Revisiting the role of impulsivity and compulsivity in problematic sexual behaviors

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Revisiting the role of impulsivity and compulsivity in problematic sexual behaviors

ABSTRACT

Impulsivity and compulsivity are transdiagnostic features associated with clinically relevant aspects of psychiatric disorders including addictions. However, little research has investigated how impulsivity and compulsivity relate to hypersexuality and problematic pornography use. Thus, the aims of the present study were to investigate (a) self-reported impulsivity and compulsivity with respect to hypersexuality and problematic pornography use, and (b) the similarities and possible differences between hypersexuality and problematic pornography use in these domains. Utilizing structural equation modeling in a large community sample (N = 13,778 participants; female = 4,151, 30.1%), results indicated that impulsivity (β = .28, β = .26) and compulsivity (β = .23, β = .14) were weakly related to problematic pornography use among males and females, respectively. Impulsivity had a stronger relationship (β = .41, β = .42) with hypersexuality than did compulsivity (β = .21, β = .16) among males and females, respectively. Consequently, impulsivity and compulsivity may not contribute as substantially to problematic pornography use as some scholars have proposed. On the other hand, impulsivity might have a more prominent role in hypersexuality than in problematic pornography use. Future research should examine further social and situational factors associated with problematic pornography use.

Keywords: behavioral addiction, compulsivity, hypersexuality, impulsivity, problematic pornography use

INTRODUCTION

Online pornography has become more anonymous, accessible, and affordable over time. One popular pornography website's statistics reported approximately 81 million visitors per day and approximately 28.5 billion visits in 2017 (Pornhub.com, 2018). In most cases, pornography viewing is not problematic. However, for some viewers, pornography use may become problematic (estimated at approximately 3.6% of pornography users – Bőthe et al., 2017) and negatively impact functioning by generating impairments in romantic relationships, meeting obligations and/or achieving other goals (Kraus, Meshberg-Cohen, Martino, Quinones, & Potenza, 2015; Twohig, Crosby, & Cox, 2009). According to recent case studies (Bostwick & Bucci, 2008; Kraus et al., 2015), difficulties in controlling urges to engage in pornography use, a feature that may involve impulsive and compulsive tendencies, may represent a strong obstacle for people to overcome when attempting to reduce problematic pornography use. Problematic pornography use may represent a prominent manifestation of hypersexuality (also referred to as sexual compulsivity, sexual addiction or excessive sexual behavior in the literature – Kafka, 2010; Karila et al., 2014; Wéry & Billieux, 2017) because in several studies more than 80% of people with hypersexuality have reported excessive/problematic pornography use (Kafka, 2010; Reid et al., 2012). An improved understanding of the similarities and possible differences between problematic pornography use and hypersexuality may help with respect to developing improved interventions. As both impulsivity and compulsivity have been highly associated with non-substance-related addictive behaviors such as gambling (American Psychiatric Association, 2013; el-Guebaly, Mudry, Zohar, Tavares, & Potenza, 2012; Leeman & Potenza, 2012; World Health Organization, 2017), questions have arisen regarding the extent to which these features may be associated with problematic pornography use and hypersexuality. The aim of the present study was for the first time, to simultaneously examine the relationships between the two

transdiagnostic measures of self-reported impulsivity and compulsivity and specific forms of problematic sexual behaviors (i.e., problematic pornography consumption and hypersexuality).

The proposed obsessive-compulsive spectrum model as related to problematic sexual behaviors

Over two decades ago, an obsessive-compulsive spectrum model was proposed (Hollander, 1993; Hollander & Wong, 1995) with the conceptualization that different addictions could be juxtaposed on a continuum or spectrum. Disorders were proposed to lie along this spectrum with underestimation of harm being on the impulsive end and overestimation of harm being on the compulsive end (American Psychiatric Association, 2013; Hollander & Benzaquen, 1997). According to the meta-theory of Hollander and Wong (1995), sexuality-related compulsions or addictions are closer to the impulsive end of the spectrum. Just over a decade later, Mick and Hollander (2006) proposed that problematic sexual behaviors had both impulsive and compulsive characteristics. However, these models were proposed largely in the absence of empirical data supporting this continuum of impulsivity and compulsivity lying along extreme ends of a continuous spectrum. When examining gambling and substance-use disorders , both impulsive and compulsive features have been observed, and individuals with gambling disorder score high on measures of both impulsivity and compulsivity (Leeman & Potenza, 2012; Potenza, 2007). Consequently, questions exist regarding empirically derived relationships between problematic sexual behaviors and impulsivity and compulsivity.

