

## The Short Version of the Problematic Pornography Consumption Scale (PPCS-6): A Reliable and Valid Measure in General and Treatment-seeking Populations

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## **The Short Version of the Problematic Pornography Consumption Scale (PPCS-6): A Reliable and Valid Measure in General and Treatment-Seeking Populations**

### **Abstract**

To date, no short scale existed that could assess problematic pornography use (PPU) having a solid theoretical background and strong psychometric properties. Having such a short scale may be advantageous when scarce resources are available and/or when respondents' attention spans are limited. The aim of the present investigation was to develop a short scale that can be utilized to screen for PPU. The Problematic Pornography Consumption Scale (PPCS-18) was used as a basis for the development of a short measure of PPU (PPCS-6). A community sample ( $N_1=15,051$ ), a sample of pornography site visitors ( $N_2=760$ ), and a sample of treatment-seeking individuals ( $N_3=266$ ) were recruited to investigate the reliability and validity of the PPCS-6. Also, its association was tested to theoretically-relevant correlates (e.g., hypersexuality, frequency of masturbation), and a cut-off score was determined. The PPCS-6 yielded strong psychometric properties in terms of factor structure, measurement invariance, reliability, correlated reasonably with the assessed variables, and an optimal cut-off was identified that could reliably distinguish between PPU and non-problematic pornography use. PPCS-6 can be considered as a short, reliable, and valid scale to assess PPU in studies when the length of a questionnaire is essential or when a brief screening for PPU is necessary.

**Keywords:** pornography; problematic pornography use; Problematic Pornography Consumption Scale (PPCS); PPCS-6; screening

Pornography consumption among young adults and even among pre-adolescent children has started to increase in the past decades (Lewczuk, Wojcik, & Gola, 2019; Price, Patterson, Regnerus, & Walley, 2016). According to the latest statistics of a popular pornography website (Pornhub.com, 2019), on average, 115 million people visited this website daily, and more than 1300 searches were conducted every second. Not only has public interest started to increase concerning pornography use, but an increasing number of scientific studies has been published in this topic in the recent years (e.g., Blais-Lecours, Vaillancourt-Morel, Sabourin, & Godbout, 2016; Bóthe, Tóth-Király, & Orosz, 2015; Kraus & Rosenberg, 2014). However, to date, no short scale existed that could assess problematic pornography use adequately (Fernandez & Griffiths, 2019).

Having such a short scale to assess and screen for problematic pornography use may be advantageous when scarce resources are available. For example, in large-scale, nationally representative data collection (Cunney & Perri, 1991) which is a gap in the literature given that only a handful of studies were conducted in Western countries (Grubbs, Kraus, & Perry, 2019; Rissel et al., 2017). Moreover, the use of a short scale is also beneficial when respondents' attention spans are limited (Konrath, Meier, & Bushman, 2014). Previous studies reported positive associations between problematic pornography use and impulsivity (Antons & Brand, 2018; Bóthe, Tóth-Király, Potenza, et al., 2019) and attention deficit hyperactivity disorder (ADHD, Bóthe, Koós, Tóth-Király, Orosz, & Demetrovics, 2019) indicating that individuals with problematic pornography use may experience difficulties with sustained attention. Thus, using a short scale would be adequate to assess problematic pornography use. Therefore, the aim of the present study was to develop a short, reliable, and valid scale that could assess problematic pornography use based on an overarching and well-studied (Andreassen, Pallesen, Griffiths, Torsheim, & Sinha, 2018; Andreassen, Griffiths, Hetland, & Pallesen, 2012; Orosz, Bóthe, & Tóth-Király, 2016; Orosz, Tóth-Király, Bóthe, & Melher, 2016) theoretical framework of addictions and problematic behaviors, namely, Griffiths' six-component model (Griffiths, 2005). The Problematic Pornography Consumption Scale (PPCS-18; Bóthe, Tóth-Király, Zsila, et al., 2018) served as a basis for this purpose. Then, the psychometric properties of the developed scale (PPCS-6) were examined on three independent samples of pornography users with the inclusion of theoretically-relevant correlates (Marsh, Ellis, Parada, Richards, & Heubeck, 2005) and a potential cut-off score was determined.

#### **Assessment of Problematic Pornography Use**

Despite the inclusion of the diagnosis of Compulsive Sexual Behavior Disorder (CSBD) in the 11th version of *International Statistical Classification of Diseases and Related Health Problems* (ICD-11) (World Health Organization, 2019), there is no official diagnostic criteria and classification for problematic pornography use, resulting in diverse definitions and measurements of the given phenomenon (Fernandez & Griffiths, 2019). However, as problematic pornography use may be subsumed as a manifestation or subcategory of CSBD, the same diagnostic criteria may be applied to define problematic pornography use. Thus, in the case of problematic pornography use, pornography is the central focus of the users' life; problematic users experience failures when trying to control their use with recurring unsuccessful efforts to regulate or reduce it; and they engage in pornography use despite the negative consequences and deriving little or no satisfaction from it anymore (World Health Organization, 2019). Also, it has to be noted that problematic pornography use and frequency of pornography use are related but yet may be considered as distinct domains of pornography use, as they showed positive, but only small-to-moderate associations in previous studies (Bóthe, Tóth-Király, Zsila, et al., 2018; Gola, Lewczuk, & Skorko, 2016; Grubbs & Perry, 2019; Grubbs, Perry, Wilt, & Reid, 2019; Kor et al., 2014). Thus, it may be assumed that there are individuals who use pornography frequently and experience no related problems at all. At the same time, others may use pornography just as frequently as non-problematic users, but at the same time experience severe adverse consequences (e.g., non-problematic highly-engaged users vs. problematic users) (Ferguson, Coulson, & Barnett, 2011).

Studies examining the prevalence rates of pornography use frequency and problematic pornography use often apply only one item assessing the subjective feeling of "pornography addiction" without further indicators of problems related to it (e.g., Rissel et al., 2017). These results might be prone to biases due to moral incongruence regarding pornography use (Grubbs, Perry, Wilt, & Reid, 2018).

Although individuals with religious beliefs may oppose pornography use, they tend to engage in this activity, potentially leading to moral incongruence and reporting lower levels of pornography use. In addition, they may attribute any amount of pornography use to control problems, and they may interpret it as an “addiction” to pornography use (Grubbs et al., 2018; Grubbs, Perry, et al., 2019; Kraus & Sweeney, 2019).

