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**Theses of the Doctoral Dissertation**

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**EXAMINATION OF THE SIMILARITIES AND DISSIMILARITIES BETWEEN  
HYPERSEXUALITY AND PROBLEMATIC PORNOGRAPHY USE**

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## FOREWORD<sup>1</sup>

Less than a decade ago, hypersexuality was considered as a new clinical diagnosis in the fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders* as “Hypersexual Disorder” (DSM-5; American Psychiatric Association, 2013; Kafka, 2010, 2014), but it was ultimately rejected. However, as a result of robust empirical studies and thorough clinical investigations (e.g., Kraus, Voon, & Potenza, 2016; Reid, Carpenter, et al., 2012; Voon et al., 2014), it is now included in another diagnostic manual, the *eleventh edition of International Statistical Classification of Diseases and Related Health Problems* under the name of “Compulsive Sexual Behavior Disorder” classified as an impulse control disorder (ICD-11; World Health Organization, 2018).<sup>2</sup>

As a result of this official diagnostic criteria, the terminology, the definition, and the classification of hypersexuality is likely to converge in future studies; however, there are some important questions that are not addressed yet. The place of problematic pornography use among problematic sexual behaviors is still controversial in the scientific literature and clinical practice. Exploring the connection between hypersexuality and problematic pornography use may not only provide better theoretical understanding of problematic sexual behaviors (e.g., categorization of problematic pornography use in future diagnostic manuals), but it can provide useful clinical implications as well (e.g., differential diagnosis or different treatment protocols). One of the main questions is whether problematic pornography use could be considered as a subcategory or a manifestation of hypersexuality (e.g., Kafka, 2010; Werner, Stulhofer, Waldorp, & Jurin, 2018; Wéry et al., 2016; Wordecha et al., 2018). On the one hand, one of the most strongly related problematic sexual behaviors that is mentioned in relation to hypersexuality is problematic pornography use. More than 80% of the individuals with hypersexuality reported problematic pornography use in previous studies (Kafka, 2010; Reid, Carpenter, et al., 2012; Wordecha et al., 2018) indicating that problematic pornography use may be considered as one of the most prominent manifestations of hypersexuality. However, according to recent results (e.g., Werner et al., 2018; Wéry et al., 2016), it is not unambiguous whether problematic pornography use should be taken into account as a core element of hypersexuality.

Therefore, the aim of the present dissertation was to examine the similarities and dissimilarities between hypersexuality and problematic pornography use regarding the underlying psychological processes involved in the development and maintenance of these problematic sexual behavior with taking into consideration potential gender differences as well (e.g., Wéry & Billieux, 2017; Werner et al., 2018). For this reason, first, valid and reliable assessment tools were adapted/constructed to assess the level of hypersexuality and problematic pornography. Second, the associations of hypersexuality and problematic pornography use were examined with theoretically-relevant key variables (i.e., impulsivity and compulsivity, adult attention deficit hyperactivity disorder symptoms).

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<sup>2</sup>Although currently Compulsive Sexual Behavior Disorder is the official terminology to refer to hypersexuality, the term “hypersexuality” is used in the present dissertation for several reasons. This terminology is preferred in the present studies as the conceptualization of Hypersexual Disorder (Kafka, 2010) was applied and the Hypersexual Behavior Inventory was used to assess the level of uncontrollable sexual fantasies, urges and behaviors. Despite some differences between the two conceptualizations (i.e., Hypersexual Disorder and Compulsive Sexual Behavior Disorder) that are mentioned later, the two concepts are strongly related (correlations ranging from .82-.92 in previous studies – Reid, Garos, Carpenter, 2011; Reid et al., 2012). Thus, using the term “hypersexuality” can be appropriate in the present context.

## I. INTRODUCTION

### I/1. PREVALENCE AND ASSESSMENT OF HYPERSEXUALITY AND PROBLEMATIC PORNOGRAPHY USE

Although estimations are available (Stewart & Fedoroff, 2014), the prevalence of hypersexuality in the population is not properly identified yet due to methodological problems (e.g., inappropriate measurements). However, estimations suggested that hypersexuality could affect 1-10% of the general population (e.g., Montgomery-Graham, 2017). According to recent reviews (e.g., Montgomery-Graham, 2017) and psychometric studies (e.g., Klein et al., 2014), the Hypersexual Behavior Inventory (HBI; Reid, et al., 2011) appears to be the most reliable and valid scale for assessing hypersexuality. Therefore, the HBI was adapted to Hungarian to assess the level of hypersexuality in the present studies. According to recent nationally-representative studies, (Grubbs et al., 2018; Rissel et al., 2017) a higher percentage of men felt addicted to pornography than women (4-6% of men vs. 1-2% of women). In the literature, only three scales focused on the assessment of problematic pornography use (CPUI; Grubbs et al., 2010; CPUI-9; Grubbs et al., 2015; PPUS; Kor et al., 2014), but these scales had theoretical and methodological limitations, thus, a new scale had to be constructed to validly and reliably assess problematic pornography use (Problematic Pornography Consumption Scale, PPCS – see Study 3).

### I/2. PSYCHOLOGICAL BACKGROUND OF HYPERSEXUALITY AND PROBLEMATIC PORNOGRAPHY USE

Addictive disorders develop and maintain as a result of the interaction between the structural characteristics of the given activity, the situational characteristics, the psychological constitution, and the genetic and biological predispositions of the given individual (Griffiths, 1999; Griffiths, 2005; Tóth-Király, Bőthe, & Orosz, 2018).

Regarding the *structural characteristics*, hypersexuality can be considered as a continuously present problematic sexual behavior that has been present throughout the history under different names (e.g., sex addiction), but with similar characteristics (Karila et al., 2014). Thus, the appearance of online pornography is more interesting when taking into consideration structural characteristics. As for problematic pornography use (Cooper, 1998; King, 1999; Young, Griffin-Shelley, Cooper, O'mara, & Buchanan, 2000), the unlimited access and variety of pornographic materials, the convenience of viewing online pornography anonymously, and its novelty and excitement without efforts and financial investment could easily pull in the individual. Especially if the given individual does not feel that he could shape his sexual experiences or life freely which, in turn, could result in problematic viewing patterns.

Regarding the *situational characteristics*, both hypersexuality and problematic pornography use demonstrated positive, weak-to-moderate associations with loneliness in different populations (e.g., Butler et al., 2018; Dhuffar et al., 2015). Moreover, both hypersexuality and problematic pornography use showed negative, but only weak associations with romantic relationship characteristics (e.g., relationship satisfaction) (e.g., Bőthe et al., 2017; Reid et al., 2012). It can be concluded that although these problematic sexual behaviors contribute to negative romantic relationship experiences, their role is relatively small.

Regarding the *biological and genetic characteristics*, although research has proliferated in the past decades with respect to hypersexuality (see Kraus, Martino, et al., 2016), relatively little attention has been paid to its genetic/biological background (e.g., Kowalewska et al., 2018; Walton et al., 2017). Neuroscientific results on hypersexuality are often mentioned together or blended with the neuroscientific results on problematic pornography use (e.g., pornographic pictures were presented in fMRI studies to examine hypersexuality – Voon et al., 2014). Findings suggest that hypersexuality shares relevant similarities with substance-related

addictions (e.g., drug abuse) and behavioral addictions (e.g., pathological gambling) in terms of altered brain processes (Kowalewska et al., 2018). To date, no research has directly investigated the genetic background of these problematic sexual behaviors, but a handful of studies examined polymorphisms that may be associated with dopamine function and sexual behaviors (Stark et al., 2018).

Regarding the *psychological characteristics*, similar relationship patterns can be observed between the five core personality dimensions and both problematic sexual behaviors (i.e., hypersexuality and problematic pornography use): conscientiousness, agreeableness and neuroticism could be considered as possible predictors of hypersexuality and problematic pornography use (e.g., Egan & Parmar, 2013; Rettenberger, Klein, & Briken, 2016). Previous findings suggest that hypersexuality is positively and moderately related to generalized *impulsivity* (e.g., Miner et al., 2016; Mulhauser et al., 2014). However, data suggest weak but complex relationships between pornography use and impulsivity that do not appear entirely consistent across studies (e.g., Beyens et al., 2015; Wetterneck et al., 2012). Therefore, it is suggested that hypersexuality and problematic pornography use might not share similar background in terms of impulsivity. Regarding the associations of *compulsivity* and hypersexuality, data suggest that compulsivity appears to contribute in a relatively small manner to hypersexuality (Kafka, 2015; Reid & Carpenter, 2009). As for problematic pornography use, compulsivity had a weak, positive association with it among men (Egan & Parmar, 2013), but no previous studies have investigated these associations in the case of women. As for *psychiatric disorders*, similarities can be identified regarding the prevalence of mood disorders, anxiety disorders, and substance use disorders among individuals with hypersexuality and individuals with problematic pornography use (e.g., Reid, Davtian, Lenartowicz, Torrevillas, & Fong, 2013; Kraus et al., 2015). However, important differences can be observed regarding ADHD: while 17-67% of individuals with hypersexuality report some levels of ADHD symptoms (Reid et al., 2013), only 3% of individuals with problematic pornography use reported ADHD (Kraus et al., 2015).

### **I/3. AIMS OF THE DISSERTATION AND OVERVIEW OF THE INVESTIGATION**

The overarching aim of the present research was to examine the similarities and potential dissimilarities between hypersexuality and problematic pornography use in terms of transdiagnostic features (i.e., impulsivity and compulsivity) and comorbid psychiatric disorders (i.e., ADHD symptoms). An improved understanding of the similarities and dissimilarities between problematic pornography use and hypersexuality may help with respect to developing improved assessment tools, diagnostic categories, and specialized interventions in the long run.

Having a valid and reliable Hungarian scale that could assess the level of hypersexuality may contribute to the examination of hypersexual behavior in non-English speaking samples and could provide the opportunity to examine its association with problematic pornography use and compare their relationship patterns with different correlates. Therefore, the aims of *Study 1* were (a) to examine the validity and reliability of the Hypersexual Behavior Inventory on a large, non-clinical sample and (b) to determine a possible cut-off score for hypersexuality. The aim of *Study 2* was (c) to systematically investigate the potential differences across subgroups (i.e., males vs. females, heterosexual vs. LGBTQ individuals) regarding the level of hypersexuality as it received little attention in research (e.g., Klein et al., 2014; Parsons, 2005).

Problematic pornography use is considered as one of the most prevalent manifestation of hypersexuality (Kafka, 2010; Wordecha et al., 2018); however, previously in the literature, there was no short scale with strong psychometric properties that could assess problematic pornography use based on an overarching theoretical background (Griffiths, 2005). Therefore, the aims of *Study 3* were (a) to construct a comprehensive scale that could reliably and validly assess the level of problematic pornography use, (b) to determine a cut-off score that could

reliably distinguish problematic and non-problematic pornography users, and to (c) systematically examine the potential differences between male and female pornography users as it is suggested that males are more likely to develop problematic pornography use (Grubbs, Kraus, et al., 2018; Rissel et al., 2017). Having a valid and reliable scale measuring the level of problematic pornography use may contribute to the better understanding of the potential antecedents and consequences of problematic pornography use.

Impulsivity and compulsivity can be considered as one of the most frequently assessed personality traits in relation to psychiatric disorders and as important transdiagnostic features related to clinically relevant aspects of addictions and other potentially problematic behaviors (e.g., Wetterneck et al., 2012). However, no previous study has examined the associations of impulsivity, general compulsivity (i.e., not sexual compulsivity) and problematic sexual behaviors (i.e., hypersexuality and problematic pornography use). Therefore, the aims of *Study 4* were to simultaneously examine the associations of hypersexuality, problematic pornography use, impulsivity and compulsivity with taking into consideration gender difference as men tend to have higher levels of impulsivity (e.g., Cross, Copping, & Campbell, 2011).

Besides mood disorders, anxiety disorders, and substance use disorders (e.g., Kraus et al., 2015; Reid et al., 2013), attention deficit hyperactivity disorder (ADHD) is also a highly prevalent comorbid psychiatric disorders in relation to hypersexuality. However, no previous studies examined the associations of ADHD with problematic pornography use and the only study that reported on the prevalence of ADHD and problematic pornography use demonstrated that 3% of problematic pornography users had ADHD symptoms (Kraus et al., 2015). Therefore, the aim of *Study 5* was to simultaneously examine the associations of hypersexuality, problematic pornography use and ADHD symptoms with taking into consideration gender differences as no previous studies were carried out among women.