According to Lochner et al.'s (2005) study, hypersexual disorder may belong to the reward-deficiency cluster rather than impulsive or somatic clusters on the basis of complex clinical interviews with patients with obsessive-compulsive spectrum disorders. However, the ICD-11 (beta version of the eleventh version of *International Statistical Classification of Diseases and Related Health Problems*) Working Group on obsessive-compulsive and related

disorders suggested that compulsive sexual behavior disorder (hypersexual disorder) should be included under the classification of Impulse Control Disorders in the ICD-11 (Grant et al., 2014; Kraus et al., 2018; Stein et al., 2016; World Health Organization, 2017) due to its conceptualization and symptomatology (e.g., repeated failure to resist the impulse to engage in sexual behavior despite its long-term negative consequences). However, such a classification has been questioned because compulsive sexual behavior has similar neurobiological features to substance-use disorders indicating that compulsive sexual behavior could be considered as an addictive disorder (Potenza, Gola, Voon, Kor, & Kraus, 2017). Thus, there is currently no consensus whether sexuality-related disorders or problems (such as problematic pornography use or hypersexuality) relate to impulsive or compulsive features or whether they should be considered as behavioral addictions (e.g., Griffiths, 2016; Kraus, Voon, & Potenza, 2016; Potenza et al., 2017), while noting that these possibilities are not mutually exclusive. Given that no prior studies have simultaneously examined impulsivity and compulsivity as related to hypersexuality and problematic pornography use, there is currently a knowledge gap in this area.

One study investigated compulsivity and impulsivity together as related to pornography use (Wetterneck, Burgess, Short, Smith, & Cervantes, 2012). However, in this study, sexual compulsivity as opposed to general compulsivity was assessed. According to study's results, impulsivity-related features (risk-taking and sensation seeking) were positively and weakly correlated with self-reported positive and negative effects of pornography use and the frequency of pornography use. However, after dividing the sample into problematic and non-problematic users, there were no significant differences between the groups regarding their level of impulsivity. With respect to sexual compulsivity, the positive and negative effects of pornography use and the frequency of pornography use were positively and moderately associated with sexual compulsivity, and there was a significant difference between the

problematic and non-problematic user groups because individuals in the problematic groups reported 1.5-fold higher levels of sexual compulsivity than the non-problematic group. This study is the only one that has assessed both impulsivity and (sexual) compulsivity in one model, with few studies having separately examined impulsivity or compulsivity as related to problematic sexual behaviors such as hypersexuality and problematic pornography consumption, as discussed below.

Impulsivity, hypersexuality, and pornography consumption

Impulsivity has been related to multiple behaviors relevant to psychiatric problems and disorders (alcohol drinking – Anestis, Selby, & Joiner, 2007; Fischer, Anderson, & Smith, 2004; Fischer & Smith, 2008; compulsive buying – Billieux, Rochat, Rebetez, & Van der Linden, 2008; eating disorders – Claes, Vandereycken, & Vertommen, 2005; Fischer et al., 2004; Fischer & Smith, 2008) and specific problematic online behaviors or online addictions (such as Internet addiction – Burnay, Billieux, Blairy, & Larøi, 2015; problematic online gaming – Billieux et al., 2011; Facebook overuse and problematic series watching – Orosz, Vallerand, Bőthe, Tóth-Király, & Paskuj, 2016). According to Whiteside and Lynam (2001), impulsivity is defined via four dimensions: *sensation-seeking* (openness to experiences that might be dangerous and enjoyment of exciting activities), *negative urgency* (the tendency to engage in impulsive behaviors in order to diminish negative emotions and affects, despite the potentially harmful long-term consequences), *lack of perseverance* (difficulties with staying focused on tasks that might be boring and with finishing projects or tasks if distracting stimuli are present) and *lack of premeditation* (acting before thinking about the possible consequences). This original four-dimensional impulsivity model was later complemented with a fifth dimension, namely *positive urgency* (Billieux et al., 2012; Lynam, Smith, Whiteside, & Cyders, 2006). Positive urgency

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refers to the tendency to act rashly when experiencing intensive positive emotions. Most research

examining the relationships between pornography use and impulsivity or hypersexuality and

impulsivity have either applied a unidimensional impulsivity concept or emphasized the role of

sensation-seeking.

