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Ben Brahim, F

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Strength of Pornography Craving Experience (PCE-S): psychometric properties of a new measure based on the Elaborated Intrusion theory of desire

Farah Ben Brahim[1,5], Germano Vera Cruz[2], Robert Courtois[1], Jon May[3] Yasser Khazaal[4,5,6]

[1]University of Tours, Tours, France.

[2]Department of Psychology, UR 7273 CRP-CPO, University of Picardie Jules Verne, Amiens, France.

[3]School of Psychology (Faculty of Health), University of Plymouth, Plymouth, UK.

[4]Addiction Medicine, Lausanne University Hospital.

[5]Lausanne University, Lausanne, Switzerland.

[6]Department of Psychiatry and Addictology, Montreal University, Canada.

Introduction

Pornography use is a common sexual activity with potentially addictive use in some people. Even though craving is being recognized as an important characteristic of addictive behaviors, there is a lack of a specific validated instrument measuring the pornography craving experience.

The present study aimed at adapting and validating an instrument measuring the users' strength of pornography craving experience (PCE-S) based on the Elaborated Intrusion theory of desire.

Methods

Items from the "strength" form of the Craving Experience Questionnaire (CEQ) were adapted to pornography use and used to create the PCE-S. The PCE-S was then administered online to 1584 English-speaking cyberporn users aged 18 to 75 years old (M = 33.18; SD = 10.84]; 63.1% male, 35.2% female, and 1.7% non-binary). All participants completed an assessment of compulsive cyberporn use (CIUS adapted for cyberporn). Confirmatory factorial analysis (CFA) was used to examine the construct structure validity; Cronbach alpha coefficient, corrected item-total correlation, regression, and discriminant analysis were used to assess the instrument's psychometric properties.

Results

After using the modification indices to improve the initial model, a relatively good fit for the three-factor model was confirmed. Concurrent validity with the compulsive cyberporn use (CCU) measure was demonstrated. The PCE-S discriminated between participants with high CCU and those with low CCU scores.

Conclusions

A specific pornography craving experience instrument scale, based on the Elaborated Intrusion theory of desire seems to capture key constructs of the theory and correlate with measures of compulsive cyberporn use.

Keywords: craving, pornography craving, compulsive cyberporn, pornography problematic use.

Introduction

Cyberporn, which refers to pornographic use on the Internet is such a growing online activity. It is considered the most widespread cybersexual activity (Fisher & Barak, 2001; Ross et al., 2012). Albright (2008) reported that many men and women recruited among 15,246 American participants presented intentional online pornographic use. Cyberporn is known as risky Internet activity since its use can evolve into addictive use (Brand et al., 2020; De Alarcón et al., 2019; Koós et al., 2022; Müller et al., 2022). A representative sample of the Australian population with 20,094 participants reported that 1.2% of the women and 4.4% of the men rated themselves as addicted to porn content (i.e. cyberporn, magazines, pictures, etc.) (Rissel et al., 2016).

Researchers tended to understand porn use by exploring specific psychological characteristics of its users such as impulsivity (e.g., Beyens et al., 2015). Bőthe et al., (2019) observed that impulsivity is weakly associated with problematic pornography use among men and women. Other researchers examined porn use habits such as the frequency of use and the time dedicated to this activity (e.g., Carroll et al., 2008). Results reported that men have more spent time (per week) on cyberporn than women (Wetterneck et al., 2012), and use cyberporn more frequently (Weinstein et al., 2015). Earlier studies characterized problematic use of online sexual activities with an exaggerated use duration despite the negative impacts of these activities (Cooper et al., 1999).

Another characteristic that has been linked to compulsive porn use is craving (Weinstein et al., 2015). Craving refers to an intense desire and is known to be an essential characteristic of addictions (May et al., 2014). In the DSM-5 (American Psychiatric Association, 2013), we notice that craving is an important criterion for substance use disorder diagnosis (Cornil et al., 2019; Mallorquí-Bagué et al., 2023). The literature recognizes its crucial role also in behavioral addictions (Tiffany & Wray, 2012). Weinstein et al., (2015) showed a higher "self-reported craving" for porn use among men compared to women. In their study, they used "20 questions about cybersex addiction including pornography" from Young (2001). They assessed craving using the 20 items of the Pornography Craving Questionnaire (PCQ) of Kraus and Rosenberg (2014). However, this PCQ measures a large heterogenous concept that

includes "perceived control in using pornography, changes in mood, psychophysiological activity, and intention for using pornography" (Weinstein et al., 2015). In addition, the scale was validated only among male students in the United States.