## **II. THE PSYCHOMETRIC PROPERTIES OF THE HYPERSEXUAL BEHAVIOR INVENTORY USING A LARGE-SCALE NONCLINICAL SAMPLE (STUDY 1)<sup>3</sup>**

### **II/1. AIMS**

Among clinicians and researchers, there is a strong need to use a psychometrically robust measure of hypersexuality with a valid cutoff score to identify individuals with hypersexuality (Montgomery-Graham, 2017). Thus, the aims of the present study were twofold: (a) to examine the factor structure and reliability of the HBI in a large, nonclinical sample, and (b) to determine a reliable cutoff score for the HBI.

### **II/2. MATERIALS AND METHODS**

#### **II/2.1. Participants and Procedure**

The present study was conducted in accordance with the approval of the institutional review board of the related university and following the Declaration of Helsinki. The research was conducted via an online questionnaire that took approximately 30 minutes to complete. Data collection occurred in January 2017. Prior to enrollment, consent was obtained from those 18 years of age and older before they began completing questionnaires via one of the largest Hungarian news portals. A total of 18,034 participants had sexual experiences; therefore, they filled out the HBI. Consequently, a total of 18,034 participants (females = 6,134 [34.0%]) aged between 18 and 76 years ( $M_{age} = 33.6$ ,  $SD_{age} = 11.1$ ) were included in the final data set.

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<sup>3</sup>Böthe, B., Kovács, M., Tóth-Király, I., Reid, R. C., Griffiths, M. D., Orosz, G., & Demetrovics, Z. (2018). The Psychometric Properties of the Hypersexual Behavior Inventory Using a Large-Scale Nonclinical Sample. *Journal of Sex Research*, 1-11. doi: 10.1080/00224499.2018.1494262

## II/2.2. Measures

**Hypersexual Behavior Inventory.** The HBI is a 19-item scale that assesses hypersexuality via three factors. Participants indicated their answers on a five-point Likert scale (1 = *Never*; 5 = *Very often*). The coping factor (seven items) assesses sex and sexual behaviors as a response to emotional distress such as sadness, restlessness, or daily life worries. The control factor (eight items) assesses the lack of self-control in sexuality-related behaviors, such as an individual's attempt to change his or her sexual behavior fails. The consequences factor (four items) assesses the diverse consequences of sexual thoughts, urges, and behaviors, such as sexual activities that interfere with educational or occupational duties (Reid et al., 2011). The HBI was translated into Hungarian on the basis of Beaton, Bombardier, Guillemin, and Ferraz's (2000) protocol.

**Sexuality-Related Questions.** Topic-relevant questions were asked, including number of sexual partners; number of casual sexual partners; frequency of sex with the partner; frequency of sex with casual partners; frequency of masturbation; frequency of viewing pornographic videos online and time spent accessing pornography per session.

## II/2.3. Statistical Analysis

For the statistical analysis, SPSS 21 and Mplus 7.3 (Muthén & Muthén, 1998–2015) were used. CFA was used to assess the dimensionality of the HBI. The items were treated as categorical indicators, the mean- and variance-adjusted weighted least squares estimator (WLSMV) was used (Finney & DiStefano, 2006). In the structural assessment, commonly used goodness-of-fit indices (Brown, 2015; Kline, 2011) were observed (Schermelleh-Engel, Moosbrugger, & Müller, 2003; Tabachnick & Fidell, 2001). Reliability was assessed using Cronbach's alpha (Nunnally, 1978) and composite reliability (Raykov, 1997).

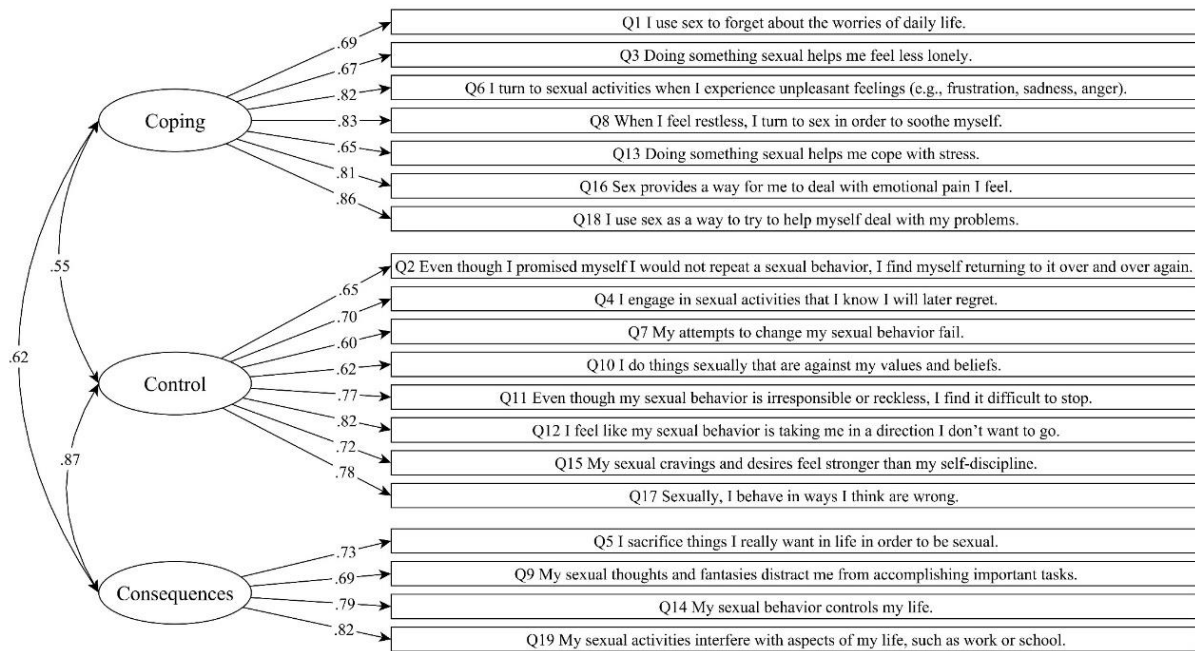
To identify possible groups of individuals with high levels of hypersexuality, latent profile analysis (LPA) was used. The analysis was performed with two to eight classes on the full sample. To determine the number of latent classes, the following indices were used: the Akaike information criterion (AIC), the Bayesian information criterion (BIC), and the sample-size adjusted Bayesian information criterion (SSABIC), where lower values indicate more parsimonious models. Entropy was also examined, indicating the accuracy of the classification process (Clark & Muthén, 2009). Finally, the Lo-Mendell-Rubin adjusted likelihood ratio test (L-M-R test) was also used, which compares the estimated model (e.g., three classes) with a model having one less class (e.g., two classes). A statistically significant  $p$  value ( $p < .05$ ) suggests that the model with more classes fits the data better (Muthén & Muthén, 1998–2015).

To determine the cutoff point for the HBI, a sensitivity analysis was carried out based on membership in the high-risk group in the LPA. Considering membership in this group as the gold standard, sensitivity, specificity, PPV, NPV, and accuracy values for all HBI cutoff points were calculated (Altman & Bland, 1994ab; Glaros & Kline, 1988).

## II/3. RESULTS

### II/3.1. Dimensionality, Structural Validity and Reliability

CFA was performed to test the hypothesized dimensionality of the HBI on the nonclinical sample. The CFA results showed that the first-order, three-factor model had acceptable fit (CFI = .940, TLI = .931 RMSEA = .071 [90% CI = .070–.072]). Factor loadings were adequate (ranging from .60 to .86) (see II/Figure 1). Descriptive statistics and reliability measures are described in II/Table 1.



**II/Figure 1.** The factor structure of the Hypersexual Behavior Inventory. *Note.* Standardized loadings are indicated on the arrows. All loadings are significant at  $p < .001$ .

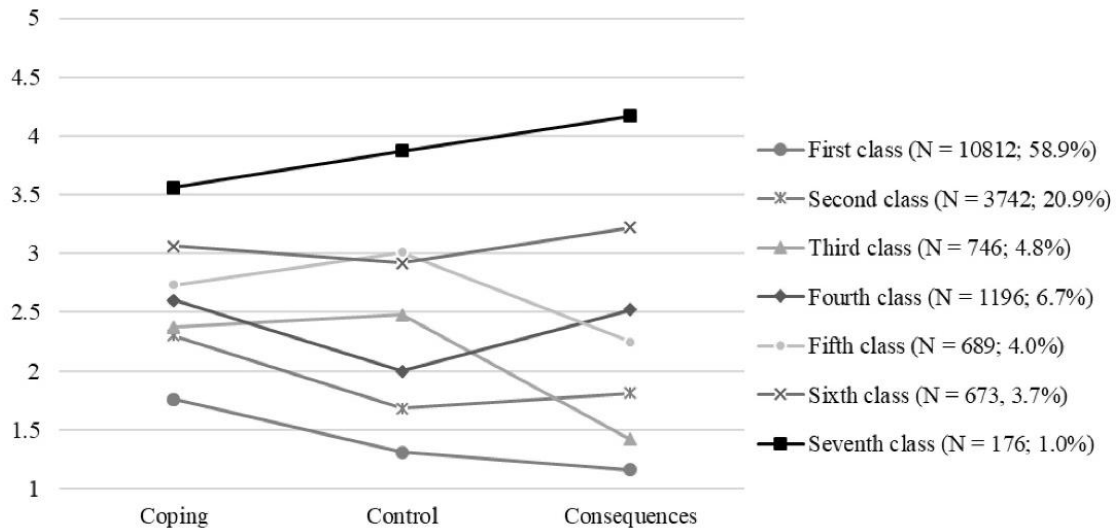
**II/Table 1.** Means, reliability indices and inter-factor correlation between the dimensions of the Hypersexual Behavior Inventory

Factors	Range	Mean (SD)	Skewness (SE)	Kurtosis (SE)	$\alpha$	CR	1	2
1. Coping	1-5	2.06 (0.78)	0.82 (0.02)	0.32 (0.04)	.86	.91	–	–
2. Control	1-5	1.64 (0.64)	1.56 (0.02)	2.78 (0.04)	.82	.89	.45*	–
3. Consequences	1-5	1.55 (0.64)	1.67 (0.02)	3.27 (0.04)	.75	.84	.48*	.67*

*Note.* SD = standard deviation;  $\alpha$  = Cronbach's alpha; CR = composite reliability; SE = standard error. \* $p < .001$ .

### II/3.2.Latent Profile Analysis

LPA was performed on the three factors of the HBI to differentiate between the possible latent classes regarding hypersexuality. The AIC, BIC, and SSABIC values continuously decreased as more latent classes were added. Regarding entropy, all solutions had high levels of accuracy. The nonsignificant  $p$  value of the L-M-R test suggested that the eight-class solution should be rejected in favor of the seven-class solution. The seven latent classes with their respective relationship patterns are outlined in II/Figure 2. In the case of the control [ $F(6, 18,033) = 8204.00; p < .001$ ] and consequences [ $F(6, 18,033) = 23576.40; p < .001$ ] factors, all post hoc tests were significant, indicating that there are significant differences between the seven classes in the control of sexual behavior and its consequences. However, in the case of coping [ $F(6, 18,033) = 1151.38; p < .001$ ], the post hoc tests between the second and the third classes and between the fourth and the fifth classes were not significant, indicating that these groups cannot be differentiated on the basis of their coping scores. The coping factor of HBI did not differentiate perfectly among the seven groups, while the control and consequences factors differentiated more clearly. The seven latent classes and their characteristics are described in II/Table 2.



**II/Figure 2.** Latent classes based on the dimensions of the Hypersexual Behavior Inventory

### II/3.3. Determination of a Potential Cutoff Score to Be Classified as Hypersexual: Sensitivity and Specificity Analysis

Based on the membership in the seventh class (i.e., the high-risk group) as a gold standard, the sensitivity, specificity, PPV, NPV, and accuracy of the HBI at all possible cutoff scores were calculated. On the basis of this analysis, it was not possible to determine a reliable cutoff score. For example, if 59 is selected as a possible cutoff score, all the indices would be excellent except for PPV, which would be low (27%). This low level of PPV indicates that if this cutoff score was used, only 27 out of 100 would be reliably identified as having problems with their sexual behavior, while 73 would be false-positive cases. Increasing the cutoff score leads to more false-negative cases (i.e., individuals highly engaged in hypersexuality with serious consequences would be mistakenly diagnosed as having nonproblematic sexual behavior), while decreasing the cutoff score results in more false-positive cases (i.e., individuals with nonproblematic sexual behavior would be mistakenly diagnosed as individuals having high levels of hypersexuality with serious consequences).

### II/4. BRIEF DISCUSSION

According to the results of the present study, the HBI has strong psychometric properties in terms of internal consistency, composite reliability, dimensionality, and structural validity. The results also indicate that the HBI can be used in diverse, nonclinical populations. However, a general, reliable cutoff score could not be determined on the basis of LPA and alongside the sensitivity and specificity analysis presumably due to the low prevalence.