Within the field of *hypersexuality*, previous research on heterosexual, bisexual, and

homosexual males and females has identified a positive, but weak association between self-

reported impulsive tendencies and hypersexuality. This suggests that people with higher

impulsivity are more likely to engage in hypersexual behaviors (Walton, Cantor, & Lykins,

2017). However, in a study examining a combined sample of hypersexual males and healthy

community controls, a moderate positive association was found between impulsivity and the level

of hypersexuality, a relationship persisting when anxiety, depression, vulnerability, and

mindfulness were taken into consideration (Reid, Bramen, Anderson, & Cohen, 2014). In the

case of highly sexually active gay and bisexual males, a similar positive, moderate association

has been observed between self-reported impulsivity and levels of hypersexuality (Pachankis,

Rendina, Ventuneac, Grov, & Parsons, 2014).

However, when hypersexual and non-hypersexual males were compared regarding their

level of impulsivity, only a trend toward significance was found in relation to impulsivity

(Mulhauser et al., 2014). In another study comparing impulsivity between hypersexual gay men

and non-hypersexual gay men (Miner et al., 2016), only one significant difference was observed.

Hypersexual gay men showed elevated levels of non-planning impulsivity compared to non-

hypersexual gay men. There were no significant differences between the two groups in their

levels of attentional and motor impulsivity. The aforementioned findings suggest that

hypersexuality is related to generalized impulsivity and that hypersexual males are not a

homogenous group regarding impulsivity levels (Miner et al., 2016; Mulhauser et al., 2014).

However, the findings suggest that impulsivity importantly relates to hypersexuality (Pachankis et al., 2014; Reid et al., 2014; Walton et al., 2017).

Regarding *pornography use*, sensation-seeking is arguably the most prevalently examined impulsivity-related characteristic studied to date. Sensation-seeking has been found to be positively related to the frequency of pornography consumption (Beyens, Vandenbosch, & Eggermont, 2015; Peter & Valkenburg, 2010), and for males, experience-seeking has also been found to be positively related to online pornography use (Paul, 2009). According to Cooper, Delmonico and Burg's (2000) research, sexually compulsive people and individuals with cybersex addiction score higher on sexual and non-sexual sensation-seeking scales than do non-sexually compulsive and moderately sexually compulsive people. In sum, people with higher levels of sensation-seeking may use pornography more intensively as manifested by either an increased amount of time spent with online pornography or the development of problematic online pornography use. Regarding the four other proposed dimensions of impulsivity (negative urgency, positive urgency, lack of perseverance, and lack of premeditation), no previous research has ever examined associations between these variables and online pornography use.

With respect to general impulsivity, the frequency of pornography use has been found to be negatively related to impulsivity among men (i.e., losing one's temper or easily getting irritated), but this was not the case for women (Carroll et al., 2008). In a separate study, low self-control (including impulsivity) only explained a small amount of the variance concerning the frequency of visiting pornography sites and downloading pornographic material after controlling for gender and age (Buzzell, Foss, & Middleton, 2006). Other research has found that motivations for using pornography positively and moderately relates to impulsivity across all motivational dimensions investigated (Reid et al., 2011). Consequently, these data suggest weak

but complex relationships between pornography use and impulsivity that do not appear entirely consistent across studies.

In sum, the empirical evidence shows that impulsivity is weakly or moderately related to several aspects of pornography use such as the frequency of pornography use or the motivation of pornography viewing (e.g., Beyens et al., 2015; Caroll et al., 2008; Peter & Valkenburg, 2010; Reid et al., 2011). However, little research has focused on the relationship between impulsivity and problematic pornography use. On the other hand, data suggest that impulsivity relates to hypersexuality, with other personality-related measures also showing relationships (Miner et al., 2016; Mulhauser et al., 2014; Pachankis et al., 2014; Reid et al., 2014; Walton et al., 2017).

