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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

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Abstract

It is considered the most widespread cybersexual activity (Fisher & Barak, 2001; Ross et al., 2012). Albright (2009) 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; Müllner 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 men rated themselves as addicted to pornography, as per the men's rating themselves as addicted (Weinstein et al., 2015). Earlier studies characterized problematic use of online pornography as an intense desire and is known to be accompanied by a vicious cycle of desire, imagery, and planning to gratify that desire, e.g., “self-reports 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 heterogeneous 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 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 craving, the present study aimed at developing 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...
Measuring Pornography Craving

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 a relationship, not married, 24.6% were in a relationship, married, and 0.5% were widowed. 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.co/), an online crowdsourcing platform designed for academic research and proven to provide high-quality data (Palan & Schütze, 2018; Puer 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

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, Intrasession = 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 Intrusiveness) —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 analysis made using R can be found on the Open Science Framework: https://osf.io/wr6r6/

Results

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

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 (FFR, IM, YK, and RC) until an 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 Intrusiveness 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 (Goes et al., 2019; Meerkert 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 Brannon et al., 2019; Yafi 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

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

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Table 1. Measuring Pornography Craving

<table>
<thead>
<tr>
<th>Item</th>
<th>M</th>
<th>SD</th>
<th>Skewness</th>
<th>Kurtosis</th>
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Table 2. Measuring Pornography Craving

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

Table 2. Measuring Pornography Craving

<table>
<thead>
<tr>
<th>Subscale</th>
<th>Cronbach's Alpha</th>
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<tbody>
<tr>
<td>Imagery</td>
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<td>Intensity</td>
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<td>Intrusiveness</td>
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Table 3. Measuring Pornography Craving

Table 3 presents the correlation matrix between the 10 items of the PCE-S subscales and the other study variables: CCU, FCU, CUD, UPPS-P negative urgency, and UPPS-P positive urgency.

Table 3. Measuring Pornography Craving

<table>
<thead>
<tr>
<th>Item</th>
<th>CCU</th>
<th>FCU</th>
<th>CUD</th>
<th>UPPS-P</th>
<th>UPPS-P</th>
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</table>

Table 4. Measuring Pornography Craving

Table 4 presents the results of the linear regression analysis to predict the value of CCU (mean centered) from Sex and the three PCE-S subscales (Imagery, Intensity, and Intrusiveness).

Table 4. Measuring Pornography Craving

<table>
<thead>
<tr>
<th>Subscale</th>
<th>B</th>
<th>SE</th>
<th>t</th>
<th>p</th>
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<tbody>
<tr>
<td>Imagery</td>
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<td>Intensity</td>
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<td>Intrusiveness</td>
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Results of the 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.
The initial model (see path diagram in Appendix 2, Figure A) metrics were as follow: chi-square (χ²) = 602.65, degree of freedom (df) = 32, p < 0.001; χ²/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) = 0.04; standardized root mean square residual (SRMR) = 0.044. The standardized regression weights (factor loadings) were between 0.68 and 0.82, being statistically significant (p < 0.001). All these ratings are acceptable, except for chi-square (for which the p-value should not be significant), the χ²/df values (which should be under 5), and the RMSEA value (which would be ≤ 0.080) (Collar, 2020, Kline, 2005). For an acceptable model, the SRMR should be ≤ 0.080 (which is the case here); the other indicators should be > 0.90 (acceptable model) and > 0.95 (good model) (Collar, 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: χ² = 235.76, df = 26, p < 0.001; χ²/df = 13.79; GFI = 0.96; NFI = 0.97; RFI = 0.95; IFI = 0.97; TLI = 0.95; CFI = 0.97; RMSEA = 0.04; SRMR = 0.039.

After examining the standardized residual correlation (SRC) matrix of the improved model, we decided to try to improve the model again by eliminating item 8 (from the Introspection factor), the only one that had an SRC value greater than 2 (as recommended by Collar, 2020). The improved 9-item model (see path diagram in Appendix 2, Figure B) metrics were as follow: χ² = 200.16, df = 18, p < 0.001; χ²/df = 11.12; GFI = 0.97; NFI = 0.98; RFI = 0.96; IFI = 0.99; TLI = 0.96; CFI = 0.98; RMSEA = 0.040; 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: χ² = 238.04, df = 52, p < 0.001; χ²/df = 4.74; GFI = 0.95; NFI = 0.96; RFI = 0.94; IFI = 0.97; TLI = 0.95; CFI = 0.97; RMSEA = 0.049; SRMR = 0.059. The metric invariance test indicated that the meaning of the three modeled constructs (factors) did not change across groups (χ²change = 13.16; 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 UPSR-P negative urgency and UPSR-P positive urgency.

Discriminant Validity
Discriminant analyses tested whether scores on the PCE-S subscales discriminated between (a) the participants with low CCU scores (for quartile, CQU scores ≤ 1.63, n = 405 [males = 168, females = 224, non-binary = 11]), and (b) the participants with high CCU scores (fourth quartile, CQU scores ≥ 3.13, n = 138 [males = 246, females = 96, non-binary = 6]). The descriptive statistics for the CQU score was as follow: scale = 1-5 points; range = 0-4; mean = 2.48(SD=0.93); median = 2.37. The Percentiles were: 25% = 1.63, 50% = 2.38; 75% = 3.13.

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

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 (three factors, 10 items) to the data. The X²/df value (13.79) and the RMSEA value (0.040) were above the criteria of goodness which must be ≤ 5 and ≤ 0.080 respectively (Collar, 2020; Kline, 2005).

While the improved model with 9 items got a RMSEA = 0.040, the remaining indices did not improve significantly (e.g., X²/df = 11.12). Given that the original scale ACE (Statham et al., 2011) also had a X² p-value and the RMSEA metrics (respectively p > 0.001 and 0.108; the X²/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 X² and the X²/df. This PCE-S structure with its three factors related to Imagery, Intensity, and Intrusion has also allowed covering important elements constituting the craving (Kavanaugh 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 (FUS; CUD; CCEU). The three PCE-S constructs also successfully discriminated participants with high CQU from those with low CQU. Moreover, PCE-S scores predicted the variance of the CQU.
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 PCE-S at different time to better catch dynamic interactions between craving 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 those 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.

**References**


Measuring Pornography Craving