**II/Table 2.** Comparison of latent classes on the objective indicators of hypersexuality

		(1) First class (N = 10812; 58.9%)	(2) Second class (N = 3742; 20.9%)	(3) Third class (N = 746; 4.8%)	(4) Fourth class (N = 1196; 6.7%)	(5) Fifth class (N = 689; 4.0%)	(6) Sixth class (N = 673; 3.7%)	(7) Seventh class (N = 176; 1.0%)	Wald $\chi^2$
Number of sexual partners	1-16 <sup>a</sup>	7.96 <sup>2,3,4,5,6,7</sup> (0.04)	8.72 <sup>1,4,5,6</sup> (0.08)	8.66 <sup>1,5,6</sup> (0.17)	9.09 <sup>1,2,6</sup> (0.14)	9.43 <sup>2,3</sup> (0.19)	9.65 <sup>1,2,3,4</sup> (0.19)	9.42 <sup>1</sup> (0.37)	160.38*
Number of casual sexual partners	1-16 <sup>a</sup>	3.58 <sup>2,3,4,5,6,7</sup> (0.05)	3.95 <sup>1,4,5,6,7</sup> (0.08)	4.31 <sup>1,6,7</sup> (0.16)	4.38 <sup>1,2,6,7</sup> (0.14)	4.75 <sup>1,2,7</sup> (0.18)	5.13 <sup>1,2,3,4</sup> (0.18)	5.68 <sup>1,2,3,4,5</sup> (0.39)	151.13*
Frequency of having sex with the partner	1-10 <sup>b</sup>	7.12 <sup>3,5,6,7</sup> (0.02)	7.12 <sup>3,5,6,7</sup> (0.04)	6.77 <sup>1,2,4,5</sup> (0.10)	7.02 <sup>3,5,6,7</sup> (0.07)	6.47 <sup>1,2,3,4</sup> (0.11)	6.67 <sup>1,2,4</sup> (0.11)	6.56 <sup>1,2,4</sup> (0.22)	77.63*
Frequency of having sex with casual partners <sup>#</sup>	1-10 <sup>b</sup>	3.75 <sup>2,4,5,6,7</sup> (0.04)	4.08 <sup>1,4,5,6</sup> (0.06)	3.90 <sup>4,5,6,7</sup> (0.10)	4.34 <sup>1,2,3</sup> (0.09)	4.35 <sup>1,2,3</sup> (0.10)	4.50 <sup>1,2,3</sup> (0.11)	4.45 <sup>1,3</sup> (0.22)	80.45*
Frequency of masturbation	1-10 <sup>b</sup>	6.43 <sup>2,3,4,5,6,7</sup> (0.02)	7.26 <sup>1,3,4,5,6,7</sup> (0.04)	7.54 <sup>1,2,5,6,7</sup> (0.08)	7.63 <sup>1,2,5,6,7</sup> (0.07)	7.88 <sup>1,2,3,4,6,7</sup> (0.08)	8.36 <sup>1,2,3,4,6,7</sup> (0.08)	8.74 <sup>1,2,3,4,5,6</sup> (0.13)	1068.57*
Frequency of pornography viewing	1-10 <sup>b</sup>	5.50 <sup>2,3,4,5,6,7</sup> (0.03)	6.53 <sup>1,3,4,5,6,7</sup> (0.05)	6.84 <sup>1,2,5,6,7</sup> (0.10)	7.10 <sup>1,2,5,6,7</sup> (0.09)	7.41 <sup>1,2,3,4,6,7</sup> (0.11)	7.79 <sup>1,2,3,4,5,7</sup> (0.11)	8.25 <sup>1,2,3,4,5,6</sup> (0.20)	942.04*
Duration of pornography viewing per occasion	0-180 <sup>c</sup>	23.84 <sup>2,3,4,5,6,7</sup> (0.20)	27.73 <sup>1,4,5,6,7</sup> (0.42)	27.38 <sup>1,4,5,6,7</sup> (0.87)	31.75 <sup>1,2,3,6,7</sup> (0.84)	31.05 <sup>1,2,3,6,7</sup> (1.09)	36.73 <sup>1,2,3,4,5,7</sup> (1.38)	47.31 <sup>1,2,3,4,5,6</sup> (3.16)	216.77*

*Note.* The class cells (1-7) contain the mean and standard errors (in parenthesis) of the corresponding variable row. Superscript numbers (1, 2, 3, 4, 5, 6, 7) indicate significant differences between the given class and the indexed classes according to the Wald  $\chi^2$  test. <sup>a</sup> = 1: 0 partner; 2: 1 partner; 3: 2 partners; 4: 3 partners; 5: 4 partners; 6: 5 partners; 7: 6 partners; 8: 7 partners; 9: 8 partners; 10: 9 partners; 11: 10 partners; 12: 11-20 partners; 13: 21-30 partners; 14: 31-40 partners; 15: 41-50 partners; 16: more than 50 partners; <sup>b</sup> = 1: never; 2: once in the last year; 3: 1-6 times in the last year; 4: 7-11 times in the last year; 5: monthly; 6: two or three times a month; 7: weekly; 8: two or three times a week; 9: four or five times a week; 10: six or seven times a week; <sup>c</sup> = participants indicated their responses in minutes; <sup>d</sup> = number of partnered respondents; <sup>e</sup> = number of respondents who had casual sexual partners. <sup>#</sup> The frequency of having sex with a casual partner were only assessed among those respondents who indicated that he/she had casual partner(s) in the last year. \*  $p < .001$ .

### III. HYPERSEXUALITY, GENDER, AND SEXUAL ORIENTATION: A LARGE-SCALE PSYCHOMETRIC STUDY (STUDY 2)<sup>4</sup>

#### III/1. AIMS

To date, epidemiologic data regarding hypersexuality are sparse, and most published studies have mainly focused on HB among males (e.g., Kraus, Martino et al., 2016; Levaque et al., 2016), with a paucity of studies investigating female HB (e.g., Dhuffar & Griffiths, 2014; Klein, Rettenberger, Boom et al., 2014). Also, there is a paucity of studies examining HB among sexual minority groups (i.e., lesbian, gay, bisexual, transgender, and queer communities—LGBTQ)—presumably due to the relatively small proportion of LGBTQ individuals in the general population (i.e., Cooper et al., 2000; Missildine et al., 2005). Therefore, the aim of the present study was to systematically investigate these potential differences across different subgroups (males vs. females, heterosexual vs. LGBTQ individuals) via tests of measurement invariance.

#### III/2. MATERIALS AND METHODS

##### III/2.1. Participants and Procedure

The same procedure and sample was used as in Study 1.

##### III/2.2. Measures

**Hypersexual Behavior Inventory (HBI; Reid et al., 2011).** See Study 1.  
**Sexuality-Related Questions.** See Study 1.

##### III/2.3. Statistical Analysis

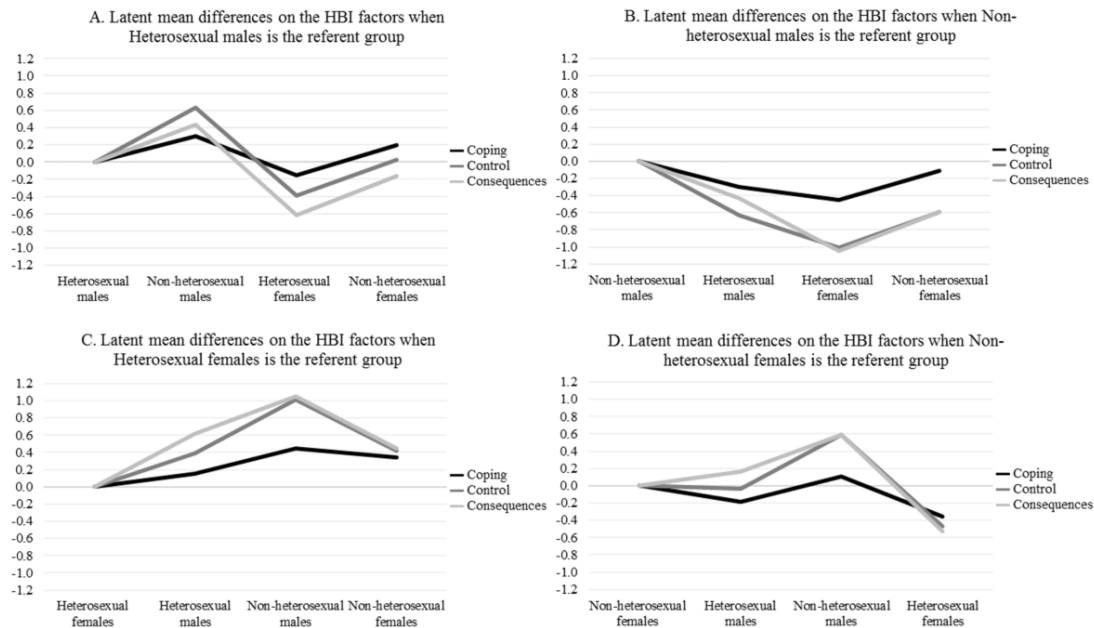
For the statistical analysis, SPSS 21 and Mplus 7.3 (Muthén & Muthén, 1998–2015) were used. Confirmatory factor analysis (CFA) was used to assess the dimensionality of the Hypersexual Behavior Inventory, same as in Study 1. To test structural invariance between groups based on combination of gender and sexual orientation (heterosexual males vs. LGBTQ males vs. heterosexual females vs. LGBTQ females), several multi-group CFAs were carried out (Vandenberg & Lance, 2000). When comparing the increasingly constrained models, relative change in fit indices was observed (Marsh et al., 2009). One-way analyses of variance (ANOVA) with Bonferroni post hoc tests was conducted to investigate whether the gender and sexual orientation-based groups were different.

#### III/3. RESULTS

Latent mean invariance could not be achieved across the four subgroups (heterosexual male vs. LGBTQ male vs. heterosexual female vs. LGBTQ female), suggesting the presence of latent mean differences (III/Table 1). When the latent means of the LGBTQ males were set to be zero for the purpose of identification, the inspection of the latent means revealed that all other groups' (LGBTQ females, heterosexual males, and heterosexual females) latent means were significantly lower (differences ranging from  $-1.05$  to  $-0.11$ ) on all the three factors (Coping, Control, Consequences). In the case of LGBTQ females and heterosexual males, a more diverse pattern was evident. There was no difference in the Control dimension; however, LGBTQ females scored higher on the Coping dimension, while heterosexual males had higher scores on the Consequences dimension. For a visual representation, see III/Figure 1.

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<sup>4</sup>Böthe, B., Bartók, R., Tóth-Király, I., Reid, R. C., Griffiths, M. D., Demetrovics, Z., & Orosz, G. (2018). Hypersexuality, gender, and sexual orientation: A large-scale psychometric survey study. *Archives of Sexual Behavior*, 47(8), 2265-2276. doi: 10.1007/s10508-018-1201-z



**III/Figure 1.** Visualization of latent mean comparisons between groups based on gender and sexual orientation. *Note.* Latent means are fixed to zero in one referent group for identification purposes and latent means estimated in the other three groups reflect deviations from this referent groups expressed in standard deviation units.

### III/3.2. Gender and Sexual Orientation-Based Comparisons

In the next step of the analysis, one-way ANOVA with a Bonferroni post hoc tests were conducted in order to investigate whether gender and sexual orientation-based groups differed in other possible indicators of hypersexuality (see III/Table 2). According to the results, LGBTQ males significantly differed from all the other groups on all dimensions, except for the frequency of having sex with casual partners.

### III/4. BRIEF DISCUSSION

The Hypersexual Behavior Inventory (HBI) has previously demonstrated robust psychometrics in terms of reliability and validity (e.g., Klein et al., 2014; Reid et al., 2011, 2012b; Yeagley et al., 2014). According to the present study, the HBI had strong psychometric properties in terms of factor structure and measurement invariance along several subgroups. In the case of tests of invariance based on gender and sexual orientation, latent mean invariance was not achieved, indicating that the latent means of the groups were different with LGBTQ males having the highest latent means and they also reported highest scores regarding the other possible indicators of hypersexual behaviors. LGBTQ males are a group most at risk of developing hypersexual disorder, but it should be noted that LGBTQ females are also at risk of engaging in hypersexual activities most likely due to coping problems.