Compulsivity, hypersexuality, and pornography consumption

Compulsivity is another personality-related characteristic that has been associated with psychiatric disorders and behaviors (e.g., substance-use and gambling disorders – Leeman & Potenza, 2012; compulsive overeating – Davis & Carter, 2009; alcohol abuse and dependence – Modell, Glaser, Mountz, Schmaltz, & Cyr, 1992; bulimia nervosa – Engel et al., 2005). Compulsivity is characterized by the "performance of repetitive and functionally impairing overt or covert behavior without adaptive function, performed in a habitual or stereotyped fashion, either according to rigid rules or as a means of avoiding perceived negative consequences." (Fineberg et al., 2014; p. 70). Therefore, compulsivity may refer to the engagement in ritualistic, repetitive behaviors and actions in order to prevent or reduce distress or eliminate feared consequences of an individual's behaviors. However, this feeling of alleviation may be temporary, leading to a vicious cycle where the individual regularly engages in ritualistic actions (Deacon & Abramowitz, 2005).

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Few studies have examined associations between compulsivity and *hypersexuality*. Among males with non-paraphilic hypersexual disorder, the lifetime prevalence of obsessive-compulsive disorder—a psychiatric disorder characterized by compulsivity—ranges from 0-14% (Kafka, 2015). Obsessiveness—which may be associated with compulsive behavior (MMPI-2 – Butcher, Dahlstrom, Graham, Tellegen, & Kaemmer, 1989)—in treatment-seeking males with hypersexuality has been found to be elevated relative to a comparison group, but the effect size of this difference was weak (Reid & Carpenter, 2009). When the association between the level of obsessive-compulsive behavior—assessed by the subscale of SCID-II (First, Gibbon, Spitzer, Williams, & Benjamin, 1997)—and the level of hypersexuality was examined among treatment-seeking males with hypersexual disorder, a trend toward a positive, weak association was found (Carpenter, Reid, Garos, & Najavits, 2013). On the basis of the aforementioned results, compulsivity appears to contribute in a relatively small manner to hypersexuality.

Sexual compulsivity (more so than general compulsivity) has been associated with pornography use. Among male students, pornography viewing has been found to be positively and moderately associated with sexual compulsivity, with sexual compulsivity mediating the positive association between pornography viewing and problematic behavioral outcomes (Twohig et al. 2009). In line with the effects of thought suppression observed in obsessive-compulsive disorder (e.g., Abramowitz, Tolin, & Street, 2001; Tolin, Abramowitz, Przeworski, & Foa, 2002), these results suggest that the unwanted urges to use pornography may influence pornography use, leading to ego-dystonic viewing (i.e., pornography viewing in conflict with an individual's personality and beliefs) which in turn could lead to negative outcomes (i.e., problematic viewing). A moderate positive association between sexual compulsivity and problematic pornography use was reported in a separate convenience sample of males and females (Grubbs, Exline, Pargament, Hook, & Carlisle, 2015). Other research has found that

craving for pornography was also positively and moderately related to sexual compulsivity

(Kraus & Rosenberg, 2014). These results are consistent with the notion that hypersexuality

includes elements of sexual compulsivity (e.g., Kafka, 2010).

In one study, general compulsivity was examined in relation to problematic pornography

use among males, showing a positive but weak associations (Egan & Parmar, 2013). When

investigated in a more complex model, the relationship between general compulsivity and

problematic pornography use was mediated by sexual addiction and Internet addiction, as well as

an addiction more generally (Egan & Parmar, 2013). Taken together, the associations between

compulsivity and hypersexuality and compulsivity and problematic use appear relatively weak

(Carpenter et al., 2013; Egan & Parmar, 2013).