To address these limitations, studies should be carried out with psychometrically appropriate and theoretically solid measures to gain a better knowledge of the phenomenon of problematic pornography use. As the first step in this process, reliable and valid measures are needed that can assess problematic pornography use, not only the subjective feelings of “pornography addiction” (Fernandez & Griffiths, 2019). According to a recent systematic review evaluating the psychometrics instruments measuring problematic pornography use (Fernandez & Griffiths, 2019), more than 20 scales were developed or adapted to assess problematic pornography use or some characteristics of problematic pornography use. However, most of them showed theoretical and/or methodological shortcomings that limited their applications to develop a shorter version from them. For example, some scales only covered a narrow range of the components of problematic pornography use (e.g., craving or negative effects of pornography use), others were validated on specific samples (e.g., men who have sex with men, or men with hypersexuality), or were restricted by the phrasing of the original item set assessing different behaviors (e.g., scales adapted from prior instruments assessing compulsive internet use may not be appropriately applied in the case of problematic pornography use) (Fernandez & Griffiths, 2019).

When taking into consideration the strengths and limitations of these scales, the PPCS-18 (Böthe, Tóth-Király, Zsila, et al., 2018) and the Problematic Pornography Use Scale (PPUS) (Kor et al., 2014) demonstrated the strongest psychometric properties, and they were recommended to be used in both research and clinical settings (Fernandez & Griffiths, 2019). For the purpose of the present study, we chose the PPCS-18 as a basis for a short scale in opposition to the PPUS because the PPCS-18 explicitly measures tolerance as opposed to the PPUS, its items are short and concise, and the items provide clear information regarding the areas that are aimed to be measured (i.e., some items of the PPUS are long and include several areas of functioning hindering clear information which of them are affected by pornography use) (Fernandez & Griffiths, 2019).

The PPCS-18 includes six factors assessing the dimensions of problematic pornography use based on Griffiths’ six-component model of addiction (Griffiths, 2005): salience (importance of pornography use in one’s life), tolerance (gradual increase of pornography use without reaching satisfaction), mood modification (pornography use as a tool to reduce negative feelings), conflict (intra- and interpersonal problems as a result of pornography use), withdrawal (psychological distress and/or withdrawal symptoms appearing when pornography use is inhibited), and relapse (unsuccessful efforts to reduce or stop pornography use). According to the six-component model, problematic use may only be present if all the characteristics of problematic use appear regarding the given behavior. Someone may demonstrate some (but not all) of these characteristics without real problematic use. For example, pornography use may cause significant distress in people’s life (i.e., conflict component) because their partner may consider pornography use as a form of cheating (Bechara et al., 2003). In this case, individuals would score higher on the conflict component, but they did not display other characteristics of problematic pornography use. Thus, they may not be considered as problematic users. If we separate the items and examine them independently from the other characteristics, they may not seem the most unambiguous indicators of problematic use (e.g., salience or mood modification). However, when all the six components are considered as characteristics of problematic use, and all these components are present regularly at the same time, then they represent the most important criteria of problematic use (Griffiths, 2005). Moreover, applying the six-component model is in line with recent considerations that problematic use or potentially addictive behaviors should be classified based on the same criteria (e.g., the six-component model) because the use of these similar characteristics will unify the examination of the different problematic behaviors and would lead to a more unified view of them (Griffiths, 2019).

The PPCS-18 demonstrated strong psychometric properties in terms of good confirmatory factor analysis as well as high levels of measurement invariance and reliability; in addition, a reliable cut-off

score with high sensitivity, specificity, positive predictive value, negative predictive value, and accuracy was determined for this scale (Bóthe, Tóth-Király, Zsila, et al., 2018). The validity of the PPCS-18 was established in relation to sexuality-related (i.e., hypersexuality, sexual motivations, sexual satisfaction, sex mindset, and relationship satisfaction), personality-related variables (i.e., impulsivity and compulsivity), and psychiatric disorders (i.e., adult ADHD symptoms) (Bóthe, Tóth-Király, Zsila, et al., 2018; Bóthe, Koós, Tóth-Király, Orosz, & Demetrovics, 2019; Bóthe et al., 2017; Bóthe, Tóth-Király, Potenza, et al., 2018; Tóth-Király, Vallerand, Bóthe, Rigó, & Orosz, 2019). In sum, the PPCS-18 is a robust multidimensional scale lying on a solid theoretical background (Griffiths, 2005), and demonstrating strong psychometric properties in terms of reliability, measurement invariance, construct validity, and convergent and divergent validity as well (Bóthe, Tóth-Király, Zsila, et al., 2018; Bóthe, Koós, et al., 2019; Bóthe et al., 2017; Bóthe, Tóth-Király, Potenza, et al., 2018; Tóth-Király et al., 2019). Therefore, the PPCS-18 may be considered as an adequate basis for further analysis to develop a short scale assessing problematic pornography use.

### **When to Use Brief Versions of Scales**

The utilization of brief scales is highly welcomed both in clinical settings for quick screening purposes as well as in research, especially in the case of surveys when there is no room for longer measures. However, some issues need to be considered before using short versions of given scales. *First*, only those short scales should be utilized that were adequately tested in terms of psychometric properties through independent studies (i.e., within-network and between-network investigations were carried out) and had a solid theory behind them (Marsh et al., 2005). *Second*, short measures or even single-item measures may be more adequate to use when researchers or therapists have limited resources, such as having only a short period of time to administer the scale or having other scales that should be included in a questionnaire battery (Cunney & Perri, 1991; Danner, Treiber, & Bosnjak, 2019). Moreover, short measures may be less expensive than full-length scales (Dolan et al., 2015). *Third*, short scales may be more appropriate in studies when the given constructs are measured multiple times (e.g., experience sampling studies or diary studies), or when exploratory (e.g., when new methods or theories are pilot tested) or experimental studies are conducted (Danner et al., 2019; Konrath, Meier, & Bushman, 2014, 2018). *Fourth*, from the perspective of respondents, short scales or single-item measures can be fruitful in cases when participants have a limited attention span (e.g., online studies) or when the original, longer version of the given scale includes several, repetitive items that may potentially result in reduced motivation which, in turn, can lead to higher dropout rates (Danner et al., 2019; Konrath et al., 2014, 2018). However, there are cases when the use of longer scales may be more appropriate. Longer scales are suggested when the small differences between the individuals or in the severity of the given condition have high importance.