**III/Table 1.** Tests of gender and sexual orientation invariance on the Hypersexual Behavior Inventory

Model	WLSMV $\chi^2$ (df)	CFI	TLI	RMSEA	90% CI	Comparison	$\Delta\chi^2$ (df)	$\Delta$ CFI	$\Delta$ TLI	$\Delta$ RMSEA
CFA 3-factor first-order model	13718.625* (149)	.940	.931	.071	.070-.072	—	—	—	—	—
Baseline heterosexual male	7781.602*(149)	.942	.933	.070	.069-.072	—	—	—	—	—
Baseline LGBTQ male	1748.908*(149)	.936	.927	.087	.083-.090	—	—	—	—	—
Baseline heterosexual female	3597.855*(149)	.921	.909	.071	.069-.073	—	—	—	—	—
Baseline LGBTQ female	1435.119*(149)	.933	.923	.076	.072-.080	—	—	—	—	—
M1. Configural	14238.264*(596)	.936	.927	.071	.070-.072	—	—	—	—	—
M2. Metric	14905.906*(644)	.934	.929	.070	.069-.071	M2-M1	788.817* (48)	-.002	+.002	-.001
M3. Scalar	13907.647*(806)	.939	.948	.060	.059-.061	M3-M2	803.312* (162)	+.005	+.019	-.010
M4. Residual	12857.928*(863)	.944	.956	.056	.055-.057	M4-M3	425.574* (57)	+.005	+.008	-.004
<b>M5. Latent variance-covariance</b>	<b>6814.007*(881)</b>	<b>.972</b>	<b>.979</b>	<b>.039</b>	<b>.038-.040</b>	<b>M5-M4</b>	<b>78.145* (18)</b>	<b>+.028</b>	<b>+.023</b>	<b>-.017</b>
M6. Latent means	11520.841*(890)	.950	.962	.052	.051-.052	M6-M5	1496.022* (9)	-.022	-.017	+.013

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; Bold letters indicate the final levels of invariance that were achieved. \* $p < .001$ .

**III/Table 2.** Comparison of gender and sexual orientation-based groups on the indicators of hypersexuality

	Range	(1)	(2)	(3)	(4)	ANOVA		
		Heterosexual males (N = 11052 N <sub>d</sub> = 8163 N <sub>e</sub> = 3869)	LGBTQ males (N = 740 N <sub>d</sub> = 391 N <sub>e</sub> = 505)	Heterosexual females (N = 5664 N <sub>d</sub> = 4149 N <sub>e</sub> = 1890)	LGBTQ females (N = 468 N <sub>d</sub> = 301 N <sub>e</sub> = 219)	F	p	$\eta^2$
number of sexual partners	1-16 <sup>a</sup>	8.39 (4.40) <sup>2,3</sup>	10.85 (4.52) <sup>1,3,4</sup>	7.96 (4.02) <sup>1,2,4</sup>	8.63 (4.25) <sup>2,3</sup>	100.71	<.001	.017
number of casual sex. partners	1-16 <sup>a</sup>	5.62 (4.62) <sup>2,3</sup>	9.52 (5.10) <sup>1,3,4</sup>	4.87 (3.97) <sup>1,2,4</sup>	5.82 (4.45) <sup>2,3</sup>	242.62	<.001	.039
freq. of sex with the partner	1-10 <sup>b</sup>	6.95 (1.82) <sup>2,3</sup>	6.67 (2.17) <sup>1,3,4</sup>	7.31 (1.70) <sup>1,2</sup>	7.15 (1.76) <sup>2</sup>	42.56	<.001	.010
freq. of sex with casual partners	1-10 <sup>b</sup>	4.07 (2.03) <sup>3</sup>	4.28 (1.95) <sup>3</sup>	3.79 (1.83) <sup>1,2</sup>	3.96 (2.00)	12.38	<.001	.006
freq. of masturbation	1-10 <sup>b</sup>	7.43 (2.14) <sup>2,3,4</sup>	8.47 (1.66) <sup>1,3,4</sup>	5.60 (2.18) <sup>1,2,4</sup>	6.77 (1.98) <sup>1,2,3</sup>	1039.16	<.001	.150
freq. of pornography viewing	1-10 <sup>b</sup>	7.13 (2.36) <sup>2,3,4</sup>	8.12 (1.92) <sup>1,3,4</sup>	3.87 (2.33) <sup>1,2,4</sup>	5.18 (2.40) <sup>1,2,3</sup>	2459.82	<.001	.309
duration of porn. viewing	0-180 <sup>c</sup>	27.83 (21.18) <sup>2,3,4</sup>	35.76 (28.89) <sup>1,3,4</sup>	21.82 (16.51) <sup>1,2</sup>	24.48 (20.20) <sup>1,2</sup>	130.75	<.001	.026

Note. <sup>a</sup> = 1: 0 partner; 2: 1 partner; 3: 2 partners; 4: 3 partners; 5: 4 partners; 6: 5 partners; 7: 6 partners; 8: 7 partners; 9: 8 partners; 10: 9 partners; 11: 10 partners; 12: 11-20 partners, 13: 21-30 partners; 14: 31-40 partners; 15: 41-50 partners; 16: more than 50 partners; <sup>b</sup> = 1: never; 2: once in the last year; 3: 1-6 times in the last year; 4: 7-11 times in the last year; 5: monthly; 6: two or three times a month; 7: weekly; 8: two or three times a week; 9: four or five times a week; 10: six or seven times a week; <sup>c</sup> = participants indicated their responses in minutes; <sub>d</sub> = number of partnered respondents; <sub>e</sub> = number of respondents who had casual sexual partners.  $\eta^2$  = Eta-squared. Superscript numbers (<sup>1, 2, 3, 4</sup>) indicate significant ( $p < .05$ ) difference between the given group and the indexed group within the same variable.

## IV. THE DEVELOPMENT OF THE PROBLEMATIC PORNOGRAPHY CONSUMPTION SCALE (PPCS) (STUDY 3)<sup>5</sup>

### IV/1. AIMS

Considering the pervasive presence of pornography use, the lack of a strongly theory-driven psychometric scale regarding problematic pornography use, and the lack of potentially important components of problematic pornography use in previous instruments, the goal of the present study was to create a comprehensive psychometric scale that addresses the weakness of previous instruments (Grubbs et al., 2010, 2015; Kor et al., 2014). Consequently, the aim of the present study was to develop a short, valid, reliable, multidimensional scale that encompasses the most important aspects of problematic pornography use based on the most extensively tested model of behavioral addictions and problematic online behaviors.

### IV/2. MATERIALS AND METHODS

#### IV/2.1. Participants and Procedure

The same procedure was followed as in Study 1, except for data collection occurred in June 2016 on a public, topic-irrelevant Facebook page that has approximately 217,000 members. Therefore, a total of 772 participants (females = 390, 50.5%) were retained for further analyses who were between ages 18 and 54 ( $M_{age} = 22.58$ ,  $SD_{age} = 4.89$ ).

#### IV/2.2. Measures

**Problematic Pornography Consumption Scale.** To match Griffiths' (2005) components, the definitions of each component were taken into account. To have similar wording to other specific and psychometrically robust problematic behavior scales (e.g., Andreassen et al., 2012; Orosz, Bóthe, et al., 2016), the items of these scales were considered as a basis of the items of the PPCS. On the basis of these guidelines, a focus group of psychologists (two men and two women,  $M_{age} = 27.5$  years,  $SD_{age} = 4.65$ ) created four items per component. After the focus group created the items, two experts in the addictive behavior field refined the items. In the final step of item creation, six individuals (young men and women, not psychologists) pretested the items to determine whether they were understandable and close to everyday language use.

**UCLA Loneliness Scale Version Three.** In the present study, a pretested shortened version of eight items with acceptable validity was used (CFI = .973; TLI = .962; RMSEA = .074 [90% CI = .060 to .089]) and reliability ( $\alpha = .90$ ) (Bóthe, 2016). Respondents rated each item on a 4-point scale (1 = *Never*; 4 = *Always*).

**Sexuality- and Pornography-Related General Questions.** Sexual satisfaction (5-point Likert scale, 1 = *Not satisfied*; 5 = *Very satisfied*); frequency of masturbation (9-point Likert scale, 1 = *Never*; 9 = *Several times a day*); frequency of masturbation during pornography use (5-point Likert scale, 1 = *Never*; 5 = *Very often*), and frequency of reading sexuality-related online stories, viewing pictures, and watching videos (nine-point Likert scale, 1 = *Never*; 9 = *Several times a day*).

#### IV/2.3. Statistical Analysis

Same as in Study 1 and Study 2.

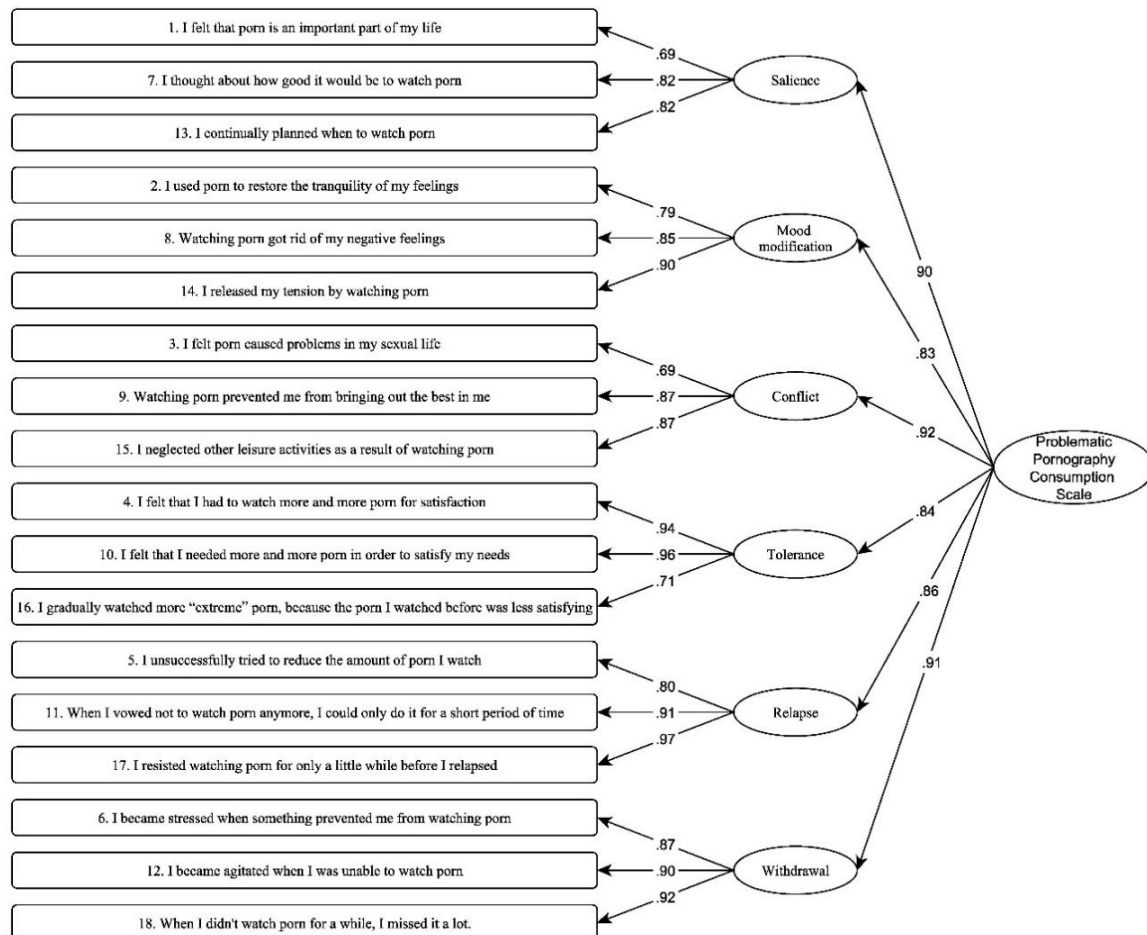
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<sup>5</sup>Bóthe, B., Tóth-Király, I., Zsila, Á., Griffiths, M. D., Demetrovics, Z., & Orosz, G. (2018). The development of the problematic pornography consumption scale (PPCS). *Journal of Sex Research*, 55(3), 395-406. doi: 10.1080/00224499.2017.1291798

### IV/3. RESULTS

#### IV/3.1. Dimensionality, Structural Validity and Measurement Invariance

The CFA results showed that the theory-based hierarchical model with six factors and a superordinated problematic use dimension (CFI = .977, TLI = .973, RMSEA = .064 [90% CI .059 to .070]) had adequate fit (IV/Figure 1). The results of the invariance analysis are shown in IV/Table 1. Fit indices supported the comparability of the PPCS across gender groups.



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

#### IV/3.3. Gender Differences and Correlates

The descriptive statistics of the PPCS are shown in IV/Table 2. PPCS scores weakly correlated with the time spent viewing pornography per occasion ( $r(770) = .14, p < .01$ ). PPCS correlated with the frequency of reading online pornographic stories ( $r(770) = .13, p < .01$ ), online pornography picture viewing ( $r(770) = .27, p < .01$ ), and online pornography video viewing ( $r(770) = .47, p < .01$ ). The frequency of masturbation positively correlated with PPCS scores ( $r(770) = .38, p < .01$ ), and the frequency of pornography consumption during masturbation also positively related with PPCS scores ( $r(770) = .27, p < .01$ ). Satisfaction with sexual life was weakly and negatively correlated with PPCS scores ( $r(372) = -.22, p < .01$ ). One-way ANOVA was used to assess differences in sexual orientation. According to the results, no differences in PPCS scores were found regarding sexual orientation. However, gender differences were found, as women ( $M_{female} = 1.66, SD_{female} = 0.87$ ) had lower scores [ $t(729.77) = 8.52, p < .01$ ] than men ( $M_{male} = 2.26, SD_{male} = 1.07$ ).