Among the few instruments assessing craving, the Alcohol Craving Experience Questionnaire (ACE) (Statham et al., 2011) and the Craving Experience Questionnaire (CEQ) (May et al., 2014) were based on the Elaborated Intrusion (EI) theory (Kavanagh et al., 2005). This theory postulates that craving (for drugs, food, drink, and other activities) is "a cognitive-affective phenomenon that involves an initial, apparently spontaneous intrusive thought (triggered by cues from the environment, mind and body), followed by controlled processes of elaboration, which tend to include construction of multi-sensory imagery" (May et al., 2010, 2014). The EI theory considers that craving experiences are due to users generating images of the needed substance in their minds that are instantly satisfying but worsen their perception of deficit. This vicious cycle of desire, imagery, and planning to gratify that desire, is accompanied by a greater elaboration of the imagery that interacts with "high-level cognitive processes (such as working memory)". Thus, we notice a restricted efficiency on parallel cognitive tasks and an intense emotional response (May et al., 2004).

The construction of the CEQ tends to be a craving "generic measure" that could be used for different consumption targets and different consumption periods (May et al., 2014). It was based on the ACE and follows its two forms: strength (ACE-S) for the intensity of the craving feelings; and frequency (ACE-F) for the occurrence of these feelings. The CEQ evaluates the strength and the frequency of the three dimensions proposed in the ACE: Imagery, Intensity, and Intrusion. In the ACE, the Imagery dimension was related to the vividness of sensory imagery (e.g., *How vividly did you imagine a drink?*). The Intensity dimension assesses the intensity of the craving (e.g., *How strongly did you want a drink?*). The Intrusion dimension was about the magnitude of the intrusiveness of thoughts about drinking (e.g., *How hard were you trying not to think about alcohol?).*

Since the actual literature presents a lack of specific, brief, and theory-based instruments to evaluate the craving experience related to pornography use, the present study aimed at adapting and validating an instrument measuring the users' strength of pornography craving experience. Items from the Strength form of the Craving Experience Questionnaire (CEQ) (May et al., 2014) were adapted and used to create a measurement instrument called Pornography Craving Experience – Strength form (PCE-S). We also examined the correlational relationships between the three dimensions of the developed PCE-S and a set of

psychosocial variables, impulsivity (positive and negative urgency), compulsive cyberporn use, and cyberporn use patterns.

Methods

Participants

Overall, 1584 individuals participated in the study and answered an online questionnaire. Participants aged from 18 to 75 years old (M = 33.18; SD = 10.84). Males represented 63.1% of them, 35.2% were female, and 1.7% were non-binary. Among the participants, 77.6% were heterosexual, 6.3% were homosexual, 13.7% were bisexual, and 2.4% chose the option "other" to characterize their sexual orientation. At the time of the study, 32.1% of the participants were single, 42.7% were in relation, not married, 24.6% were in relation, married, and 0.5% were a widow. Details of the participants' residences are noted in Appendix 1.

Recruitment and Sampling Procedures

The study was conducted via an anonymous SphinxOnline survey. We recruited participants over the age of 18 who had viewed pornography at least once in the past six months. They were recruited through Prolific (https://www.prolific.ac/), an online crowdsourcing platform designed for academic research and proven to provide high-quality data (Palan & Schitter, 2018; Peer et al., 2022).

Ethics

The Research Ethics Committee of Tours-Poitiers in France (no. 2020-04-05) assented to the study protocol. All participants confirmed their online informed consent.

Measures

Socio-demographic characteristics

These characteristics consisted of age, sex, sexual orientation, and marital status.

Cyberporn use patterns

These included the one year estimated cyberporn use duration (CUD) per week (range: 0h to 40h), and the frequency of cyberporn use (FCU) over the past year (continuous variable).

Strength of pornography craving experience

We developed the Pornography Craving Experience – Strength form (PCE-S) to assess the strength of the craving experience related to porn use. The development of this tool was based on the CEQ, from which we took the items related to the Strength form. We adapted these items to pornography use. We revised the adaptation of these items with the authors (FBB, JM, YK, and RC) until a unanimous consensus was reached. The items were well understood by a pilot sample of 10 participants. The PCE-S included 10 items evaluating 3 dimensions (Table 1). The Imagery dimension is related to the vividness of the sensory pornographic imagery (4 items). The Intensity dimension assesses the urge to use pornography (3 items). The Intrusion dimension is about the intrusiveness of thoughts related to pornographic stimuli (3 items). Associated with each item there is a visual analog scale with anchor points of zero (not at all) and 10 (extremely). Following are the instructions and an example item: "Think about the time in the last month you most wanted to watch porn. At that time…how much did you want it?".