Examining impulsivity and compulsivity with respect to hypersexuality and problematic

pornography consumption

Building on prior work (Wetterneck et al. 2002), a subsequent step is the simultaneous

examination of general compulsivity and impulsivity and how each of the constructs may relate

to problematic pornography use and hypersexuality in the case of males and females. The aims of

the present study were to examine impulsivity and compulsivity relative to hypersexuality and

problematic pornography use in order to identify possible similarities and differences in

relationship with hypersexuality and problematic pornography use in a large, non-clinical sample

and 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.

METHOD

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. Informed consent was obtained from all participants. Data collection was conducted in January 2017, via an online questionnaire that was advertised on one of the largest Hungarian news portals as a research study examining sexual activities. Only individuals aged 18 years old or older were invited to participate in the present study. Participants received detailed information about the aims of the study (i.e., investigation of sexual habits and behaviors of people), and they were assured of anonymity and confidentiality. Subsequently, the participants read and provided informed consent. Completing the questionnaire took approximately 30 minutes.

Overall, 24,372 individuals agreed to participate. However, 7282 participants quit before completing the scales used in these analyses. Four requirements were established for being included in the present analysis: (i) having watched pornography at least once in the last year, (ii) completing the hypersexuality-related scale, (iii) completing the compulsivity-related scale, and (iv) completing the impulsivity-related scale. Out of 17,090 participants, 1,602 had not watched pornography at least once in the last year; 469 did not complete the hypersexuality-related scale; 899 did not complete the compulsivity-related scale, and 342 did not complete the impulsivity-related scale. Therefore, 13,778 participants met the aforementioned criteria (female = 4,151, 30.1%; did not indicate gender = 72, 0.5%) and were aged between 18 and 76 years (M_{age} = 33.52, SD_{age} = 10.93). Regarding residency, 7,505 (54.5%) lived in the capital city, 2,133 (15.5%) in county towns, 2,881 (20.9%) in towns, and 1,259 (9.1%) in villages. Regarding level of education, 350 (2.5%) had primary school degrees or less, 541 (3.9%) had vocational degrees, 4,383 (31.8%) had high-school degrees, and 8,504 (61.7%) had higher-education degrees

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(bachelor, masters or doctoral). Regarding relational status, 3,198 were single (23.2%), 5,932

were in a relationship (43.1%), 556 were engaged (4.0%), 3,430 were married (24.9%), 384 were

divorced (2.8%), 67 were widow/widower (0.5%), and 211 indicated the 'other' option (1.5%). A

previously established question was asked to assess the sexual orientation of the participants

(Træen, Nilsen, & Stigum, 2006). Based on responses to this question, 11,388 were heterosexual

(82.7%), 1,401 were heterosexual with homosexuality to some extent (10.2%), 380 were bisexual

(2.8%), 99 were homosexual with heterosexuality to some extent (0.7%), 384 were homosexual

(2.8%), 16 were asexual (0.1%), 73 were unsure about their sexual orientation (0.5%), and 37

indicated the 'other' option (0.3%). Regarding past-year pornography use, participants watched

online pornography weekly, and reported spending 26.4 minutes per session ($SD = 20.5$).

Measures

   UPPS-P Impulsive Behavior Scale (UPPS-P). The Short UPPS-P Impulsive Behavior

Scale (Zsila, Bőthe, Demetrovics, Billieux, & Orosz, 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* (e.g., "When I am upset I often act without thinking."), *positive urgency* (e.g., "When I

am really excited, I tend not to think on the consequences of my actions."), s*ensation seeking*

(e.g., "I sometimes like doing things that are a bit frightening."), *lack of premeditation* (e.g., "I

usually think carefully before doing anything.") and *lack of perseverance* (e.g. "I generally like to

see things through to the end."). All items were scored on a four-point Likert scale (from 1 − "I

agree strongly" to 4 − "I disagree strongly"). The facets negative urgency, positive urgency and

sensation seeking include reversed items. Descriptive statistics and the internal consistencies of

the scale are shown in Table 1.

Structured Clinical Interview for DSM Disorders. The SCID-II (First et al., 1997; Szádóczky, Unoka, & Rózsa, 2004) comprises 140 items covering ten personality disorders included in DSM-IV Axis II and two personality disorders listed in the Appendix for diagnoses requiring further studies. In the present research, only the compulsivity subscale was used which assesses compulsive behavior utilizing nine true (1) or false (0) items (e.g., "Do you have trouble throwing things out because they might come in handy someday?"). Descriptive statistics and the internal consistency of the scale are shown in Table 1.