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

Model	WLSMV $\chi^2$	df	CFI	TLI	RMSEA	90% CI	Model comparison	$\Delta$ CFI	$\Delta$ TLI	$\Delta$ RMSEA
Baseline male	395.016*	129	.983	.979	.055					
Baseline female	286.645*	129	.981	.977	.057					
M1: configural	679.104*	258	.975	.970	.065	.059-.071				
M2: metric	718.544*	270	.973	.970	.065	.060-.071	M2-M1	-.002	.000	.000
M3: scalar	786.415*	354	.974	.978	.056	.051-.062	M3-M2	+.001	+.008	-.009
M4: residual	750.792*	372	.977	.981	.051	.046-.057	M4-M3	+.003	+.003	-.005

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;  $p < .001$ .

**IV/Table 2.** Descriptive statistics, reliability indices and inter-factor correlation between the dimensions of the Problematic Pornography Consumption Scale

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

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

### IV/3.4. Latent Profile Analysis

LPA was performed on the six PPCS factors. The AIC, BIC, and SSABIC values continuously decreased as more latent classes were added. Regarding entropy, all solutions had high levels of accuracy. The nonsignificant  $p$  value of the L-M-R test suggested that the four-class solution should be rejected in favor of the three-class solution. Based on these criteria, the three-class solution was selected. The first class represented nonproblematic pornography users (614 individuals, 79.5%). The second class represented low-risk pornography users (130 individuals, 16.8%). The third class represented at-risk pornography users (28 individuals, 3.6%). The three latent classes and their characteristics can be seen in IV/Table 4.

**IV/Table 4.** Comparison of the three latent classes based on the Problematic Pornography Consumption Scale (PPCS)

	Range	(a)	(b)	(c)	ANOVA	
		Nonproblematic users (N = 614)	Low-risk users (N = 130)	At-risk users (N = 28)	F	$p$
PPCS	1-7	1.52 (0.43) <sub>bc</sub>	3.32 (0.58) <sub>ac</sub>	5.04 (0.83) <sub>ab</sub>	1369.22	< .001
Time spent with pornography	1-6 <sup>d</sup>	2.82 (0.94) <sub>b†</sub>	3.10 (1.00) <sub>a</sub>	3.21 (1.03) <sub>†</sub>	6.32	< .002
Freq. of porn. viewing	0-8 <sup>#</sup>	4.47 (1.94) <sub>bc</sub>	6.09 (1.46) <sub>a</sub>	6.36 (1.66) <sub>a</sub>	50.47	< .001
Loneliness	1-4	2.10 (0.71) <sub>bc</sub>	2.38 (0.73) <sub>a†</sub>	2.70 (0.67) <sub>a†</sub>	16.64	< .001

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

### IV/3.5. Determination of a Potential Cutoff Score to Be Classified as a Problematic Pornography User: Sensitivity and Specificity Analysis

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

## IV/4. BRIEF DISCUSSION

The Problematic Pornography Consumption Scale is based on a solid theoretical framework of addictions, specifically Griffiths's six-component model (2005), and it has strong psychometric properties in terms of factor structure, reliability, and model invariance. Latent profile analysis identified almost 4% of the sample as at-risk pornography users. However, further clinical investigation and validation are needed to assess the extent of problems related to pornography use. The PPCS provides the opportunity for future research to compare the role of each component in various theoretical frameworks such as obsessive versus harmonious passion toward pornography use (Vallerand, 2015), or motivations regarding pornography use (Reid, Li, et al., 2011).



## V. REVISITING THE ROLE OF IMPULSIVITY AND COMPULSIVITY IN PROBLEMATIC SEXUAL BEHAVIORS (STUDY 4)<sup>6</sup>

### V/1. AIMS

Impulsivity and compulsivity are transdiagnostic features associated with clinically relevant aspects of psychiatric disorders, including addictions. Building on prior work (Wetterneck et al., 2012), the aims of the present study were to examine impulsivity and compulsivity relative to hypersexuality and problematic pornography use to identify possible similarities and differences in relationships with hypersexuality and problematic pornography use using validated and well-established measures. It was hypothesized that impulsivity and compulsivity would each positively correlate with problematic pornography use and hypersexuality, and that these relationships would be relatively weak but stronger for hypersexuality.

### V/2. MATERIALS AND METHODS

#### V/2.1. Participants and Procedure

The same procedure was used as in Study 1. Therefore, 13,778 participants met the criteria (female = 4,151, 30.1%) and were aged between 18 and 76 years ( $M_{age} = 33.52$ ,  $SD_{age} = 10.93$ ).

#### V/2.2. Measures

**UPPS-P Impulsive Behavior Scale (UPPS-P).** The Short UPPS-P Impulsive Behavior Scale (Zsila, Bóthe et al., 2017) was developed by Billieux et al. (2012) from the original 59-item UPPS-P (Lynam et al., 2006). The Short UPPS-P is a 20-item scale comprising five different impulsivity aspects with four items per dimension: negative urgency, positive urgency, sensation seeking, lack of premeditation, and lack of perseverance. All items were scored on a four-point Likert scale (from 1 = *I agree strongly* to 4 = *I disagree strongly*).

**Structured Clinical Interview for DSM Disorders.** In the present research, only the compulsivity subscale was used, which assesses compulsive behavior, utilizing nine true (1) or false (0) items (First et al., 1997; Szádóczy, Unoka, & Rózsa, 2004).

**Hypersexual Behavior Inventory (HBI).** See Study 1.

**Problematic Pornography Consumption Scale (PPCS).** See Study 3.

#### V/2.3. Statistical Analysis

SPSS 21 and Mplus 7.3 (Muthén & Muthén, 1998–2015) were used. Structural equation modeling (SEM) was used to explore the associations between the examined variables. The same fit indices were used as in Study 1.

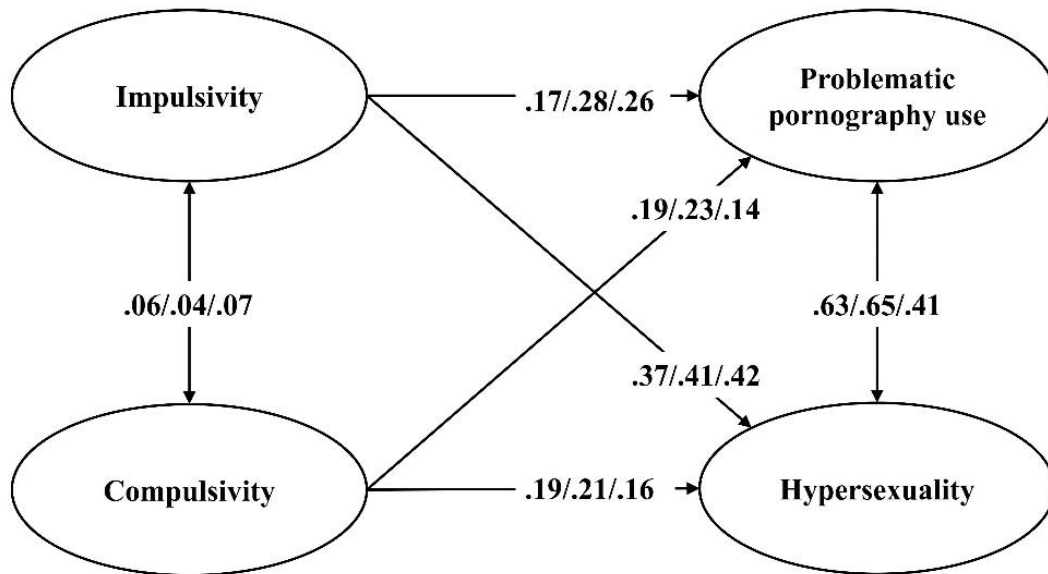
### V/3. RESULTS

Descriptive data, reliability indices, and correlations between the aspects of impulsivity, compulsivity, hypersexuality, and problematic pornography use are shown in V/Table 1. The models with standardized estimates are shown in V/Figure 1. In the total sample model, the fit indices were acceptable (CFI = .941, TLI = .937, RMSEA = .055 [90% CI = .054–.055]). The proportion of explained variance was 6.6% for problematic pornography use and 18.1% for hypersexuality. In the male sample model, the fit indices were acceptable (CFI = .929, TLI = .924, RMSEA = .059 [90% CI = .058–.059]). The proportion of explained variance was 13.2% for problematic pornography use and 21.7% for hypersexuality. In the female sample model,

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<sup>6</sup>Bóthe, B., Tóth-Király, I., Potenza, M. N., Griffiths, M. D., Orosz, G., & Demetrovics, Z. (2018). Revisiting the role of impulsivity and compulsivity in problematic sexual behaviors. *Journal of Sex Research*, 1-14. doi: 10.1080/00224499.2018.1480744

the fit indices were acceptable (CFI = .914, TLI = .908, RMSEA = .055 [90% CI = .054–.056]). The proportion of explained variance was 9.1% for problematic pornography use and 21.0% for hypersexuality.



**V/**Figure 1. The impulsivity and compulsivity background of hypersexuality and problematic pornography use ( $N_{\text{total}} = 13,778$ ;  $N_{\text{males}} = 9,555$ ;  $N_{\text{females}} = 4,151$ ). *Note.* All variables presented in ellipses are latent variables. For the sake of clarity, indicator variables related to them are not depicted in this figure. One-headed arrows represent standardized regression weights and two-headed arrows represent correlations. The first numbers on the arrows indicate the path coefficients of the total sample, the second numbers indicate the path coefficients of the male sample, and the third numbers indicate the path coefficients of the female sample. All pathways were significant at level  $p < .01$ .

#### V/4. BRIEF DISCUSSION

In sum, impulsivity and compulsivity did not contribute as importantly and directly to problematic pornography use as previously proposed in the literature, and impulsivity may have a more prominent role in hypersexuality. Thus, several issues arise regarding the categorization of problematic pornography use. One issue is whether problematic pornography use may be considered a subcategory of hypersexuality if relationships with impulsivity and compulsivity are not as strong as previously hypothesized. A second issue is how problematic pornography use may best be categorized (Griffiths, 2016; Kraus et al., 2016; Potenza et al., 2017).

**V/**Table 1. Descriptive statistics, reliability indices and correlations between the aspects of impulsivity, compulsivity, hypersexuality and problematic pornography use

Scales	Skewness (SE)	Kurtosis (SE)	Range	M (SD)	$\alpha$	1	2	3	4	5	6	7	8
1. PPCS total	1.61 (0.02)	2.61 (0.04)	1-7	1.92 (1.00)	.94	—							
2. HBI total	1.24 (0.02)	1.85 (0.04)	1-5	1.76 (0.57)	.89	.57*	—						
3. UPPS-P total	0.06 (0.02)	-0.10 (0.04)	1-4	2.28 (0.41)	.85	.15*	.31*	—					
4. UPPS-P negative urgency	0.17 (0.02)	-0.57 (0.04)	1-4	2.38 (0.73)	.83	.13*	.24*	.76*	—				
5. UPPS-P positive urgency	-0.05 (0.02)	-0.25 (0.04)	1-4	2.61 (0.63)	.73	.13*	.29*	.80*	.64*	—			
6. UPPS-P sensation seeking	-0.10 (0.02)	-0.24 (0.04)	1-4	2.58 (0.63)	.77	.04*	.15*	.47*	.17*	.39*	—		
7. UPPS-P lack of premeditation	0.38 (0.02)	-0.03 (0.04)	1-4	1.90 (0.58)	.82	.04*	.14*	.67*	.36*	.35*	.04*	—	
8. UPPS-P lack of perseverance	0.41 (0.02)	-0.05 (0.04)	1-4	1.91 (0.59)	.83	.14*	.18*	.52*	.18*	.16*	-.09*	.49*	—
9. SCID-II compulsivity	-0.15 (0.02)	-0.41 (0.04)	0-1	0.54 (0.21)	.49 <sup>a</sup>	.13*	.14*	.02*	.17*	.11*	.04*	-.19*	-.11*

*Note.* PPCS = Problematic Pornography Consumption Scale; HBI = Hypersexual Behavior Inventory; UPPS-P = UPPS-P Impulsive Behavior Scale; SCID-II = Structured Clinical Interview for DSM Disorders;  $\alpha$  = Cronbach's alpha; M = mean; SD = standard deviation; SE = standard error; <sup>a</sup> = Internal consistency was examined by assessment of the Kuder-Richardson Formula 20 (KR-20) for this dichotomous scale. \* $p < .001$

## **VI. INVESTIGATING THE ASSOCIATIONS OF ADULT ADHD SYMPTOMS, HYPERSEXUALITY AND PROBLEMATIC PORNOGRAPHY USE AMONG MEN AND WOMEN ON A LARGESCALE, NON-CLINICAL SAMPLE (STUDY 5)<sup>7</sup>**

### **VI/1. AIMS**

Given that the previous studies were carried out in small samples of treatment-seeking men, there is currently a lack of empirical evidence in this area regarding the associations of adult ADHD symptoms and the severity of hypersexuality in non-treatment seeking men and women; and treatment-seeking women. Moreover, no previous research examined the associations between adult ADHD symptoms and the severity of problematic pornography use. Thus, the aims of the present study were to (a) examine adult ADHD symptoms relative to hypersexuality and problematic pornography use, and to (b) identify possible similarities and differences in relationship with hypersexuality and problematic pornography use in a large, non-clinical sample with taking into consideration gender. Based on previous results (Reid et al., 2013), it might be hypothesized that the level of ADHD symptoms would have a positive, moderate association with the severity of hypersexuality. However, regarding the associations of problematic pornography use and ADHD symptoms, a weaker, but still positive association was expected as previous studies reported lower levels of comorbidity between these variables (Kraus et al., 2015).

