs, and engaging in phone sex and various forms of cybersex (Kafka, 2010).

Based on LPA, three severity groups of users were identified. Almost 4% of the sample belonged to the at-risk group. These individuals had high scores on each PPCS component. However, it is important to note that all three groups had relatively lower scores on the conflict component. Arguably, problematic pornography use is not as visible as other forms of problematic behaviors or addictions (such as substance abuse or drinking alcohol). Therefore, the interpersonal conflicts are not as prevalent as in the case of other potentially addictive behaviors. Despite the fact that the at-risk group viewed pornography more frequently and spent more time engaging in it on each occasion, the differences between the low-risk and at-risk groups were only trends.

Finally, sensitivity and specificity analyses revealed an optimal cutoff of 76 points for diagnosing problematic pornography use with the PPCS. However, future studies should further validate this cutoff in a clinical sample to consolidate the present findings. Also, it is important to note that the use of scales is limited when employed as an early diagnostic indicator, because only clinically based interview studies are appropriate to diagnose that a specific behavior is truly problematic or pathological for a given individual (Maraz, Király, & Demetrovics, 2015).

The present study was not without limitations. This was a self-selected, self-report, questionnaire-based, cross-sectional study that is prone to bias. Furthermore, a longitudinal design would be most useful in examining how potential life events could affect an individual's problematic pornography use. Although the sample was diverse and the gender ratio was good, it was not representative, which limits the generalization of the results. Therefore, future studies—similarly to Hald (2006), Luder et al. (2011), and Traeen et al. (2004)—should use representative samples. Regarding the PPCS, the results were based on a correlational design that does not make it possible to infer causality. Further research is needed to examine its temporal stability, as well as convergent, divergent, and predictive validity in different cultures. In terms of clinical practice, prevalence and incidence should be investigated. It would also be useful to examine the relationship patterns between hypersexuality, compulsive behavior, and problematic pornography. Further research is also needed to explore whether problematic pornography use and other problematic online behaviors have the same roots. It is possible that these online behaviors have very similar negative consequences.

Conclusions

The Problematic Pornography Consumption Scale is based on a solid theoretical framework of addictions, specifically Griffiths's six-component model (2005), and it has strong psychometric properties in terms of factor structure, reliability, and model invariance. Latent profile analysis identified almost 4% of the sample as at-risk pornography users. However, further clinical investigation and validation are needed to assess the extent of problems related to pornography use. Further cross-cultural research

should focus on the characteristics of low- and at-risk groups and identifying potential pathways that lead to problematic pornography use to establish potential risk factors and protective factors that can be utilized in prevention and intervention programs.

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Appendix. The Problematic Pornography Consumption Scale (PPCS)

Please think back to the past six months and indicate on the following 7-point scale how often or to what extent the statements apply to you. There is no right or wrong answer. Please indicate the answer that most applies to you.

1 Never	2 Rarely	3 Occasionally	4 Sometimes	5 Often	6 Very Often	7 All the Time

	1	2	3	4	5	6	7
1. I felt that porn is an important part of my life	O	O	O	O	O	O	O
2. I used porn to restore the tranquility of my feelings	O	O	O	O	O	O	O
3. I felt porn caused problems in my sexual life	O	O	O	O	O	O	O
4. I felt that I had to watch more and more porn for satisfaction	O	O	O	O	O	O	O
5. I unsuccessfully tried to reduce the amount of porn I watch	O	O	O	O	O	O	O
6. I became stressed when something prevented me from watching porn	O	O	O	O	O	O	O
7. I thought about how good it would be to watch porn	O	O	O	O	O	O	O
8. Watching porn got rid of my negative feelings	O	O	O	O	O	O	O
9. Watching porn prevented me from bringing out the best in me	O	O	O	O	O	O	O
10. I felt that I needed more and more porn in order to satisfy my needs	O	O	O	O	O	O	O
11. When I vowed not to watch porn anymore, I could only do it for a short period of time	O	O	O	O	O	O	O
12. I became agitated when I was unable to watch porn	O	O	O	O	O	O	O
13. I continually planned when to watch porn	O	O	O	O	O	O	O
14. I released my tension by watching porn	O	O	O	O	O	O	O
15. I neglected other leisure activities as a result of watching porn	O	O	O	O	O	O	O
16. I gradually watched more “extreme” porn, because the porn I watched before was less satisfying	O	O	O	O	O	O	O
17. I resisted watching porn for only a little while before I relapsed	O	O	O	O	O	O	O
18. I missed porn greatly when I didn’t watch it for a while	O	O	O	O	O	O	O

Scoring: Add the scores of the items of each factor. For the total score, add all the scores of the items. A score of 76 or higher indicates possible problematic pornography use. Factors: salience = 1, 7, 13; mood modification = 2, 8, 14; conflict = 3, 9, 15; tolerance = 4, 10, 16; relapse = 5, 11, 17; withdrawal = 6, 12, 18.