The aim of the present work was to develop a new, short version of the PPCS-18 that preserves the strong psychometric qualities of the PPCS-18 despite the brevity of the new measure (Marsh et al., 2005). Three independent samples were recruited (i.e., a large community sample, visitors of a pornography site, and treatment-seeking individuals) and theoretically-relevant constructs were assessed as correlates (i.e., frequency and duration of pornography use, frequency of masturbation, frequency of pornography use during masturbation, and hypersexuality) to increase the reliability and validity of the findings. Given that important gender-based (Grubbs, Kraus, et al., 2018; Rissel et al., 2017) and sexual orientation-based (Bóthe, Bartók, et al., 2018) differences have been reported in the literature with respect to pornography use; it was deemed necessary, similar to Bóthe, Tóth-Király, Zsila et al. (2018), to test via measurement invariance whether the PPCS-6 functions the same way in these subgroups. Moreover, measurement invariance testing was conducted to examine whether the PPCS-6 functions the same way in treatment-seeking and in general populations. Similarly to the original validation study (Bóthe, Tóth-Király, Zsila, et al., 2018), a potential cut-off score was determined for the PPCS-6 that can distinguish between problematic and non-problematic pornography users. Overall, it was expected that the short version of the scale would demonstrate similar construct validity, reliability, and association patterns with the assessed correlates like the long one.

### **Methods**

## Participants and Procedure

The present work was approved by the Institutional Ethical Review Board of the research team's university and was conducted in accordance with the Helsinki Declaration. Data collection was conducted via online surveys, completing them took 15-30 minutes as the present study was part of a larger project. Participants were informed about the aims of the study, and informed consent was obtained from them prior to data collection. Before presenting the pornography-related measures, this previously established definition of pornography (Bóthe, Tóth-Király, Zsila, et al., 2018; Hald & Malamuth, 2008; Reid, Li, Gilliland, Stein, & Fong, 2011) was provided to the participants to avoid potential biases deriving from individual differences (Willoughby & Busby, 2016): "*Pornography is defined as material (text, picture, video, etc.) that (1) creates or elicits feelings or thoughts and (2) contains explicit exposure or descriptions of sexual acts involving the genitals, such as vaginal or anal intercourse, oral sex, or masturbation*". Only individuals aged 18 years or older were allowed to participate. In the case of Sample 1, respondents were invited to participate via advertisements on one of the largest Hungarian news portal in January 2017. The survey was advertised as a study examining sexual activities. As for Sample 2, participants were invited to take part in the study via a popular Hungarian pornography site in December 2017. The survey was advertised as a study examining pornography use. Regarding Sample 3, participants were recruited on an English-language website presenting the latest findings in diverse psychological topics (i.e., PsyPost) in an easily understandable way in July 2019. The advertisement targeted those people who may experience problems related to their pornography use and wanted to participate in the pretest of a new online program aiming to reduce problematic pornography use (i.e., treatment-seeking individuals). In the advertisement, first, prior findings of problematic pornography use were presented. Then, a new online cognitive-behavioral therapy-based program that we had developed was shortly described. We asked the participants to complete a short survey about their pornography use and willingness to participate in the online program if they wanted to reduce their pornography use-related problems. We also informed the participants that the study was approved by the related university's ethical review board; their data will be kept confidential and will only be used for scientific purposes.

**Sample 1.** A total number of 15,051 individuals (29.7% female) participated in the present study aged between 18 and 76 years ( $M_{age} = 33.2$  years,  $SD_{age} = 11.0$ ). As for sexual orientation, 12,412 were heterosexual (82.5%), 1,519 were heterosexual with homosexuality to some extent (10.1%), 438 were bisexual (2.9%), 106 were homosexual with heterosexuality to some extent (0.7%), 420 were homosexual (2.8%), 23 were asexual (0.2%), 93 were unsure about their sexual orientation (0.6%), and 40 indicated the "other" option (0.3%). Regarding relationship status, 4,293 were single (28.5%), 5,932 were in any kind of romantic relationship (i.e., being in a relationship, engaged, or married) (70.0%), and 219 indicated the "other" option (1.5%). Regarding past-year pornography use, participants watched online pornography weekly and reported spending 26.6 minutes with it per each session ( $SD = 20.9$ ). Regarding masturbation, participants masturbated two to three times a week, and they used pornography more than 75% of these occasions.

**Sample 2.** A total number of 760 individuals (6.3% female) participated in the present study aged between 19 and 75 years ( $M_{age} = 39.6$  years,  $SD_{age} = 9.7$ ). As for sexual orientation, 603 were heterosexual (79.3%), 87 were heterosexual with homosexuality to some extent (11.4%), 45 were bisexual (5.9%), five were homosexual with heterosexuality to some extent (0.7%), 12 were homosexual (1.6%), two were asexual (0.3%), five were unsure about their sexual orientation (0.7%), and 1 indicated the "other" option (0.1%). Regarding relationship status, 159 were single (20.9%), 597 were in any kind of romantic relationship (i.e., being in a relationship, engaged, or married) (78.6%), and four indicated the "other" option (0.5%). Regarding past-year pornography use, participants watched online pornography weekly and reported spending 38.3 minutes with it per each session ( $SD = 28.1$ ). Regarding masturbation, participants masturbated two to three times a week, and they used pornography more than 75% of these occasions.

**Sample 3.** A total number of 266 individuals (3.0% female) participated in the present study aged between 18 and 76 years ( $M_{age} = 37.2$  years,  $SD_{age} = 12.3$ ). As for sexual orientation, 184 were heterosexual (69.2%), 46 were heterosexual with homosexuality to some extent (17.3%), 13 were bisexual

(4.9%), three were homosexual with heterosexuality to some extent (1.1 %), 16 were homosexual (6.0%), no one was asexual (0.0%), two were unsure about their sexual orientation (0.8%), and two indicated the “other” option (0.8%). Regarding relationship status, 81 were single (30.4%), 180 were in any kind of romantic relationship (i.e., being in a relationship, engaged, or married) (67.4%), and five indicated the “other” option (1.9%). Regarding past-year pornography use, participants watched online pornography six to seven times a week and reported spending 47.9 minutes with it per each session ( $SD = 41.0$ ). Regarding masturbation, participants masturbated four to five times a week, and they almost always used pornography during these occasions.

### Measures

**Problematic Pornography Consumption Scale** (PPCS-18, Bóthe, Tóth-Király, Zsila, et al., 2018). The PPCS-18 assesses problematic pornography use via six factors (three items each) based on the proposed six-component addiction model (Griffiths, 2005): salience, tolerance, mood modification, relapse, withdrawal, and conflict. Participants indicated their answers on a seven-point scale (1 = never; 7 = very often) regarding the past six months. The short version is available in Appendix 1.

**Masturbation and Pornography Use-Related Questions** (Bóthe, Bartók, et al., 2018). Respondents indicated their frequency of online pornography use and their frequency of masturbation on a 10-point scale (1 = “never”, 10 = “6 or 7 times a week”)<sup>1</sup>. Also, they reported their time spent with accessing pornography per session (in minutes) over the past year and the frequency of their pornography use during masturbation on an eight-point scale (1 = “never”, 8 = “always”).