Compulsive cyberporn use

Compulsive cyberporn use (CCU) was assessed with the short form of the Compulsive Internet Use Scale (CIUS) including 8 items (Gmel et al., 2019; Meerkerk et al., 2009). For each participant, a score of compulsive cyberporn use was calculated (5-point response scale). Higher scores indicate greater CCU. Previous studies have adjusted the CIUS for variables such as cybersex (Ben Brahim et al., 2019; Varfi et al., 2019). In the present study, we adapted this measure to cyberporn. We specified that the word "Internet" refers to pornographic websites.

Impulsivity: positive and negative urgency

These dimensions were measured using the Short Impulsive Behavior Scale (UPPS-P) (Billieux et al., 2012; Lynam, 2013). From the 20 items of this scale, only 8 items were used in the present study to assess the two dimensions most frequently associated with addictive issues (Coskunpinar et al., 2013): positive urgency and negative urgency (4-point response scale). Thus, for each participant, two scores were calculated: positive urgency impulsivity and negative urgency impulsivity. Higher scores indicated greater impulsivity.

Data Analysis

First, we conducted descriptive analysis (mean [M] and standard deviation [SD]) and normality distribution test (Skewness and Kurtosis) for each item of the PCE-S – main results are displayed in Table 1.

Second, we conducted tests to check the appropriateness of the data for factorial analysis (Kaiser-Meyer-Olkin [KMO] and Bartlett's test of sphericity), reliability tests (Cronbach alpha coefficient and Corrected item-total correlation), exploratory factorial analysis (EFA) to examine the variance associated with each of the three modeled factors – main results are exhibited in Table 2.

Third, we conducted confirmatory factorial analysis (CFA) to test the validity of the PCE-S factorial structure theoretical model (Imagery = 4 items, Intensity = 3 items, Intrusion = 3 items). The CFA includes (a) the main analysis, (b) model improvement techniques based on the examination of the modification indices yielded by the main analysis, and (c) a test of the model invariant across groups (male vs. female) – main results are shown in Figure 1.

Fourth, we conducted discriminant analyses to test whether scores on the PCE-S subscales discriminated between (a) the participants with low CCU scores and (b) the participants with high CCU scores – main results are presented in Figure 2.

Fifth, we conducted correlations analysis between the three PCE-S subscales (factors) and the other study variables: CCU, FCU, CUD, UPPS-P negative urgency, and UPPS-P positive urgency – main results are shown in Table 3.

Sixth, using only data from the male and female participants, we conducted a linear regression analysis to predict the value of CCU (mean centered) from Sex and the three PCE-S subscales (Imagery, Intensity, and Intrusions) – main results are presented in Table 4.

The statistical analyses were first carried out using SPSS software (version 29.0) and AMOS (version 26.0). Then, all the analyses were replicated using R. The data, the code and the Markdown files related to the analyses made using R can be found on the Open Science Framework: https://osf.io/mt6re/

Results

Descriptive Statistics, Normality Tests, and Adequacy of Data for Factorial Analysis

Table 1 presents the main descriptive statistics and normality distribution tests regarding the 10 items of the PCE-S.

[Insert Table 1 here]

Tests of univariate normality indicated that all items were normal, except item 8 which was slightly right skewed (skeweness = .925) and item 6 which was platykurtic (kurtosis = -1.213). When the skewness is between -0.5 and 0.5, the distribution is fairly symmetric. If the value is greater than +1, the distribution is right skewed. If the value is less than -1, the distribution is left skewed. If the Kurtosis value is greater than + 1, the distribution is leptokurtic; if the value is less than -1, the distribution is platykurtic.

The data suitability test was as follow: KMO = .876 (a value greater than 0.8 can be considered good); Bartlett's test of sphericity $X^2(45)$ = 11183.65, p = <.001. These values confirm that the data is suitable for factorial analysis (see Cerny & Kaiser, 1977).

Internal reliability, Means and Variances Explained by each PCE-S Subscale

Table 2 displays the main results of the reliability tests and variances analysis for each of the three PCE-S subscales.

[Insert Table 2 here]

Cronbach's alpha coefficient showed all PCE-S subscales had acceptable internal reliability: Imagery (α = 0.89), Intensity (α = 0.90) and Intrusion (α = 0.85). The corrected item-total correlations for each item are all greater than 0.60. Cronbach's alpha: if the scale is an exploratory one, a good reliability is set at α > 0.7; if it is an established one, a good reliability is set at α > 0.80 (Bland & Altman, 1997; Zijlmans et al., 2018). Corrected item-total correlation: a good, corrected item-total correlation is set at r (correlation coefficient) > 0.30 (Bland & Altman, 1997; Zijlmans et al., 2018).

Confirmatory Factorial Analysis (CFA)

The theoretical internal structure of the PCE-S (resulting from the adaptation of the CEQ) was tested by applying CFA using AMOS statistical software. Figure 1 shows the path diagram of the improved model with the standardized estimates.