Hypersexual Behavior Inventory (HBI). The HBI (Reid et al., 2011) comprises 19 items assessing the level of hypersexual behavior across three dimensions. The *control* factor (eight items, e.g., "I engage in sexual activities that I know I will later regret.") assesses the lack of self-control in sexuality-related behaviors such as an individual's failed attempts to change their sexual behavior. The *coping* factor (seven items; e.g., "Doing something sexual helps me cope with stress.") refers to sexual behaviors as a response to emotional distress such as frustration, sadness or daily life worries. The *consequences* factor (four items, e.g., "My sexual thoughts and fantasies distract me from accomplishing important tasks.") refers to perceived consequences of sexual urges, thoughts, and behaviors such as sexual activities interfering with important tasks, studies, or work. This scale was translated on the basis of the protocol outlined by Beaton, Bombardier, Guillemin and Ferraz (2000). All items are scored on a five-point Likert scale (from 1 − "never" to 5 − "very often"). Descriptive statistics and the internal consistency of the scale are shown in Table 1.

Problematic Pornography Consumption Scale (PPCS). The PPCS (Bőthe et al., 2017) is based on a proposed six-component addictions model (Griffiths, 2005). The PPCS is an 18-item scale that assesses problematic pornography consumption using six factors with three items relating to each factor. *Tolerance* captures when increasing amounts of the activity are required to

achieve the same mood-modifying effects (e.g., "I felt that I had to watch more and more porn for satisfaction."). *Salience* refers to the relevance of pornography in an individual's life (e.g., "I felt that porn is an important part of my life."). *Mood modification* is an either arousing or relaxing subjective experience that users report as a consequence of viewing pornography (e.g., "I released my tension by watching porn."). *Conflict* includes interpersonal conflicts between problematic users and their significant others, intrapsychic conflicts (e.g., knowing the activity is generating problems but feeling difficulties in to consuming less or quitting) and occupational or educational concerns (e.g., "I felt porn caused problems in my sexual life."). *Relapse* is the tendency for returning to pornography quickly after abstinence or control (e.g., "I unsuccessfully tried to reduce the amount of porn I watch."). Lastly, *withdrawal* refers to the unpleasant feelings and emotional states that occur when the particular activity is decreased or ceased (e.g., "I became stressed when something prevented me from watching porn."). All items are scored on a seven-point Likert scale (from 1 − "never" to 7 − "very often"). Descriptive statistics and the internal consistency of the scale are shown in Table 1.

Statistical analyses

For the statistical analysis, SPSS 21 and Mplus 7.3 (Muthén & Muthén, 1998-2015) were used. Normality was assessed by the investigation of skewness and kurtosis. Reliability was assessed using Cronbach's alpha (Nunnally, 1978) in the case of continuous scales. For the one dichotomous scale used (i.e., compulsivity subscale of SCID-II), internal consistency was examined with the Kuder-Richardson Formula 20 (KR-20, Kuder & Richardson, 1937). Structural equation modeling (SEM) was used to explore the associations between impulsivity, compulsivity, hypersexuality, and problematic pornography use. Items were treated as categorical indicators, because they had significant floor effects (on the basis of kurtosis and skewness).

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Consequently, the mean- and variance-adjusted weighted least-squares estimator (WLSMV) was

applied (Finney & DiStefano, 2006). Commonly used goodness-of-fit indices (Brown, 2015;

Kline, 2011) were observed (Bentler, 1990; Brown, 2015; Browne & Cudeck, 1993; Hu &

Bentler, 1999; Schermelleh-Engel, Moosbrugger, & Müller, 2003; Tabachnick & Fidell, 2001) to

assess the acceptability of the proposed model. The analyses examined the Comparative Fit Index

(CFI; $\geq$ .95 for good, $\geq$ .90 for acceptable), the Tucker–Lewis index (TLI; $\geq$ .95 for good, $\geq$ .90

for acceptable), and the Root-Mean-Square Error of Approximation (RMSEA; $\leq$ .06 for good, $\leq$.