**Hypersexual Behavior Inventory** (HBI, Bóthe, Kovács, et al., 2019; Reid, Garos, & Carpenter, 2011). HBI assesses the level of hypersexuality via three factors (coping, control, and consequences) with 19-items. Participants indicated their answers on a five-point scale (1 = “never”; 5 = “very often”). The HBI demonstrated excellent reliability in the present study ( $\alpha = .90$ ).

### Statistical Analysis

For statistical analysis, SPSS 22 and Mplus 7.3 (Muthén & Muthén, 1998-2015) were utilized. Initially, the PPCS-18 was examined to select the best items representing each factor with one item. Based on the combined guidelines of prior work (Haynes, Richard, & Kubany, 1995; Marsh et al., 2005; Orosz, Tóth-Király, & Bóthe, 2016; Orosz et al., 2018), each item was evaluated by the following criteria: (a) having adequate corrected item-total correlations, (b) having adequate standardized factor loadings, (c) having the lowest skewness and kurtoses values, and (d) best covering the breadth of the content determined by separate subjective evaluations from the authors (i.e., evaluation of an expert in clinical psychology and addiction, evaluation of an expert in pornography research, and evaluation of two experts in scale development). First, the psychometric properties of each item were examined, and then the four evaluators independently rated and selected the items that they found the most appropriate assessing the given criterion. After these evaluations, those items were selected that had strong psychometric properties and represented best the factors’ content. Six items were selected (each representing one factor from the original PPCS-18) for further analyses.

Confirmatory factor analysis (CFA) was conducted on Sample 1 and then on Sample 2 and Sample 3 to cross-validate the results. Commonly used goodness-of-fit indices were used to evaluate the models (Brown, 2015; Hu & Bentler, 1999): Comparative Fit Index (CFI;  $\geq .95$  for good,  $\geq .90$  for acceptable), the Tucker–Lewis index (TLI;  $\geq .95$  for good,  $\geq .90$  for acceptable), and the Root-Mean-Square Error of Approximation (RMSEA;  $\leq .06$  for good,  $\leq .08$  for acceptable) with its 90% confidence interval. Items were treated as categorical indicators, and the mean- and variance-adjusted weighted least-squares estimator (WLSMV) was applied (Finney & DiStefano, 2006). To test measurement invariance between gender-based groups (men vs. women) and sexual orientation-based groups (exclusively heterosexual vs. sexual minority individuals), multi-group CFAs were carried out (Tóth-Király, Bóthe, Rigó, & Orosz, 2017; Vandenberg & Lance, 2000) on Sample 1. Additionally, to test measurement invariance between general populations (Sample 1 and Sample 2) and treatment-seeking individuals

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<sup>1</sup> In Sample 3, frequency of pornography use and frequency of masturbation were measured on an 11-point scale ranging from 1 = „never” to 11 = „more than 7 times a week”.

(Sample 3), multi-group CFAs were conducted on Sample 1, Sample 2, and Sample 3. A total of six levels of invariance were tested and compared in each case: configural, metric, scalar, residual, latent variance and latent mean (such as in the case of hypersexuality in a previous study – Bóthe, Bartók, et al., 2018). When comparing the increasingly constrained models, relative change in fit indices was observed (Chen, 2007; Cheung & Rensvold, 2002; Marsh et al., 2009):  $\Delta CFI \leq .010$ ;  $\Delta TLI \leq .010$ ; and  $\Delta RMSEA \leq .015$ .

Cronbach's alpha (Nunnally, 1978) was calculated for estimated internal consistency with its acceptable ( $\geq .70$ ) or good ( $\geq .80$ ) thresholds. Following prior recommendations (Sijtsma, 2009), composite reliability (CR) was also calculated following the formula of Raykov (1997) as CR represents the construct more adequately by taking into account the factor loadings with their respective measurement errors. Values  $> .60$  are considered acceptable and values  $> .70$  are considered good (Bagozzi & Yi, 1988). Apart from the correlations between the long and short forms, associations between pornography use frequency, pornography use duration per occasion, masturbation frequency, pornography use frequency during masturbation, and the PPCS-6 were assessed to corroborate the validity of the PPCS-6.

Lastly, sensitivity and specificity analysis were conducted to calculate a cut-off score for the PPCS-6 based on treatment-seeking status (i.e., Sample 3 (treatment-seeking individuals) vs. Sample 2 (non-treatment-seeking individuals)). The sensitivity, specificity, positive predictive value, negative predictive value, and accuracy values for potential cut-off scores on the PPCS-6 cut-off scores were calculated. Sensitivity was defined as the proportion of true positives belonging to the treatment-seeking group, while specificity was defined as the proportion of the true negatives belonging to the non-treatment-seeking group (Altman & Bland, 1994a; Glaros & Kline, 1988). Positive predictive value was calculated as the proportion of the "true positive" cases (individuals with positive test results who were correctly diagnosed as problematic users), while negative predictive value was calculated as the proportion of "true negative" cases (individuals with negative test results who were correctly diagnosed as non-problematic users) (Altman & Bland, 1994b; Glaros & Kline, 1988).

## Results

### Item Selection

First, on Sample 1, CFA was conducted on the PPCS-18 to obtain standardized factor loadings for the items. The model had adequate fit to the data (Table 1). The standardized factor loadings of the items, corrected item-total correlations, skewness, and kurtosis values can be seen in Table 2. Based on the aforementioned indices and the subjective content evaluation of the items by experts, six items (one per factor) were selected for further analysis.

More precisely, in the process of item selection, the authors considered both theoretical and empirical approaches. Selecting items solely on statistical information could be biased as we might lose important aspects or content from the theoretical conceptualization of the factor. Indeed, apart from the reported statistical information, we also considered the theoretical adequacy of the items (as proposed by Hu & Bentler, 1998; Marsh, Hau, & Wen, 2004; Morin, Katrin Arens, & Marsh, 2015). In the case of the salience factor, we decided to choose the item "I felt that porn is an important part of my life" (Item S1) for the following reasons. First, all items in the salience factor had appropriate standardized factor loadings, corrected item-total correlations, and had adequate skewness and kurtosis values. These values for all three items suggest that all are adequate representations of the salience factor. For this reason, secondly, the content of the items was evaluated regarding what extent each item covers the definition of the salience factor by independent experts in the field of clinical psychology and addiction, pornography research, and scale development, thus making sure that the most optimal item is selected. Third, from a theoretical perspective, the content of Item S1 describes best the salience component of problematic behaviors based on Griffiths' definition of salience (Griffiths, 2005). Thus, as all the items on the salience factor had appropriate psychometric properties, we chose the most appropriate item on a theoretical basis, which aligned with the actual definition provided by Griffiths. Item S1 is a better choice than Item S7 and Item S13 that are more restricted in their content and only assess the more peripheral characteristics of salience. Therefore, Item S1 was retained for the short version of the PPCS. The same process was followed in the case of all items.