[Insert Figure 1 here]

The initial model (see path diagram in Appendix 2, Figure A) metrics were as follow: chi-square [$\chi 2$] = 602.65, degree of freedom [df] = 32, p < 0.001; $\chi 2$ /df = 18.83; goodness-of-fit index [GFI] = 0.93; normed fit index [NFI] = 0.94; relative fit index [RFI] = 0.92; incremental fit index [IFI] = 0.95; Tucker-Lewis index [TLI] = 0.93, comparative fit index [CFI] = 0.95; root mean square error of approximation [RMSEA] = 0.106; standardized root mean square residual [SRMR] = 0.044. The standardized regression weights (factor loadings) were between 0.68 and 0.92, being statistically significant (p < 0.001). All these ratings are acceptable, except for chi-square (for which the p-value should be not significant), the X^2/df values (which should be under 5), and the RMSEA value (which would be ≤ 0.080) (Collier, 2020; Kline, 2005). For an acceptable model, the SRMR should be ≤ 0.080 (which is the case here); the other indicates should be > 0.90 (acceptable model) and > 0.95 (good model) (Collier, 2020; Kline, 2005).

After examining the modification indices, we improved the model by establishing covariances between the standardized errors. The improved model (see path diagram in Figure 1) metrics were as follow: $\chi 2$ = 358.76, df = 26, p < 0.001; $\chi 2$ /df = 13.79; GFI = 0.96; NFI = 0.97; RFI = 0.95; IFI = 0.97; TLI = 0.95; CFI = 0.97; RMSEA = 0.090; SRMR = 0.039.

After examining the standardized residual covariance (SRC) matrix of the improved model, we decided to try to improve the model again by eliminating item 8 (from the Intrusion factor), the only one that had an SRC value greater than 2 (as recommended by Collier, 2020). The improved 9-item model (see path diagram in Appendix 2, Figure B) metrics were as follow: $\chi 2$ = 200.16, df = 18, p < 0.001; $\chi 2$ /df = 11.12; GFI = 0.97; NFI = 0.98; RFI = 0.96; IFI = 0.98; TLI = 0.96; CFI = 0.98; RMSEA = 0.080; SRMR = 0.039.

Sex (Male vs. Female) Invariance tests

To find out whether the factor structure of the scale is invariant to sex, a multi-group analysis was carried out from the first improved model (with all 10 items).

The configural invariance test showed an acceptable fit for the unconstrained model: $\chi 2$ = 387.04, df = 52, p < 0.001; $\chi 2$ /df = 7.44; GFI = 0.95; NFI = 0.96; RFI = 0.94; IFI = 0.97; TLI = 0.95; CFI = 0.97; RMSEA = 0.091; SRMR = 0.039. The metric invariance test

indicated that the meaning of the three modeled constructs (factors) did not change across groups (X^2 change = 11.36, df = 7, p = 0.124).

Concurrent Validity

PCE-S factor scores were obtained by summing the items on each factor. Zero-order correlations were conducted between PCE-S factor scores, CCU score, FCU, and CUD. Table 3 shows the correlation matrix and indicates significant correlations between all PCE-S factors and the CCU score, the FCU, the CUD, the UPPS-P negative urgency and UPPS-P positive urgency.

[Insert Table 3 here]

Discriminant Validity

Discriminant analyses tested whether scores on the PCE-S subscales discriminated between (a) the participants with low CCU scores (fist quartile, CPU scores ≤ 1.63; n = 403 [males = 168, females = 224, non-binarys = 11]).) and (b) the participants with high CCU scores (fourth quartile, CCU scores ≥ 3.13; n = 348 [male = 246, female = 96, non-binary = 6]).

The descriptive statistics for the CCU score was as follow: scale = 1-5 points; range = 0-4; mean = 2.44(SD=.93); median = 2.37. The Percentiles were: 25% = 1.63, 50% = 2.38; 75% = 3.13.

[Insert Figure 2 here]

Figure 2 summarizes graphically the results of this analysis. One significant discriminant function explained the overall relationship between the grouping and response variables. Factors distinguished between participants with low CCU scores and participants with high CCU scores. This function explained 61% of between-group variance, x^2 = 351.14, df = 3, p < .001. Participants with low CCU scores were classified more successfully (83.1% of cases) than participants with high CCU scores (77.0% of cases). All three PCE-S factors were discriminated significantly between participants with low CCU scores and participants with high CCU scores: Intrusion (F[1, 749] = 331.54, p < .001) was the most powerful discriminator, followed by Intensity (F[1, 749] = 302.97, p < .001) and Imagery (F[1, 749] = 231.60, p < .001). The structure coefficient matrices showed that the three factors were highly

correlated with the discriminant functions (r = .72; r = .16 [imagery]; r = .82; r = .46 [intensity]; r = .86; r = .89 [intrusion]).