### **VI/2. MATERIALS AND METHODS**

#### **VI/2.1. Participants and Procedure**

The same procedure was used as in Study 1. A total number of 14,043 participants were included in the present analysis (female = 4,237, 30.2%) who were aged between 18 and 76 years ( $M_{age} = 33.53$  years,  $SD_{age} = 10.94$ ).

#### **VI/2.2. Measures**

**ADHD Self-Report Scale (ASRS)** (Adler et al., 2006; Bitter, Simon, Bálint, Mészáros, & Czobor, 2010). The six-item screener version of the ASRS were used to assess adult ADHD symptoms. Participants indicated their answers on a seven-point Likert scale (0 = never; 4= very often) regarding the last six months.

**Problematic Pornography Consumption Scale (PPCS)**. See Study 3.

**Hypersexual Behavior Inventory (HBI)**. See Study 1.

**Sexuality and pornography related questions**. See Study 2.

#### **VI/2.3. Statistical Analysis**

See Study 4.

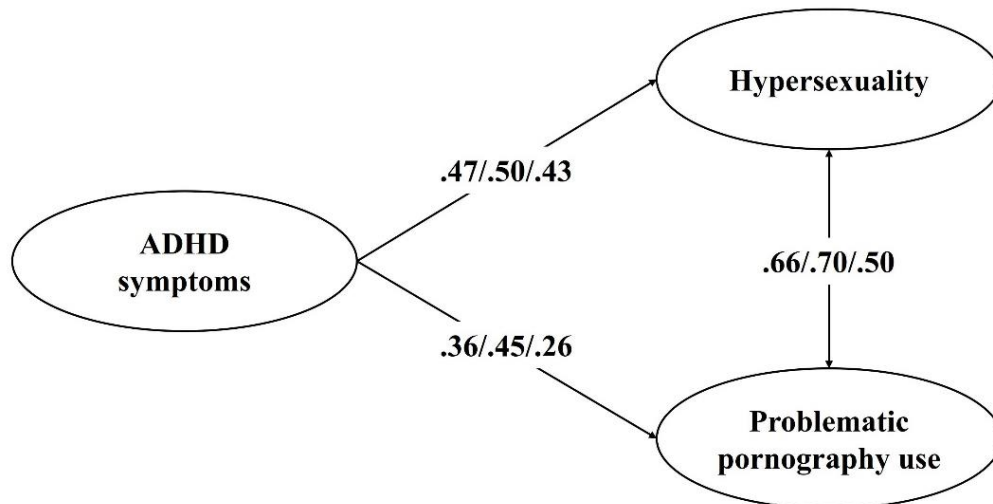
### **VI/3. RESULTS**

Descriptive statistics and correlations between self-reported ADHD symptoms, hypersexuality, problematic pornography use, and sexuality and pornography related questions can be seen in VI/Table 1. With the utilization of structural equation modeling, the associations between ADHD symptoms, hypersexuality and problematic pornography use were investigated on the total sample and separate male and female models. The models with standardized estimates are shown in VI/Figure 1. The fit indices were acceptable in all models and all

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<sup>7</sup>Bóthe, B., Koós, M., Tóth-Király, I., Orosz, G., & Demetrovics, Z. (in press). Investigating the associations of adult ADHD symptoms, hypersexuality, and problematic pornography use among men and women on a largescale, non-clinical sample. *Journal of Sexual Medicine*.

pathways were significant at  $p < .01$ . In the *total sample model* (CFI = .928, TLI = .923, RMSEA = .058 [90% CI .058-.059]), the proportion of explained variance was 22% for hypersexuality and 13% for problematic pornography use. In the *male sample model* (CFI = .913, TLI = .908, RMSEA = .064 [90% CI .064-.065]), the proportion of explained variance was 25% for hypersexuality and 20% for problematic pornography use. In the *female sample model* (CFI = .928, TLI = .923, RMSEA = .045 [90% CI = .044-.046]), the proportion of explained variance was 18% for hypersexuality and 7% for problematic pornography use.



**VI/Figure 1.** The associations of ADHD symptoms with hypersexuality and problematic pornography use. *Note.* All variables presented in ellipses are latent variables. For the sake of clarity, indicator variables related to them are not depicted in this figure. One-headed arrows represent standardized regression weights and two-headed arrows represent correlations. Numbers on the arrows indicate the path coefficients (total, male and female sample, respectively). All pathways were significant at level  $p < .01$ .

#### VI/4. BRIEF DISCUSSION

Using a large-scale, non-clinical sample, the associations between ADHD symptoms and hypersexuality and problematic pornography use were positive and moderate. When taking into consideration gender, the association between ADHD symptoms and hypersexuality remained the same effect size regardless gender. At the same time, the association between ADHD symptoms and problematic pornography use was stronger in the case of men, while it was weaker in the case of women. In sum, ADHD symptom severity may play similar roles in hypersexuality and problematic pornography use in the case of men, while in the case of women, it is more likely that ADHD symptoms would rather contribute to hypersexuality than to problematic pornography use. Moreover, the present findings further corroborated previous results (Werner et al., 2018; Wéry et al., 2016) that problematic pornography use may not be unequivocally considered as a manifestation of hypersexuality as different mechanisms may lead to the appearance of hypersexuality and problematic pornography use.

**VI/**Table 1. Descriptive statistics and correlations between the self-reported ADHD symptoms, hypersexuality, problematic pornography use and sexuality-related questions

Scales	Skewness (SE)	Kurtosis (SE)	Range	M (SD)	1	2	3	4	5	6
1. ADHD Self-Report Scale total	0.14 (0.02)	-0.16 (0.04)	0-4	1.65 (0.69)	—					
2. Hypersexual Behavior Inventory total	1.25 (0.02)	1.90 (0.04)	1-5	1.77 (0.57)	.33**	—				
3. Problematic Pornography Consumption Scale total	1.61 (0.02)	2.57 (0.04)	1-7	1.93 (1.01)	.26**	.58**	—			
4. Number of sexual partners	0.02 (0.02)	-1.31 (0.04)	1-16 <sup>a</sup>	8.40 (4.32)	-.05**	.11**	-.02*	—		
5. Frequency of having sex with one's partner	-1.06 (0.02)	1.28 (0.04)	1-10 <sup>b</sup>	7.04 (1.80)	.02*	-.06**	-.10**	.02	—	
6. Frequency of masturbation	-0.78 (0.02)	0.22 (0.04)	1-10 <sup>b</sup>	7.14 (2.12)	.13**	.29**	.41**	.04**	-.11**	—
7. Frequency of online pornography viewing	-0.51 (0.02)	-0.69 (0.04)	1-10 <sup>b</sup>	6.55 (2.47)	.09**	.26**	.51**	.05**	-.07**	.64**

*Note.* M = mean; SD = standard deviation; SE = standard error; <sup>a</sup> 1 = 0 partner; 2 = 1 partner; 3 = 2 partners; 4 = 3 partners; 5 = 4 partners; 6 = 5 partners; 7 = 6 partners; 8 = 7 partners; 9 = 8 partners; 10 = 9 partners; 11 = 10 partners; 12 = 11–20 partners, 13 = 21–30 partners; 14 = 31–40 partners; 15 = 41–50 partners; 16 = more than 50 partners; <sup>b</sup> 1 = never; 2 = once in the last year; 3 = 1–6 times in the last year; 4 = 7–11 times in the last year; 5 = monthly; 6 = two or three times a month; 7 = weekly; 8 = two or three times a week; 9 = four or five times a week; 10 = six or seven times a week; \* $p < .05$ ; \*\* $p < .001$

## VII. GENERAL DISCUSSION

### VII/1. BRIEF SUMMARY OF THE MAIN FINDINGS OF THE PRESENT STUDIES

Hypersexuality and problematic pornography use research has started to flourish in the past decades (see Montgomery-Graham, 2017; Wéry & Billieux, 2017). However, there are still several unanswered questions in the literature that deserve scientific attention. The present dissertation aimed to address some of the controversies in the problematic sexual behaviors research by investigating the similarities and dissimilarities of hypersexuality and problematic pornography use from the perspective of impulsivity, compulsivity and ADHD symptoms. Both the Hypersexual Behavior Inventory (HBI) and the Problematic Pornography Consumption Scale (PPCS) showed strong psychometric properties suggesting that these measurement tools can be reliably and validly use to assess the level of hypersexuality and problematic pornography used in general populations (*Study 1-3*). Both similarities and dissimilarities were demonstrated regarding the associations of hypersexuality and problematic pornography use in relation to transdiagnostic features (i.e., impulsivity and compulsivity) and psychiatric comorbidity (i.e., ADHD symptoms). Hypersexuality and problematic pornography use showed similar relationship patterns in relation to compulsivity among both gender, while they demonstrated differences in relation to impulsivity and ADHD symptoms (*Study 4-5*). A brief summary and the main results of the present findings can be seen in VII/Table 1.

### VII/2. IMPLICATIONS OF THE PRESENT DISSERTATION

#### VII/2.1. Theoretical Implications

The present investigation aimed to answer some theoretical questions related to hypersexuality and problematic pornography use that are currently gaining more and more scientific attention (e.g., classification of hypersexuality and problematic pornography use – e.g., Potenza et al., 2017). *First*, results of Study 2 indicated that the coping factor of HBI may not differentiate reliably between individuals who experience and individuals who do not experience problems related to hypersexuality. Thus, it raised the question whether coping may be considered as a key domain of hypersexuality or rather it should be assessed as a potential motivational factor that is highly related to hypersexuality but not an essential criterion of it. *Second*, as for classification, hypersexuality is now categorized as an impulse-control disorder in ICD-11 (World Health Organization, 2018). Although empirical results indicate positive, moderate associations between impulsivity and hypersexuality (Study 4, Reid et al., 2014), other empirical findings suggest that important characteristics of behavioral addictions also appear in hypersexuality (e.g., pathological gambling – Kowalewska et al., 2018). *Third*, as for the nomenclature of hypersexuality, in ICD-11, hypersexuality is included under the name of Compulsive Sexual Behavior Disorder; however, according to the results of Study 4 and previous findings (e.g., Carpenter et al., 2013), hypersexuality is only weakly related to compulsivity, indicating that CSBD might not be the most appropriate term to refer to hypersexuality, thus, it might be revised in future versions of diagnostic manuals. *Fourth*, the findings of the present investigation (Study 4 and Study 5), may not only question the classification of hypersexuality, but also lead to more questions regarding the categorization of problematic pornography use as well. On the one hand, hypersexuality and problematic pornography use showed dissimilarities in their relationship patterns with respect to impulsivity and ADHD symptoms suggesting that problematic pornography use may not be best categorized under the umbrella of hypersexuality. On the other hand, problematic pornography use was positively, but weakly related to impulsivity in Study 4. These results may suggest that the categorization of problematic pornography use (especially problematic online pornography use) as an impulse control disorder—due to the fact that hypersexuality is currently classified as an impulse control disorder and problematic pornography use is considered as a manifestation

of hypersexuality—may not be the most appropriate classification. To conclude, the present five-study investigation may not only contribute to the ongoing debate regarding the classification and nomenclature-related problems in hypersexuality and problematic pornography use (e.g., Potenza et al., 2017), but it may raise further questions regarding the etiology and development of both hypersexuality and problematic pornography use.