### Validity and Reliability of the PPCS-6

In the next step of the analysis, CFA was conducted on the selected items to investigate the construct validity of the six-item version of the PPCS (PPCS-6). The model had an excellent fit to the data on all samples (Table 1). The PPCS-6 had adequate reliability in terms of Cronbach's alpha and composite reliability values on each sample (see Table 3). The PPCS-6 and PPCS-18 had strong, positive associations with each other, and the PPCS-6 showed adequate (positive, weak-to-moderate) associations with pornography use frequency, pornography use duration, masturbation frequency, and frequency of pornography use during masturbation on each sample (see Table 4). Also, both the PPCS-6 and the PPCS-18 showed positive, moderate associations with the level of hypersexuality in Sample 1. The differences between the associations of the PPCS-6 and the PPCS-18 with respect to the theoretically-relevant correlates were highly similar; the highest absolute difference between the correlations was .05, indicating no significant loss of information.

To ensure the validity of the PPCS-6 and to ensure that gender-based comparisons are meaningful, measurement invariance testing was conducted to examine the factor structure of the PPCS-6 across two subgroups (men vs. women) on Sample 1. Baseline models were estimated for each group and, then, parameters were gradually constrained. Fit indices suggested that configural, metric, and scalar invariance was achieved (i.e.,  $\Delta CFI \leq .010$ ;  $\Delta TLI \leq .010$ ; and  $\Delta RMSEA \leq .015$ ). For residual invariance, although the change in TLI was acceptable, changes in CFI and RMSEA were higher than the recommended threshold values. Therefore, based on the examination of modification indices, we relaxed the equality constraint on the residual variance of item 6, thus achieving a model of partial residual invariance, which demonstrated adequate changes in the fit indices. Latent variance invariance was also achieved, but latent mean invariance was not, suggesting the presence of latent mean differences between men and women (see Table 5). Using the variance model, latent mean differences are expressed in SD units and are accompanied by tests of statistical significance. When men's latent mean differences were constrained to zero for the purpose of model identification, women's latent means proved to be substantially lower (-1.16 SD,  $p < .001$ ).

To lend further support for the validity of the PPCS-6 and to ensure that sexual orientation-based comparisons are meaningful, we examined the invariance of the factor structure of the PPCS-6 across two subgroups (exclusively heterosexual vs. sexual minority individuals) on Sample 1. Baseline models were estimated for each group and, then, parameters were gradually constrained. Fit indices suggested that configural, metric, scalar, residual, latent variance, and latent mean invariance was achieved (i.e.,  $\Delta CFI \leq .010$ ;  $\Delta TLI \leq .010$ ; and  $\Delta RMSEA \leq .015$ ). These results indicate sexual orientation-related invariance on the level of latent means, and the PPCS-6 appears to function the same way in both groups, demonstrating the equality of factor loadings, thresholds, and uniquenesses.

To ensure that the PPCS-6 can be reliably used in both general and treatment-seeking populations, and these comparisons are meaningful, measurement invariance testing was conducted to examine the factor structure of the PPCS-6 across the three samples. Baseline models were estimated for each group and, then, parameters were gradually constrained. Fit indices suggested that configural and metric invariance was achieved (i.e.,  $\Delta CFI \leq .010$ ;  $\Delta TLI \leq .010$ ; and  $\Delta RMSEA \leq .015$ ). For scalar invariance, although the change in TLI and RMSEA was acceptable, changes in CFI were slightly higher than the recommended threshold values (i.e.,  $\Delta CFI = .011$ ). Thus, we retained this model for the further steps of invariance testing. Residual and latent variance invariance was also achieved, but latent mean invariance was not, suggesting the presence of latent mean differences between the samples (see Table 5). When treatment-seeking individuals' latent mean differences were constrained to zero for the purpose of model identification, treatment-seeking individuals' latent means were substantially higher than participants' latent means in Sample 1 and Sample 2 (Sample 1: -1.81 SD,  $p < .001$ ; Sample 2: -1.76 SD,  $p < .001$ ), indicating that treatment-seeking individuals have significantly higher scores on the PPCS-6 than general, non-treatment-seeking people.

### Distinguishing Problematic and Non-Problematic Pornography Use: Determination of a Cut-off Score

As the last step, a potential cut-off score was calculated for the PPCS-6 based on treatment-seeking status (i.e., treatment-seeking individuals versus non-treatment-seeking/control individuals). Individuals in Sample 3 were considered treatment-seeking participants, while participants from Sample 2 who has never sought help for problematic pornography use (698 participants, 92% of the sample) were included in the non-treatment-seeking/control group. The sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and the accuracy of the PPCS-6 at possible cut-off scores were calculated (Table 6). A score of 20 (out of 42) can be considered as an optimal cut-off score to be classified as a problematic pornography user. The accuracy of the PPCS-6 was 89%. The sensitivity and specificity values suggest that 16% of the treatment-seeking individuals were not recognized, while only 10% of non-treatment-seeking individuals were identified as potentially problematic users at this cut-off score. Based on the PPV and NPV, 24% of the individuals with a positive test result (i.e., having 20 points or higher) were identified mistakenly as problematic users, while only 6% of the participants with a negative test result (i.e., having 19 points or lower) were identified mistakenly as non-problematic users.

### Discussion

With the increase of pornography consumption (Lewczuk et al., 2019; Price et al., 2016), the clinical and scientific interest in the examination of pornography use—especially with respect to problematic pornography use—has started to increase (e.g., Blais-Lecours et al., 2016; Ford et al., 2012; Grubbs et al., 2015). Despite this increased interest in problematic pornography use (Kraus, Voon, & Potenza, 2016), no short scale existed in the literature that could reliably and validly assess the extent of problematic pornography use and could be used as a screener to distinguish between potentially problematic and non-problematic pornography users, limiting the adequate assessment of problematic pornography use in large-scale survey studies (Fernandez & Griffiths, 2019). Thus, the present study sought to address this shortcoming with the development of the PPCS-6, a short, reliable, and valid scale assessing problematic pornography use with six items based on a solid theoretical background (Griffiths, 2005).