Sex, CCU, and PCE-S

When participants were split into quartiles, there was a statistically significant difference between the number of males and females present in each group, $\chi2$[3] =73.3, p < .001. Figure 3 summarizes graphically the results of this analysis. Figure C (in Appendix 2) presents the mean PCE-S score for participants within each quartile of the CCU. As can be seen in this Figure 3, the number of females is greater than the number of males in the first quartile; conversely, in the fourth quartile, the number of females is lower than the number of males.

[Insert Figure 3 here]

In addition, using only data from the male and female participants, we predicted the value of CCU (mean-centered) from Sex and the three PCE-S subscales. In effect, Table 4 shows the standardized regression coefficients for each predictor (Sex, the three PCE-S subscales), and their statistical significance.

[Insert Table 4 here]

Sex was not a statistically significant predictor. In the contrary, the PCE-S subscales were significant predictors. Overall, these variables and the regression predicted 27.8% of the variance in CCU.

Discussion

After improvement, almost all important CFA indices (GFI, NFI, RFI, IFI, TLI, CFI, SRMR) indicate a good fit of the PCE-S theoretical construct structure (three factors, 10 items) to the data. The X^2/df value (13.79) and the RMSEA value (0.090) were above the criteria of goodness which must be ≤ 5 and ≤ 0.080 respectively (Collier, 2020; Kline, 2005). While the improved model with 9 items got a RMSEA = 0.080, the remain indices did not improve significantly (e.g., X^2/df =11.12). Given that the original scale ACE (Statham et al., 2011) also had a X^2 p-value and the RMSEA metrics (respectively p <0.001 and 0.108; the X^2/df was not reported) above the criteria of goodness, we considered that the CFA validated

the theoretical construct of the PCE-S in its 10 items version. However, further studies are needed to understand why all indices indicate a good fit except the X^2 and the X^2/df. This PCE-S structure with its three factors related to Imagery, Intensity, and Intrusion has also allowed covering important elements constituting the craving (Kavanagh et al., 2013; May et al., 2014).

The reliability, concurrent, and discriminant validity statistics showed that the PCE-S has good psychometric properties. Particularly, the three constructs related to Imagery, Intensity, and Intrusion are positively and significantly correlated with three measures of the participant's cyberporn use: frequency, duration, and compulsive use (FCU, CUD, CCU). This PCE-S three constructs also successfully discriminated participants with high CCU from those with low CCU. Moreover, PCE-S scores predicted the variance of the CCU. The literature advanced that addiction craving is characterized by sensory imagery (May et al., 2004). Some authors have previously suggested the prediction of alcohol use by the Imagery items using the ACE Imagery items (Connor et al., 2014). More specifically and concerning behavioral addictions, a recent systematic review reported links between craving and the gambling use (Mallorquí-Bagué et al., 2023). Furthermore, craving seemed to predict the severity of the gambling disorder as well as its episodes. The present study reports the close links between craving and addictive cyberporn use. These associations are only very little studied in the literature or studied with measures less specific to the craving and to the cyberporn. Thus, the present results highlight the association between craving (with its three constructs of Imagery, Intensity, and Intrusion) and addictive cyberporn.

The study at hand showed that the participants' pornography craving scores were positively and significantly associated with the two measured dimensions of impulsivity (negative and positive urgency). Negative urgency is "the tendency to engage in rash action in response to extreme negative affect". Positive urgency is "the tendency to engage in rash action in response to extreme positive affect" (Cyders & Smith, 2008). Previous studies have advanced that urgency was significantly and positively associated with tobacco cravings (Billieux et al., 2007). Negative urgency indicated stronger gambling craving (Mallorquí-Bagué et al., 2023). Regarding the association between impulsivity and pornography, the literature is controversial. In their review of the literature, Bőthe et al. (2019) concluded that there is a weak to moderate link between impulsivity and various features of pornography (e.g., frequency of use, and pornographic motives). The results of the present study suggest a new comprehension approach by associating pornography craving with negative and positive

urgency impulsivity. Further studies should be conducted to clarify these associations and the dynamic interactions between craving and addictive porn use.

The present study has the advantage of being based on a large population of cyberporn users assessed with the PCE-S, designed for pornography use. It is therefore specific and proposes items adapted to this use. This brief and theory-based instrument could be used clinically and for research purposes. The PCE-S may allow for better understanding of the interactions and dynamic associations between craving patterns, context, and porn use related behaviors. The PCE-S could help in the identification of more targeted interventions and in the evaluation of proposed treatments. In the present study, we asked participants about their last month craving experiences, with the aim to catch their current experience about craving. Further studies may re-assess craving with the PCR-S at different time to better catch dynamic interactions between different phenomena and addictive porn use patterns.