## **VII/2.2. Practical Implications**

Beyond the theoretical implications, the practical implications of the present research should be mentioned. *First*, both the HBI and the PPCS demonstrated strong psychometric properties in terms of reliability and validity as well, indicating that these scale can be appropriate to assess the level of hypersexuality and problematic pornography use in general populations (Study 1-3). Thus, in the diagnostic process, a two-step evaluation process would be ideal. In the first step, self-report reliable and valid scales (such as the HBI or the PPCS) should be administered followed by a thorough clinical interview. *Second*, LGBTQ men may be considered most at-risk, but LGBTQ women are also at risk of developing hypersexuality on the basis of the results of Study 2, possibly as a result of negative discrimination and obstacles forming romantic relationships (Montgomery-Graham, 2017; Muench & Parsons, 2004). LGBTQ individuals may use sexuality-related activities as a way of coping with negative feelings and emotions. Consequently, when considering therapeutic approaches in the treatment of individuals with hypersexuality (especially in the case of LGBTQ individuals), the promotion of negative emotion management and more adaptive coping strategies should be one focus as they report lower levels of mindfulness, self-compassion and self-forgiveness (Hook et al., 2015; Reid, Bramen, et al., 2014). *Third*, from the perspective of interventions, it might be beneficial to develop interventions that focus on specific manifestations of problematic sexual behaviors (e.g., problematic pornography use) and tailored to specific groups (e.g., men versus women) as some dissimilarities have been observed between hypersexuality and problematic pornography use in Study 4-5. *Fourth*, from a diagnostic perspective, when individuals assessed for ADHD, hypersexuality-related measures (and problematic pornography use related measures in the case of men) should also be administered. Moreover, in case of individuals seeking treatment for hypersexuality (or men seeking treatment for problematic pornography use), ADHD as a potentially comorbid disorder should be considered along with mood disorders, anxiety disorders or substance abuse.

Taken together, the present research contributed to the assessment of hypersexuality and problematic pornography use in general, non-treatment seeking populations as both the HBI and the PPCS may be applied to reliably and validly measure the extent of hypersexuality and problematic pornography use with relatively short scales. LGBTQ men were identified as a potential at-risk group of developing hypersexuality, thus, hopefully, they will be paid more attention in relation to hypersexuality. With the identification of possible transdiagnostic features and comorbid disorders, more focused prevention and intervention programs can be developed in the future.



**VII/Table 1.** Brief summary of the studies the present dissertation is based on

Study	Running title	Aims	Main findings
1	Psychometric properties of the Hypersexual Behavior Inventory (HBI)	(1) Examination of the factor structure and reliability of the HBI in a large, nonclinical sample. (2) Determination of a cutoff score for the HBI.	(1) The three-factor, first-order model of the HBI is a valid and reliable measure in terms of structural validity, relevant correlates, and reliability as well. (2) On the basis of latent profile analysis, sensitivity, specificity, positive predictive value, negative predictive value and accuracy, it was not possible to determine a reliable cutoff score for the HBI.
2	Gender and sexual orientation-based differences on the Hypersexual Behavior Inventory (HBI)	(3) Investigation of whether men and women, or heterosexual and LGBTQ individuals respond to the HBI similarly or whether they have gender- or sexual orientation-based differences in their response patterns.	(3) When gender and sexual orientation were considered together, the latent means of LGBTQ men were significantly higher than the other groups' means on the HBI (i.e., heterosexual men, LGBTQ women, and heterosexual women). Moreover, LGBTQ men and LGBTQ women had significantly higher latent means on the coping factor of the HBI than heterosexual men and heterosexual women.
3	Psychometric properties of and gender-based differences on the Problematic Pornography Consumption Scale (PPCS)	(4) Development of a theory-based, psychometrically strong scale that can reliably and validly assess problematic pornography use. (5) Investigation of whether men and women respond to the PPCS similarly or whether they have gender-based differences in their response patterns. (6) Determination of a cutoff score for the PPCS.	(4) The six-factor, second-order model of PPCS is a valid and reliable measure in terms of structural validity, relevant correlates, and reliability. (5) When gender was considered, high levels of invariance were demonstrated across gender indicating that gender based comparisons are meaningful. (6) Based on latent profile analysis, sensitivity, specificity, positive predictive value, negative predictive value, and accuracy, a score of 76 points was suggested as an optimal cutoff to be classified as problematic pornography user.
4	Impulsivity and compulsivity in relation to hypersexuality and problematic pornography use	(7) Simultaneous examination of impulsivity and compulsivity in association with hypersexuality and problematic pornography use in a large, nonclinical sample with taking into consideration possible gender differences.	(7) Based on the results of structural equation modeling, impulsivity was moderately and positively related to hypersexuality, while compulsivity was only weakly related to it, suggesting that impulsivity contributes more strongly to hypersexuality than compulsivity in both men and women. However, impulsivity and compulsivity related only weakly and positively to problematic pornography use among both genders.
5	ADHD symptoms in relation to hypersexuality and problematic pornography use	(8) Simultaneous examination of ADHD symptoms in association with hypersexuality and problematic pornography use in a large, nonclinical sample with taking into consideration possible gender differences.	(8) Based on the results of structural equation modeling, ADHD symptoms were positively and moderately related to hypersexuality among both men and women. Regarding men, ADHD had a positive, moderate association with problematic pornography use, while ADHD had a positive, but weak association with problematic pornography use in the case of women.

*Note.* LGBTQ = Lesbian, Gay, Bisexual, Transgender, and Queer Communities; ADHD = Attention Deficit Hyperactivity Disorder.

### **VII/3. LIMITATIONS AND FUTURE DIRECTIONS**

#### **VII/3.1. Limitations of the Present Dissertation**

Besides the strengths of the present investigation, some limitations have to be noted. Although the sample sizes were large and comprehensive, data were cross-sectional and the samples were self-selected and nonrepresentative limiting the generalization of the results. Due to the utilization of cross-sectional data, causality cannot be inferred. The studies excluded those individuals who did not use the Internet, therefore, future research should try to recruit individuals applying different recruitment strategies, as well as try to increase the representativeness of the sample. The scales assessed self-reported ratings, which may distort the reality. The results may also be distorted as a result of recall and social desirability biases.

#### **VII/3.2. Future Directions**

Besides cross-sectional data, the application of longitudinal (e.g., Grubbs, Wilt et al., 2018) or diary-based research designs (e.g., Wordecha et al., 2018) would be beneficial to have a greater understanding of the developmental process of hypersexuality and problematic pornography use. Results of Study 4 and Study 5, in line with recent results (Werner et al., 2018), may imply that the detailed examination of the similarities and dissimilarities of different problematic sexual behaviors (e.g., masturbation) would be fruitful in order to have a clearer view of what kind of sexual behaviors may be potentially considered as manifestation of hypersexuality. From a broader perspective, systematic examination of structural, situational, psychological, biological and genetic characteristics (Griffiths, 2005) may lead not only to deeper theoretical knowledge regarding the development and maintenance of problematic sexual behaviors, but it could serve as a practical basis for developing specific prevention and intervention programs (e.g., Crosby & Twohig, 2016). Recent results suggest that a general psychopathology factor (p factor) may be attributable for the comorbidities of different psychiatric disorders (Caspi et al., 2014). When the associations of several psychiatric disorders were examined with taking into consideration the higher-order p factor, the associations substantially decreased between the disorders. These results raise the possibility that the associations between hypersexuality, problematic pornography use and ADHD symptoms were a result of the general p factor, but this hypothesis should be empirically tested.

### **VII/4. FINAL CONCLUSIONS**

Although problematic sexual behaviors have been paid more and more attention in the recent years, it has to be noted that in most cases, sexual activities are not problematic and are essential parts of human functioning. However, in some case, these behaviors can become problematic and can cause severe distress and impairment in the individuals' life (e.g., Chatzittofis et al., 2017). As a first step in the examination of these behaviors, proper conceptualizations, definitions, categorizations and measurement tools are needed. Next, the identification of potential risk and protective factors may be aimed through comprehensive, theoretically supported models. Presumably, the conceptualization and definition of hypersexuality will converge as it is now included in ICD-11 as a mental disorder. The present investigation aimed to contribute to the adequate measurement and classification of hypersexuality and problematic pornography use and to the identification of potential risk factors of developing such sexual problems. Although the results of these studies were promising, further large-scale, intercultural, representative studies are needed to clarify several important questions such as whether problematic pornography use may be considered as a manifestation of hypersexuality or whether the frequency of/amount of given behaviors may be acknowledged as indicators of problematic behaviors (e.g., Grubbs, Perry et al., 2018).

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- Zsila, Á., Bőthe, B., Demetrovics, Z., Billieux, J., & Orosz, G. (2017). Further exploration of the SUPPS-P Impulsive Behavior Scale's factor structure: Evidence from a large Hungarian sample. *Current Psychology, 1*-11.

## IX. LIST OF PUBLICATIONS THAT THE DISSERTATION IS BASED UPON

- Bóthe, B.,** Bartók, R., Tóth-Király, I., Reid, R. C., Griffiths, M. D., Demetrovics, Zs., & Orosz, G. (2018). Hypersexuality, gender, and sexual orientation: A large-scale psychometric survey study. *Archives of Sexual Behavior*, 47(8), 2265-2276. doi: 10.1007/s10508-018-1201-z
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- Bóthe, B.,** Tóth-Király, I., Potenza, M. N., Griffiths, M. D., Orosz, G., & Demetrovics, Z. (2018). Revisiting the role of impulsivity and compulsivity in problematic sexual behaviors. *Journal of Sex Research*, 1-14. doi: 10.1080/00224499.2018.1480744
- Bóthe, B.,** Tóth-Király, I., Zsila, Á., Griffiths, M. D., Demetrovics, Z., & Orosz, G. (2018). The development of the problematic pornography consumption scale (PPCS). *Journal of Sex Research*, 55(3), 395-406. doi: 10.1080/00224499.2017.1291798
- Bóthe, B.,** Koós, M., Tóth-Király, I., Orosz, G., & Demetrovics, Z. (in press). Investigating the associations of adult ADHD symptoms, hypersexuality, and problematic pornography use among men and women on a largescale, non-clinical sample. *Journal of Sexual Medicine*.

Total impact factor of the published studies: 15.33

*Note:* Each co-author has granted permission for the given publication to be included in the current dissertation.

## X. LIST OF PUBLICATIONS DIRECTLY NOT USED IN THE DISSERTATION

### X/1. PEER REVIEWED SCIENTIFIC PAPERS

#### International:

\* Indicates shared first author position (equal contribution)

- Tóth-Király, I. \*, **Bóthe, B.\***, & Orosz, G. \* (2018). Seeing the forest through different trees: A social psychological perspective of work addiction. Commentary on: Ten myths about work addiction (Griffiths et al., 2018). *Journal of Behavioral Addictions*, 7(4), 875-879. doi: 10.1556/2006.7.2018.122
- Tóth-Király, I., **Bóthe, B.**, Jánvári, M. I., Rigó, A., & Orosz, G. (2018). Longitudinal trajectories of passion and their individual and social determinants: A latent growth modeling approach. *Journal of Happiness Studies*. doi: 10.1007/s10902-018-0059-z
- Király, O., **Bóthe, B.**, Ramos-Diaz, J., Rahimi-Movaghar, A., Lukavska, K., Hrabec, O., Miovisky, M., Billieux, J., Deleuze, J., Nuyens, F., Karila, L., Griffiths, M. D., Nagygyörgy, K., Urbán, R., Potenza, M. N., King, D., Rumpf, H-J., Carragher, N., & Demetrovics, Z. (in press). Ten-Item Internet Gaming Disorder Test (IGDT-10): Measurement invariance and cross-cultural validation across seven language-based samples. *Psychology of Addictive Behaviors*.
- Bolló, H., **Bóthe, B.**, Tóth-Király, I., & Orosz, G. (2018). Pride and social status. *Frontiers in psychology*. doi: 10.3389/fpsyg.2018.01979
- File, B., Keczer, Zs., Vancsó, A., **Bóthe, B.**, Tóth-Király, I., Hunyadi, M., Ujhelyi, A., Ulbert, I., Góth, J., & Orosz, G. (2018). Emergence of polarized opinions from free associations networks. *Behavior Research Methods*. doi: 0.3758/s13428-018-1090-z
- Tóth-Király, I., **Bóthe, B.**, Orosz, G., & Rigó, A. (2018). A New Look on the Representation and Criterion Validity of Need Fulfillment: Application of the Bifactor Exploratory Structural Equation Modeling Framework. *Journal of Happiness Studies*. doi: 10.1007/s10902-018-0015-y
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- Orosz, G., Bruneau, E. G., Tropp, L. R., Sebestyén, N., Tóth-Király, I., & **Bóthe, B.** (2018). What Predicts Anti-Roma Prejudice? Qualitative and quantitative analysis of everyday sentiments about the Roma. *Journal of Applied Social Psychology*, 48(6), 317-328. doi: 10.1111/jasp.12513
- Orosz, G., Benyó, M., Berkes, B., Nikoletti, E. Gál, É., Tóth-Király, I., & **Bóthe, B.** (2018). The personality, motivation and need-based background of problematic Tinder use. *Journal of Behavioral Addictions*, 7(2), 301-316. doi: 10.1556/2006.7.2018.21
- Orosz, G., Zsila, Á., Vallerand, R. J., & **Bóthe, B.** (2018). On the Determinants and Outcomes of Passion for Playing Pokémon Go. *Frontiers in Psychology*, 9, 316. doi: 10.3389/fpsyg.2018.00316
- Orosz, G., Tóth-Király, I., **Bóthe, B.**, Paskuj, B., Berkics, M., Fülöp, M., & Roland-Lévy, C. (2018). Linking cheating in school and corruption. *European Review of Applied Psychology*, 68(2), 89-97. doi: 10.1016/j.erap.2018.02.001
- Zsila, Á., **Bóthe, B.**, Demetrovics, Zs., Billieux, J., & Orosz, G. (2017). Further exploration of the SUPPS-P impulsive behaviour scale's factor structure: Evidence from a large Hungarian sample. *Current Psychology*. doi: 10.1007/s12144-017-9773-7
- Tóth-Király, I., **Bóthe, B.**, Tóth-Fáber, E., Hága, G., & Orosz, G. (2017). Connected to TV series: Quantifying series watching engagement. *Journal of Behavioral Addictions*, 6(4), 472-489. doi: 10.1556/2006.6.2017.083