Following previous guidelines and studies developing short measures (Danner et al., 2019; Perreira et al., 2018; Schaufeli, Shimazu, Hakanen, Salanova, & De Witte, 2017), one item was selected from each factor representing the given factor best, and the resulting model demonstrated as strong psychometric properties as the original 18-item scale (Bóthe, Tóth-Király, Zsila, et al., 2018). The PPCS-6 showed a strong, positive association with the PPCS-18, further demonstrating the appropriateness of the scale. Moreover, the construct validity and reliability of the PPCS-6 were cross-validated on two independent and distinct samples, including treatment-seeking individuals as well. Not only the construct validity of the PPCS-6 was supported, but its convergent validity was also established by reporting its associations with pornography use frequency, pornography use duration, masturbation frequency, pornography use frequency during masturbation, and hypersexuality.

In line with previous studies (Bóthe, Tóth-Király, Zsila et al., 2018; Grubbs, Perry, et al., 2018), pornography use frequency and problematic pornography use (measured by PPCS-6) had moderate, positive associations. Moreover, duration of pornography use per occasion, frequency of masturbation, and frequency of pornography use during masturbation demonstrated weak-to-moderate, positive associations with the PPCS-6 (Baćak a & Štulhofer, 2011; Bóthe et al., 2017; Bóthe, Tóth-Király, Zsila, et al., 2018; Carvalheira, Træen, & Stulhofer, 2015; Wéry & Billieux, 2016). In line with previous studies (Bóthe, Koós, et al., 2019; Bóthe, Tóth-Király, Potenza, et al., 2018; Grubbs, Exline, Pargament, Hook, & Carlisle, 2015; Grubbs, Volk, et al., 2015; Kor et al., 2014), the level of hypersexuality showed a moderate-to-strong association with problematic pornography use (both measured by the PPCS-18 and the PPCS-6) supporting the validity of the this new, short scale.

Measurement invariance testing indicated that the latent mean of problematic pornography use was higher among men than women, corroborating previous findings (Bóthe, Tóth-Király, Zsila et al., 2018; Grubbs, Kraus, et al., 2018; Rissel et al., 2017). When sexual orientation was included in measurement invariance testing as a grouping variable, there were no latent means differences between exclusively heterosexual and sexual minority individuals indicating that heterosexual and sexual minority individuals demonstrate similar levels of problematic pornography use in general. Moreover, treatment-

seeking individuals (Sample 3) reported elevated scores on the PPCS-6 and on all the items of the scale compared to general populations (Sample 1 and Sample 2), further supporting its validity and demonstrating the scale's potential clinical utility. In addition, the sensitivity and specificity analyses, and the positive and negative predictive values suggested an optimal cut-off of 20 out of 42 points on the PPCS-6 for distinguishing between problematic and non-problematic pornography use. Despite the high-accuracy of the recommended cut-off score, it should be noted that self-report scales (such as the PPCS-6) could and should only be used as a first step (screening) of the diagnostic process followed by clinical interviews. To summarize, the PPCS-6 was developed by following a rigorous guideline (Marsh et al., 2005), yielded strong psychometric properties, showed differentiated results in the case of general and treatment-seeking samples, and thus, it may be utilized as a short measure of problematic pornography use in future studies.

Potentially, the PPCS-6 may be applied in cases when only limited resources are available (e.g., time is limited to administer a scale) (Cunney & Perri, 1991; Danner et al., 2019). Moreover, the PPCS-6 might be appropriate in the future in exploratory investigations (Wright, 2013), in multiple assessment studies, such as in diary studies (Wordecha et al., 2018), or in experimental studies (Hald & Malamuth, 2015). Moreover, the PPCS-6 may be used when respondents have a limited attention span, such as in the case of large-scale or nationally-representative studies (Bóthe, Tóth-Király, Demetrovics, & Orosz, 2017; Rissel et al., 2017) or in the case of individuals with psychiatric problems (e.g., depression or attention-deficit hyperactivity disorder – Bóthe, Koós, et al., 2019; Kraus, Potenza, Martino, & Grant, 2015).

However, it has to be mentioned that the multidimensional nature of the PPCS-18 has been sacrificed for brevity, such as in previous studies constructing short measures (Gosling, Rentfrow, & Swann, 2003; Schaufeli et al., 2017). Thus, in cases when the dimensions of problematic pornography use are to be examined or when profiles of users are to be compared, using the PPCS-18 is advised in opposition to the PPCS-6. To conclude, the PPCS-6 and the PPCS-18 have their advantages and disadvantages, but both scales have their niches in research and potentially in clinical settings as well.

### **Limitations and Future Studies**

The present work had some limitations that need to be addressed. The study used cross-sectional, self-reported data on self-selected samples; thus, the results may be prone to biases (e.g., social desirability). The samples were large and comprehensive, but they were not representative of the population, limiting the generalization of the findings. The samples included males predominantly potentially due to the advertisement of the studies (i.e., surveys on sexuality and pornography use) and the websites used for recruitment (e.g., Sample 2 was collected on a website providing pornographic materials). Therefore, the application of the findings to female populations should be made with caution due to fundamental differences in men's and women's pornography use (Bóthe, Koós, et al., 2019; Lewczuk, Szymd, Skorko, & Gola, 2017). Future studies are needed to examine further the construct and clinical validity of the PPCS-6 conducting within-network and between-network studies on different populations (e.g., in clinical settings or in different cultures – (Marsh et al., 2005; Schaufeli et al., 2017). Longitudinal studies would be fruitful to investigate the temporal stability of the PPCS-6 (Fernandez & Griffiths, 2019) and to examine the natural course of problematic pornography use.

### **Conclusions**

The PPCS-6 is a short, valid, and reliable measure of problematic pornography use that can be included in large-scale survey studies, can reliably distinguish between problematic and non-problematic users, and may be reliably used among treatment-seeking individuals as well. Short measures, such as the PPCS-6, may be adequate to use when researchers or therapists have scarce resources and/or when participants have limited attention spans. In future studies, the PPCS-6 may be applied in nationally-representative studies accompanied by one-item measures of subjective feelings of problematic pornography use to gain better knowledge on the prevalence of problematic pornography use.