Limitation

This was a cross-sectional study. As such, it was not designed to test the reliability and validity of the PCE-S construct structure over time. Follow-up studies will be needed to test these properties.

Conclusions

The PCE-S represents a specific and brief pornography craving experience instrument scale. It is also based on the Elaborated Intrusion theory of desire. Results showed that the PCE-S items are able to capture key constructs of the theory and correlate with measures of addictive cyberporn use.

Abbreviations

PCE-S = Pornography Craving Experience – Strength form.

ACE = Alcohol Craving Experience questionnaire.

ACE-S = Alcohol Craving Experience questionnaire - Strength form

ACE-S = Alcohol Craving Experience questionnaire - Strength form

UPPS-P = Urgency, Premeditation, Perseverance, Sensation Seeking, Positive Urgency (UPPS-P) Impulsive Behavior Scale.

CIUS = Compulsive Internet Use Scale.

KMO = Kaiser-Meyer-Olkin.

EFA = exploratory factorial analysis.

CFA = confirmatory factorial analysis

GFI = goodness-of-fit index.

NFI = normed fit index.

RFI = relative fit index.

IFI = incremental fit index.

TLI = Tucker-Lewis index.

CFI = comparative fit index.

RMSEA = root mean square error of approximation.

SRMR = standardized root mean square residual.

Declarations

Conflicts of Interest: The authors do not have any conflicts of interest to report.

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Ethics approval and consent to participate: Participants gave digital informed consent for their survey contribution. Participation was voluntary and restricted to those aged ≥18 years. All data was anonymously collected. The survey was conducted in accordance with the Swiss Human Research Act (Ethical approval n°…..)

Contributorship: Initial Conception of the study: YK. Conception of the survey and writing of the questions: YK, RC, and FBB: Data analysis: GVC. First draft: GVC and FBB. Final draft: All authors

Availability of data and materials: The material, the data, and the R code supporting the present study findings are available on the Open Science Framework repository at the following link: https://osf.io/mt6re/

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References

Albright, J. M. (2008). Sex in America Online : An Exploration of Sex, Marital Status, and Sexual Identity in Internet Sex Seeking and Its Impacts. *Journal of Sex Research*, *45*(2), 175-186. https://doi.org/10.1080/00224490801987481

American Psychiatric Association (Éd.). (2013). *Diagnostic and statistical manual of mental disorders : DSM-5* (5th ed). American Psychiatric Association.

Ben Brahim, F., Rothen, S., Bianchi-Demicheli, F., Courtois, R., & Khazaal, Y. (2019). Contribution of sexual desire and motives to the compulsive use of cybersex. *Journal of Behavioral Addictions*, *8*(3), 442-450. https://doi.org/10.1556/2006.8.2019.47

Beyens, I., Vandenbosch, L., & Eggermont, S. (2015). Early Adolescent Boys' Exposure to Internet Pornography : Relationships to Pubertal Timing, Sensation Seeking, and Academic Performance. *The Journal of Early Adolescence*, *35*(8), 1045-1068. https://doi.org/10.1177/0272431614548069

Billieux, J., Rochat, L., Ceschi, G., Carré, A., Offerlin-Meyer, I., Defeldre, A.-C., Khazaal, Y., Besche-Richard, C., & Van der Linden, M. (2012). Validation of a short French version of the UPPS-P Impulsive Behavior Scale. *Comprehensive Psychiatry*, *53*(5), 609-615. https://doi.org/10.1016/j.comppsych.2011.09.001

Billieux, J., Van der Linden, M., & Ceschi, G. (2007). Which dimensions of impulsivity are related to cigarette craving? *Addictive Behaviors*, *32*(6), 1189-1199. https://doi.org/10.1016/j.addbeh.2006.08.007

Bland, J. M., & Altman, D. G. (1997). Statistics notes : Cronbach's alpha. *BMJ*, *314*(7080), 572-572. https://doi.org/10.1136/bmj.314.7080.572

Bőthe, B., Tóth-Király, I., Potenza, M. N., Griffiths, M. D., Orosz, G., & Demetrovics, Z. (2019). Revisiting the Role of Impulsivity and Compulsivity in Problematic Sexual

Behaviors. *The Journal of Sex Research*, *56*(2), 166-179. https://doi.org/10.1080/00224499.2018.1480744

Brand, M., Rumpf, H.-Jü., Demetrovics, Z., Müller, A., Stark, R., King, D. L., Goudriaan, A. E., Mann, K., Trotzke, P., Fineberg, N. A., Chamberlain, S. R., Kraus, S. W., Wegmann, E., Billieux, J., & Potenza, M. N. (2020). Which conditions should be considered as disorders in the International Classification of Diseases (ICD-11) designation of "other specified disorders due to addictive behaviors"? *Journal of Behavioral Addictions*. https://doi.org/10.1556/2006.2020.00035