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- Bóthe, B.\***, Tóth-Király, I., Demetrovics, Zs., & Orosz, G\*. (2017). The pervasive role of sex mindset: Beliefs about the malleability of sexual life is linked to higher levels of relationship satisfaction and sexual satisfaction and lower levels of problematic pornography use. *Personality and Individual Differences*, 117(15), 15-22. doi: 10.1016/j.paid.2017.05.030
- Zsila, Á., Orosz, G., **Bóthe, B.**, Tóth-Király, I., Király, O., Griffiths, M. D., Demetrovics, Zs. (2017). An empirical study on the motivations underlying augmented reality games: The case of Pokémon Go during and after Pokémon fever. *Personality and Individual Differences*. Early view doi: 10.1016/j.paid.2017.06.024
- Orosz, G., Zimbardo, P. G., **Bóthe, B.**, & Tóth-Király, I. (2017). The paradoxical effect of climate on time perspective considering resource accumulation. *Behavioral and Brain Sciences*, 40, e92. doi: 10.1017/S0140525X16001072
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- Török, R., Tóth-Király, I., **Bóthe, B.**, & Orosz, G. (2017). Analyzing Models of Career Decision Self-Efficacy: First-Order, Hierarchical, and Bifactor Models of the Career Decision Self-Efficacy Scale. *Current Psychology*, 36(4), 764-773. doi: 10.1007/s12144-016-9464-9
- Orosz, G., Dombi, E., Tóth-Király, I., **Bóthe, B.**, Jagodics, B., Zimbardo, P. G. (2016). Academic Cheating and Time Perspective: Cheaters Live in the Present Instead of the Future. *Learning and Individual Differences*, 52, 39-45. doi: 10.1016/j.lindif.2016.10.007
- Orosz, G., Krekó, P. Paskuj, B., Tóth-Király, I., **Bóthe, B.**, & Roland-Lévy, C. (2016). Changing Conspiracy Beliefs through Rationality and Ridiculing. *Frontiers in Psychology*. 7:1525. doi: 10.3389/fpsyg.2016.01525
- Orosz, G., Vallerand, R. J., **Bóthe, B.**, Tóth-Király, I., Paskuj, B. (2016). On the Correlates of Passion for Screen-Based Behaviors: The Case of Impulsivity and the Problematic and Non-Problematic Facebook Use and TV Series Watching. *Personality and Individual Differences*, 101, 167-176. doi:10.1016/j.paid.2016.05.368
- Orosz, G. \*, Tóth-Király, I. \*, **Bóthe, B.\***, & Melher, D. (2016). Too many swipes for today: The Development of the Problematic Tinder Use Scale (PTUS). *Journal of Behavioral Addictions*, 5(3), 528-523. doi: 10.1556/2006.5.2016.016.
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- Orosz, G. \*, **Bóthe, B.\***, & Tóth-Király, I\*. (2016). The development of the Problematic Series Watching Scale (PSWS). *Journal of Behavioral Addictions*, 5(1), 144-150. doi: 10.1556/2006.5.2016.011
- Orosz, G.\*, Tóth-Király, I.\*, & **Bóthe, B.\*** (2015). Four facets of Facebook intensity—The development of the Multidimensional Facebook Intensity Scale. *Personality and Individual Differences*, 100, 95-104. doi: 10.1016/j.paid.2015.11.038
- Orosz, G., Tóth-Király, I., **Bóthe, B.**, Kusztor, A., Üllei, Zs., & Jánvári, M. (2015). Teacher enthusiasm: a potential cure of academic cheating. *Frontiers in Psychology* 6, 318. doi:

10.3389/fpsyg.2015.00318

**Bóthe, B.**, Tóth-Király, I., & Orosz, G. (2015). Clarifying the links among online gaming, internet use, drinking motives, and online pornography use. *Games for Health Journal*, 4(2), 107-112. doi:10.1089/g4h.2014.0054

#### **Hungarian:**

Ulicza, N., Gajdos, D., **Bóthe, B.**, Tóth-Király, I., & Orosz, G. (2015). The Factor Structure of the Short Form of the University Boredom Questionnaire. *School Culture*, 25(10), 69-77.

## **X/2. CONFERENCE PRESENTATIONS AND POSTERS**

#### **International:**

**Bóthe B.**, Tóth-Király, I., Orosz, G. & Demetrovics, Z. (2018, November 8-11). *Sexual dysfunction is related to problematic pornography use, but not to the frequency of use*. Poster session, presented at the 2018 Annual Meeting of the Society for the Scientific Study of Sexuality, Montreal, Canada.

Bolló, H., **Bóthe, B.**, Tóth-Király, I., & Orosz, G. (2018, June 21-22). *More money or more respect? Investigating the role of objective and subjective social status regarding authentic and hubristic pride*. Oral presentation presented at the Singapore Conference on Applied Psychology (SCAP), Singapore.

File, B., Keczer, Zs., Vancsó, A., **Bóthe, B.**, Tóth-Király, I., Hunyadi, M., Ujhelyi, A., Ulbert, I., Góth, J., & Orosz, G. (2018, June 21-22). *Polarized Opinions from Free Association Networks*. Oral presentation presented at the Singapore Conference on Applied Psychology (SCAP), Singapore.

**Bóthe B.**, Tóth-Király, I., Demetrovics, Zs., & Orosz, G. (2018, May 24-27). *The motivational basis of problematic pornography use*. Oral presentation presented at the 21<sup>th</sup> annual conference of the European Association of Substance Abuse Research (EASAR), Vienna, Austria.

**Bóthe, B.**, Bartók, R., Tóth-Király, I., Griffiths, M. D., Demetrovics, Zs., & Orosz, G. (2018, April 23-25). Investigating the psychometric properties of the Hypersexual Behavior Inventory using a large-scale, nonclinical sample across gender and sexual orientation. Oral presentation presented at the 5<sup>th</sup> International Conference on Behavioral Addictions (ICBA), Cologne, Germany.

Tóth-Király, I., **Bóthe, B.**, Márton, K. E., Boros, L., Orosz, G., & Rigó, A. (2018, April 23-25). *Basic psychological needs and perceived interpersonal behaviors as predictors of passion for series watching*. Oral presentation presented at the 5<sup>th</sup> International Conference on Behavioral Addictions (ICBA), Cologne, Germany.

Demetrovics, Zs., **Bóthe, B.**, Tóth-Király, I., & Orosz, G. (2018, April 23-25). *The impulsive and compulsive aspects of problematic pornography use and hypersexuality*. Oral presentation presented at the 5<sup>th</sup> International Conference on Behavioral Addictions (ICBA), Cologne, Germany

Blycker, G. R., Kraus, S. W., **Bóthe, B.**, Zsila, Á., Tóth-Király, I., Orosz, G., Demetrovics, Zs., & Potenza, M. N. (2018, April 23-25). *Gender considerations in the correlates of problematic pornography use*. Oral presentation presented at the 5<sup>th</sup> International Conference on Behavioral Addictions (ICBA), Cologne, Germany.

Bolló, H., **Bóthe B.**, Tóth-Király, I., & Orosz, G. (2018, April 4-7). Pride and social status: The role of subjective and objective social status regarding pride and status maintenance strategies. Oral presentation presented at the 13th Conference of the European Human Behaviour and Evolution Association (EHBEA), Pécs, Hungary.

**Bóthe, B.**, Tóth-Király, I., Demetrovics, Zs., & Orosz, G. (2017, July 5-8). *Beliefs about the changeability of sexual life from the perspective of problematic pornography use and relationship satisfaction*.

- Poster session, presented at the 18<sup>th</sup> General Meeting of the European Association of Social Psychology, Granada, Spain.
- Tóth-Király, I., **Bóthe, B.**, Tóth-Fáber, E., Hága, Gy., & Orosz, G. (2017, July 5-8). *Connected to Tv series: Quantifying series watching engagement*. Poster session, presented at the 18<sup>th</sup> General Meeting of the European Association of Social Psychology, Granada, Spain.
- Bolló, H., **Bóthe, B.**, Tóth-Király, I., & Orosz, G. (2017, July 5-8). *Interpersonal dynamics behind authentic and hubristic pride from the perspective of merited and unmerited success*. Poster session, presented at the 18<sup>th</sup> General Meeting of the European Association of Social Psychology, Granada, Spain.
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- Bóthe, B.**, Tóth-Király, I., Zsila, Á., Griffiths, M. D., Demetrovics, D., & Orosz, G. (2017, May 18-21). *Binding theory and psychometry: Development of the Problematic Pornography Consumption Scale (PPCS)*. Oral presentation presented at the 20<sup>th</sup> annual conference of the European Association of Substance Abuse Research (EASAR), Nunspeet, Netherlands.
- Orosz, G., Vallerand, R. J., **Bóthe, B.**, Tóth-Király, I., & Paskuj, B. (2017, May 18-21). *The mediating role of passion between impulsivity and problematic vs. non-problematic screen-based activities*. Oral presentation presented at the 20<sup>th</sup> annual conference of the European Association of Substance Abuse Research (EASAR), Nunspeet, Netherlands.
- Tóth-Király, I., **Bóthe, B.**, & Orosz, G. (2017, May 18-21). *The role of need satisfaction and the dualistic model of passion in the problematic online behaviors*. Oral presentation presented at the 20<sup>th</sup> annual conference of the European Association of Substance Abuse Research, Nunspeet, Netherlands.
- Demetrovics, Zs., **Bóthe, B.**, Ramos Diaz, J., Rahimi-Movaghar, A., Lukavska, K., Hrabec, O., ... Király, O. (2017, February 20-22). *Ten-item Internet Gaming Disorder Test (IGDT-10): Psychometric properties across seven language-based samples*. Oral presentation presented at the 4<sup>th</sup> International Conference on Behavioral Addictions, Haifa, Israel.
- Bóthe, B.**, Tóth-Király, I., Zsila, Á., Griffiths, M. D., Demetrovics, Zs., & Orosz, G. (2017, February 20-22). *The six-component problematic pornography consumption scale*. Oral presentation presented at the 4<sup>th</sup> International Conference on Behavioral Addictions, Haifa, Israel.
- Bóthe, B.**, Tóth-Király, I., Demetrovics, Zs., & Orosz, G. (2017, February 20-22). *Sex mindset beliefs can diminish the negative association between relationship satisfaction and problematic pornography consumption*. Oral presentation presented at the 4<sup>th</sup> International Conference on Behavioral Addictions, Haifa, Israel.
- Orosz, G., Tóth-Király, I., **Bóthe, B.**, & Vallerand, R. J. (2016, June 2-5). *On the determinants and outcomes of passion for screen-based behaviors: The case of impulsivity and the problematic and non-problematic Facebook use and Tv series watching*. Oral presentation presented at the 6<sup>th</sup> International Conference on Self-determination Theory, Victoria, Canada.

#### **Hungarian:**

- Bóthe, B.** (2018, June, 19). *Developing the growth mindset of university students at the Faculty of Law Enforcement, National University of Public Service*. Oral presentation presented at the Public Service and Psychology Conference, Budapest, Hungary.