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**Table 1**

*Confirmatory Factor Analyses (CFA) the Short Version of the Problematic Pornography Consumption Scale (PPCS-6)*

Model	WLSMV $\chi^2$ (df)	CFI	TLI	RMSEA A	90% CI
1-factor first-order CFA (PPCS-18, Sample 1)	10542.544* (120)	.975	.968	.076	.075-.077
1-factor first-order CFA (PPCS-6, Sample 1)	214.786* (9)	.997	.994	.039	.035-.044
1-factor first-order CFA (PPCS-6, Sample 2)	23.436* (9)	.996	.994	.046	.023-.069
1-factor first-order CFA (PPCS-6, Sample 3)	23.736* (9)	.977	.961	.078	.041-.118

*Note.* WLSMV = weighted least squares mean- and variance-adjusted estimator;  $\chi^2$  = Chi-square; df = degrees of freedom; CFI = comparative fit index; TLI = Tucker-Lewis Index; RMSEA = root-mean-square error of approximation; 90% CI = 90% confidence interval of the RMSEA. \* $p < .001$



**Table 2**

*Initial Item Set of the Problematic Pornography Consumption Scale with Normality Indices and Corrected Item-Total Correlations on Sample 1 (N = 15,051)*

Items (Number of the item from the original scale)	Factor Loadings	CITC	Skewness (SE)	Kurtosis (SE)
<b>I felt that porn is an important part of my life. (S1)</b>	<b>.790</b>	<b>.577</b>	<b>0.824 (.02)</b>	<b>-0.527 (.04)</b>
I thought about how good it would be to watch porn. (S7)	.873	.739	0.694 (.02)	-0.460 (.04)
I continually planned when to watch porn. (S13)	.827	.673	1.193 (.02)	0.640 (.04)
I used porn to restore the tranquility of my feelings. (M2)	.816	.692	1.448 (.02)	1.219 (.04)
Watching porn got rid of my negative feelings. (M8)	.873	.722	1.099 (.02)	0.192 (.04)
<b>I released my tension by watching porn. (M14)</b>	<b>.871</b>	<b>.737</b>	<b>1.193 (.02)</b>	<b>0.484 (.04)</b>
I felt porn caused problems in my sexual life. (C3)	.785	.583	2.414 (.02)	5.693 (.04)
Watching porn prevented me from bringing out the best in me. (C9)	.852	.686	2.776 (.02)	7.644 (.04)
<b>I neglected other leisure activities as a result of watching porn. (C15)</b>	<b>.852</b>	<b>.569</b>	<b>2.200 (.02)</b>	<b>4.407 (.04)</b>
<b>I felt that I had to watch more and more porn for satisfaction. (T4)</b>	<b>.929</b>	<b>.695</b>	<b>2.240 (.02)</b>	<b>4.643 (.04)</b>
I felt that I needed more and more porn in order to satisfy my needs. (T10)	.938	.697	2.649 (.02)	6.960 (.04)
I gradually watched more “extreme” porn, because the porn I watched before was less satisfying. (T16)	.690	.484	1.418 (.02)	0.984 (.04)
I unsuccessfully tried to reduce the amount of porn I watch. (R5)	.917	.796	1.922 (.02)	2.741 (.04)
<b>When I vowed not to watch porn anymore, I could only do it for a short period of time. (R11)</b>	<b>.924</b>	<b>.851</b>	<b>1.731 (.02)</b>	<b>1.839 (.04)</b>
I resisted watching porn for only a little while before I relapsed. (R17)	.965	.845	1.840 (.02)	2.410 (.04)
<b>I became stressed when something prevented me from watching porn. (W6)</b>	<b>.914</b>	<b>.776</b>	<b>2.273 (.02)</b>	<b>4.859 (.04)</b>
I became agitated when I was unable to watch porn. (W12)	.901	.747	2.397 (.02)	5.428 (.04)
I missed porn greatly when I didn’t watch it for a while. (W18)	.913	.632	1.664 (.02)	1.943 (.04)

*Note.* S = Salience; M = Mood Modification; C = Conflict; T = Tolerance; R = Relapse; W = Withdrawal; Factor Loadings = Factor loadings assessed by confirmatory factor analysis; CITC = Corrected Item-Total Correlation; SE = standard error. Bold letters indicate the final items.

**Table 3**

*Standardized Factor Loadings, Reliability Indices, and Descriptive Statistics of the Short Version of the Problematic Pornography Consumption Scale (PPCS-6) on Sample 1, Sample 2, and Sample 3*

Items	Sample 1	Sample 2	Sample 3
	(N = 15,051)	(N = 760)	(N = 266)
<b>Factor Loadings</b>			
1. I felt that porn is an important part of my life.	.71	.68	.43
2. I released my tension by watching porn.	.73	.73	.68
3. I neglected other leisure activities as a result of watching porn.	.80	.81	.70
4. I felt that I had to watch more and more porn for satisfaction.	.80	.85	.62
5. When I vowed not to watch porn anymore, I could only do it for a short period of time.	.74	.73	.60
6. I became stressed when something prevented me from watching porn.	.82	.89	.73
<b>Reliability Indices</b>			
$\alpha$ (95% CI)	.84 (.84-.84)	.84 (.82-.86)	.75 (.70-.79)
Composite Reliability	.90	.90	.80
<b>Descriptive Statistics</b>			
Total Score Mean (SD)	1.96 (1.09)	2.01 (1.09)	4.32 (1.16)
Total Score Skewness (SE)	1.55 (0.02)	1.56 (0.09)	-0.40 (0.15)
Total Score Kurtosis (SE)	2.30 (0.04)	2.29 (0.18)	0.12 (0.30)
Item 1 Mean (SD)	2.63 (1.81)	2.99 (1.80)	3.89 (1.88)
Item 2 Mean (SD)	2.27 (1.59)	2.20 (1.57)	5.11 (1.50)
Item 3 Mean (SD)	1.65 (1.26)	1.74 (1.35)	4.45 (1.85)
Item 4 Mean (SD)	1.63 (1.24)	1.65 (1.26)	4.21 (1.74)
Item 5 Mean (SD)	1.91 (1.61)	1.93 (1.56)	5.26 (1.72)
Item 6 Mean (SD)	1.64 (1.23)	1.57 (1.17)	3.01 (1.66)

*Note.* All factor loadings are standardized. Loadings are statistically significant at  $p < .001$ . CI = confidence interval; SD = standard deviation; SE = standard error.

**Table 4**

*Associations between the Long (PPCS-18) and Short (PPCS-6) Version of the Problematic Pornography Consumption Scale with Pornography Use and Sexuality-Related Variables on Sample 1, Sample 2, and Sample 3*

	Sample 1 (N = 15,051)		Sample 2 (N = 760)		Sample 3 (N = 266)	
	PPCS-18	PPCS-6	PPCS-18	PPCS-6	PPCS-18	PPCS-6
1. Problematic Pornography Consumption Scale (PPCS-18)	–	.97*	–	.97*	–	.96*
2. PPCS-18 without the Items of PPCS-6	–	.93*	–	.94*	–	.90*
3. Frequency of Pornography Use	.51*	.52*	.30*	.31*	.27*	.31*
4. Duration of Pornography Use	.30*	.30*	.25*	.24*	.23*	.23*
5. Frequency of Masturbation	.42*	.42*	.31*	.31*	.23*	.28*
6. Frequency of Pornography Use during Masturbation	.39*	.39*	.30*	.29*	.21*	.24*
6. Hypersexual Behavior Inventory	.58*	.57*	–	–	–	–

*Note.* PPCS-18 = Problematic Pornography Consumption Scale Long Version; PPCS-6 = Problematic Pornography Consumption Scale Short Version; \*  $p < .001$ .