Carroll, J. S., Padilla-Walker, L. M., Nelson, L. J., Olson, C. D., McNamara Barry, C., & Madsen, S. D. (2008). Generation XXX : Pornography Acceptance and Use Among Emerging Adults. *Journal of Adolescent Research*, *23*(1), 6-30. https://doi.org/10.1177/0743558407306348

Cerny, B. A., & Kaiser, H. F. (1977). A Study Of A Measure Of Sampling Adequacy For Factor-Analytic Correlation Matrices. *Multivariate Behavioral Research*, *12*(1), 43-47. https://doi.org/10.1207/s15327906mbr1201_3

Collier, J. E. (2020). *Applied structural equation modeling using AMOS : Basic to advanced techniques*. Routledge.

Connor, J. P., Kavanagh, D. J., Andrade, J., May, J., Feeney, G. F. X., Gullo, M. J., White, A. M., Fry, M.-L., Drennan, J., Previte, J., & Tjondronegoro, D. (2014). Alcohol consumption in young adults : The role of multisensory imagery. *Addictive Behaviors*, *39*(3), 721-724. https://doi.org/10.1016/j.addbeh.2013.11.023

Cooper, A., Scherer, C. R., Boies, S. C., & Gordon, B. L. (1999). Sexuality on the Internet : From sexual exploration to pathological expression. *Professional Psychology: Research and Practice*, *30*(2), 154-164. https://doi.org/10.1037/0735-7028.30.2.154

Cornil, A., Long, J., Rothen, S., Perales, J. C., de Timary, P., & Billieux, J. (2019). The gambling craving experience questionnaire : Psychometric properties of a new scale based on the elaborated intrusion theory of desire. *Addictive Behaviors*, *95*, 110-117. https://doi.org/10.1016/j.addbeh.2019.02.023

Coskunpinar, A., Dir, A. L., & Cyders, M. A. (2013). Multidimensionality in Impulsivity and Alcohol Use : A Meta-Analysis Using the UPPS Model of Impulsivity. *Alcoholism: Clinical and Experimental Research*, *37*(9), 1441-1450. https://doi.org/10.1111/acer.12131

Cyders, M. A., & Smith, G. T. (2008). Emotion-based dispositions to rash action : Positive and negative urgency. *Psychological Bulletin*, *134*(6), 807-828. https://doi.org/10.1037/a0013341

De Alarcón, R., De la Iglesia, J., Casado, N., & Montejo, A. (2019). Online Porn Addiction : What We Know and What We Don't—A Systematic Review. *Journal of Clinical Medicine*, *8*(1), 91. https://doi.org/10.3390/jcm8010091

Fisher, W. A., & Barak, A. (2001). Internet pornography : A social psychological perspective on internet sexuality. *Journal of Sex Research*, *38*(4), 312-323. https://doi.org/10.1080/00224490109552102

Gmel, G., Khazaal, Y., Studer, J., Baggio, S., & Marmet, S. (2019). Development of a short form of the compulsive internet use scale in Switzerland. *International Journal of Methods in Psychiatric Research*, *28*(1), e1765. https://doi.org/10.1002/mpr.1765

Kavanagh, D. J., Andrade, J., & May, J. (2005). Imaginary Relish and Exquisite Torture : The Elaborated Intrusion Theory of Desire. *Psychological Review*, *112*(2), 446-467. https://doi.org/10.1037/0033-295X.112.2.446

Kavanagh, D. J., Statham, D. J., Feeney, G. F. X., Young, R. McD., May, J., Andrade, J., & Connor, J. P. (2013). Measurement of alcohol craving. *Addictive Behaviors*, *38*(2), 1572-1584. https://doi.org/10.1016/j.addbeh.2012.08.004

Kline, R. B. (2005). *Principles and practice of structural equation modeling* (Second edition). The Guilford Press.

Koós, M., Orosz, G., Demetrovics, Z., & Bőthe, B. (2022). Present hedonism and future time perspectives predicting hypersexuality and problematic pornography use. *Frontiers in Psychiatry*, *13*, 914919. https://doi.org/10.3389/fpsyt.2022.914919

Kraus, S., & Rosenberg, H. (2014). The Pornography Craving Questionnaire : Psychometric Properties. *Archives of Sexual Behavior*, *43*(3), 451-462. https://doi.org/10.1007/s10508-013-0229-3

Lynam, D. R. (2013). *Development of a short form of the UPPS-P Impulsive Behavior Scale* [Unpublished technical report].