**Table 5***Tests of Measurement Invariance on the Short Version of the Problematic Pornography Consumption Scale (PPCS-6)*

Model	WLSMV $\chi^2$ (df)	CFI	TLI	RMSEA	90% CI	Comparison	$\Delta\chi^2$ (df)	$\Delta$ CFI	$\Delta$ TLI	$\Delta$ RMSEA
Gender invariance (Sample 1)										
Baseline men	203.576*(9)	.995	.992	.045	.040-.051	—	—	—	—	—
Baseline women	70.370*(9)	.991	.985	.039	.031-.048	—	—	—	—	—
M1. Configural	279.741*(18)	.995	.991	.044	.039-.049	—	—	—	—	—
M2. Metric	565.884*(23)	.989	.985	.056	.052-.060	M2-M1	233.431* (5)	-.006	-.006	+.012
M3. Scalar	554.853*(52)	.989	.994	.036	.033-.039	M3-M2	96.721* (29)	.000	+.009	-.020
M4a. Residual	1314.779*(58)	.974	.986	.054	.051-.056	M4a-M3	494.738* (6)	-.015	-.008	+.018
M4b. Residual partial <sup>a</sup>	1006.871* (57)	.980	.990	.047	.045-.050	M4b-M3	300.781* (5)	-.009	-.004	+.011
<b>M5. Latent variance</b>	<b>787.573*(58)</b>	<b>.985</b>	<b>.992</b>	<b>.041</b>	<b>.038-.043</b>	<b>M5-M4</b>	<b>7.421* (1)</b>	<b>+.005</b>	<b>+.002</b>	<b>-.006</b>
M6. Latent means	10467.123*(59)	.782	.889	.153	.151-.156	M6-M5	2107.182* (1)	-.203	-.103	+.112
Sexual orientation invariance (Sample 1)										
Baseline heterosexual individuals	201.777*(9)	.996	.994	.039	.035-.044	—	—	—	—	—
Baseline sexual minority individuals	21.279*(9)	.997	.996	.035	.016-.054	—	—	—	—	—
M1. Configural	221.511*(18)	.997	.994	.039	.034-.043	—	—	—	—	—
M2. Metric	225.889*(23)	.997	.996	.034	.030-.038	M2-M1	18.345*(5)	.000	+.002	-.005
M3. Scalar	197.058*(52)	.998	.999	.019	.016-.022	M3-M2	36.891(29)	+.001	+.003	-.015
M4. Residual	22.399*(58)	.997	.999	.020	.017-.022	M4-M3	32.659*(6)	-.001	.000	+.001
M5. Latent variance	162.335*(59)	.998	.999	.015	.012-.018	M5-M4	1.102(1)	+.001	.000	-.005
<b>M6. Latent means</b>	<b>437.974*(60)</b>	<b>.994</b>	<b>.997</b>	<b>.029</b>	<b>.026-.032</b>	<b>M6-M5</b>	<b>55.003*(1)</b>	<b>-.004</b>	<b>-.002</b>	<b>+.014</b>
Invariance between general and treatment-seeking populations (Sample 1, Sample 2, and Sample 3)										
M1. Configural	342.364* (27)	.995	.992	.047	.042-.051	—	—	—	—	—
M2. Metric	372.221* (37)	.995	.994	.041	.037-.045	M2-M1	70.726* (10)	.000	+.002	-.006
M3. Scalar	1109.172* (95)	.984	.992	.045	.042-.047	M3-M2	773.760* (58)	-.011	-.002	+.004
M4. Residual	1342.091* (107)	.981	.992	.046	.044-.049	M4-M3	255.158* (12)	-.003	.000	+.001
<b>M5. Latent variance</b>	<b>1147.172* (109)</b>	<b>.984</b>	<b>.993</b>	<b>.042</b>	<b>.040-.044</b>	<b>M5-M4</b>	<b>38.928* (2)</b>	<b>.003</b>	<b>+.001</b>	<b>-.004</b>
M6. Latent means	5127.744* (111)	.922	.968	.092	.090-.094	M6-M5	834.956* (2)	-.062	-.025	+.050

*Note.* WLSMV = weighted least squares mean- and variance-adjusted estimator;  $\chi^2$  = Chi-square; df = degrees of freedom; CFI = comparative fit index; TLI = Tucker-Lewis Index; RMSEA = root-mean-square error of approximation; 90% CI = 90% confidence interval of the RMSEA;  $\Delta$ CFI = change in CFI value compared to the preceding model;  $\Delta$ TLI = change in the TLI value compared to the preceding model;  $\Delta$ RMSEA = change in the RMSEA value compared to the preceding model; a = The residual variance of item 6 was freed; Bold letters indicate the final levels of invariance that were achieved. \* $p < .01$

**Table 6**

*Calculation of Cut-off Thresholds for the Short Version of the Problematic Pornography Consumption Scale (PPCS-6)*

cut-off score	true positive	true negative	false positive	false negative	sensitivity (%)	specificity (%)	PPV (%)	NPV (%)	accuracy (%)
16	245	566	132	21	92.1%	81.1%	65.0%	96.4%	84.1%
17	239	582	116	27	89.8%	83.4%	67.3%	95.6%	85.2%
18	238	600	98	28	89.5%	86.0%	70.8%	95.5%	86.9%
19	232	614	84	34	87.2%	88.0%	73.4%	94.8%	87.8%
<b>20</b>	<b>224</b>	<b>629</b>	<b>69</b>	<b>42</b>	<b>84.2%</b>	<b>90.1%</b>	<b>76.5%</b>	<b>93.7%</b>	<b>88.5%</b>
21	213	636	62	53	80.1%	91.1%	77.5%	92.3%	88.1%
22	206	642	56	60	77.4%	92.0%	78.6%	91.5%	88.0%
23	195	650	48	71	73.3%	93.1%	80.3%	90.2%	87.7%

*Note.* The bolded row indicates the suggested cut-off threshold. Possible scores on PPCS-6 range from 6 to 42.