Mallorquí-Bagué, N., Mestre-Bach, G., & Testa, G. (2023). Craving in gambling disorder : A systematic review. *Journal of Behavioral Addictions*. https://doi.org/10.1556/2006.2022.00080

May, J., Andrade, J., Kavanagh, D. J., Feeney, G. F. X., Gullo, M. J., Statham, D. J., Skorka-Brown, J., Connolly, J. M., Cassimatis, M., Young, R. McD., & Connor, J. P. (2014). The Craving Experience Questionnaire : A brief, theory-based measure of consummatory desire and craving: CEQ: Craving Experience Questionnaire. *Addiction*, *109*(5), 728-735. https://doi.org/10.1111/add.12472

May, J., Andrade, J., Panabokke, N., & Kavanagh, D. (2004). Images of desire : Cognitive models of craving. *Memory*, *12*(4), 447-461. https://doi.org/10.1080/09658210444000061

May, J., Andrade, J., Panabokke, N., & Kavanagh, D. (2010). Visuospatial tasks suppress craving for cigarettes. *Behaviour Research and Therapy*, *48*(6), 476-485. https://doi.org/10.1016/j.brat.2010.02.001

Meerkerk, G.-J., Van Den Eijnden, R. J. J. M., Vermulst, A. A., & Garretsen, H. F. L. (2009). The Compulsive Internet Use Scale (CIUS) : Some Psychometric Properties. *CyberPsychology & Behavior*, *12*(1), 1-6. https://doi.org/10.1089/cpb.2008.0181

Müller, S. M., Wegmann, E., Oelker, A., Stark, R., Müller, A., Montag, C., Wölfling, K., Rumpf, H.-J., & Brand, M. (2022). Assessment of Criteria for Specific Internet-use Disorders (ACSID-11) : Introduction of a new screening instrument capturing ICD-11 criteria for gaming disorder and other potential Internet-use disorders. *Journal of Behavioral Addictions*. https://doi.org/10.1556/2006.2022.00013

Palan, S., & Schitter, C. (2018). Prolific.ac—A subject pool for online experiments☆. *Journal of Behavioral and Experimental Finance*, *17*, 22-27. https://doi.org/10.1016/j.jbef.2017.12.004

Peer, E., Rothschild, D., Gordon, A., Evernden, Z., & Damer, E. (2022). Data quality of platforms and panels for online behavioral research. *Behavior Research Methods*, 20. https://doi.org/10.3758/s13428-021-01694-3

Rissel, C., Richters, J., de Visser, R. O., McKee, A., Yeung, A., & Caruana, T. (2016). 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

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

Statham, D. J., Connor, J. P., Kavanagh, D. J., Feeney, G. F. X., Young, R. Mc. D., May, J., & Andrade, J. (2011). Measuring alcohol craving : Development of the Alcohol Craving Experience questionnaire: Alcohol craving experience questionnaire: ACE. *Addiction*, *106*(7), 1230-1238. https://doi.org/10.1111/j.1360-0443.2011.03442.x

Tiffany, S. T., & Wray, J. M. (2012). The clinical significance of drug craving : Tiffany & Wray. *Annals of the New York Academy of Sciences*, *1248*(1), 1-17. https://doi.org/10.1111/j.1749-6632.2011.06298.x

Varfi, N., Rothen, S., Jasiowka, K., Lepers, T., Bianchi-Demicheli, F., & Khazaal, Y. (2019). Sexual Desire, Mood, Attachment Style, Impulsivity, and Self-Esteem as Predictive Factors for Addictive Cybersex. *JMIR Mental Health*, *6*(1), e9978. https://doi.org/10.2196/mental.9978

Weinstein, A. M., Zolek, R., Babkin, A., Cohen, K., & Lejoyeux, M. (2015). Factors Predicting Cybersex Use and Difficulties in Forming Intimate Relationships among Male and Female Users of Cybersex. *Frontiers in Psychiatry*, *6*. https://doi.org/10.3389/fpsyt.2015.00054

Wetterneck, C. T., Burgess, A. J., Short, M. B., Smith, A. H., & Cervantes, M. E. (2012). The Role of Sexual Compulsivity, Impulsivity, and Experiential Avoidance in Internet Pornography Use. *The Psychological Record*, *62*(1), 3-18. https://doi.org/10.1007/BF03395783

Young, K. (2001). *Are You Addicted to Cybersex ? B*.

Zijlmans, E. A. O., Tijmstra, J., van der Ark, L. A., & Sijtsma, K. (2018). Item-Score Reliability in Empirical-Data Sets and Its Relationship With Other Item Indices. *Educational and Psychological Measurement*, *78*(6), 998-1020. https://doi.org/10.1177/0013164417728358