08 for acceptable) with a 90% confidence interval.

In the case of the SCID II compulsivity subscale and the Hypersexual Behavior Inventory

items, a parceling approach was conducted due to the fact that these latent variables were

assessed using many items. Parcels are aggregated items that were used in the present model as

assessed variables. This approach is acceptable in the case of theoretically unidimensional scales

(e.g., Bandalos & Finney, 2001; Little, Cunningham, Shahar, & Widaman, 2002; Orosz et al.,

2016), and it can minimize the issues related to non-normally distributed data (Bandalos, 2002;

Matsunaga, 2008). In the case of the SCID-II compulsivity subscale, Rogers and Schmitt's

(2004) exploratory factor analysis-based algorithm was applied in the parcel construction. For the

Hypersexuality Behavior Inventory, a facet-representative approach was employed (Little,

Rhemtulla, Gibson, & Schoemann, 2013) and each subscale (namely coping, control, and

consequences) was averaged. Consequently, three indicators were constructed.

RESULTS

Descriptive data, reliability indices, and correlations between the aspects of impulsivity,

compulsivity, hypersexuality and problematic pornography use are shown in Table 1. According

to the correlations, there were only small differences between the correlations of problematic

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pornography use, hypersexuality, and the specific aspects of impulsivity. Therefore, for the sake

of simplicity, the total score of impulsivity was used in further analyses.

By using structural equation modeling, the associations between impulsivity,

compulsivity, hypersexuality and problematic pornography use were investigated on the total

sample and in the case of males and females in separate models as well. The models with

standardized estimates are shown in Figure 1.

Table 1 about here

Figure 1 about here

In the total sample model, the fit indices were acceptable (CFI = .941, TLI = .937,

RMSEA = .055 [90% CI .054-.055]). Both impulsivity and compulsivity were related positively,

but weakly, to problematic pornography use (β = .17, p < .01 and β = .19, p < .01, respectively).

The proportion of explained variance of problematic pornography use was 6.6%. In the case of

hypersexuality, compulsivity was also positively, but weakly, related to hypersexuality (β = .19, p

< .01). However, impulsivity was positively, but moderately, related to hypersexuality (β = .37, p

< .01). The proportion of explained variance of hypersexuality was 18.1%.

In the male sample model, the fit indices were acceptable (CFI = .929, TLI = .924,

RMSEA = .059 [90% CI .058-.059]). Both impulsivity and compulsivity were related positively,

but weakly, to problematic pornography use (β = .28, p < .01 and β = .23, p < .01, respectively).

The proportion of explained variance of problematic pornography use was 13.2%. In the case of

hypersexuality, compulsivity was also positively, but weakly, related to hypersexuality (β = .21, p

< .01). However, impulsivity was positively, but moderately, related to hypersexuality (β = .41, p

< .01). The proportion of explained variance of hypersexuality was 21.7%.

In the female sample model, the fit indices were acceptable (CFI = .914, TLI = .908, RMSEA = .055 [90% CI .054-.056]). Both impulsivity and compulsivity were related positively, but weakly, to problematic pornography use (β = .26, $p < .01$ and β = .14, $p < .01$, respectively). The proportion of explained variance of problematic pornography use was 9.1%. In the case of hypersexuality, compulsivity was also positively, but weakly, related to hypersexuality (β = .16, $p < .01$). However, impulsivity was positively, but moderately, related to hypersexuality (β = .42, $p < .01$). The proportion of explained variance of hypersexuality was 21.0%.

In sum, the associations between problematic pornography use and impulsivity and compulsivity, respectively, were weak and the explained variance of problematic pornography use by impulsivity and compulsivity was relatively low (6.6-13.2%) in the total sample, as well as among males and females. In the case of hypersexuality, impulsivity had a stronger effect on hypersexual behavior than compulsivity, with hypersexuality having an explained variance of approximately 20% by impulsivity and compulsivity in the total sample, as well as among males and females.

DISCUSSION

There is a current debate regarding how best to consider problematic sexual behaviors (such as hypersexuality and problematic pornography use), with competing models proposing classifications as impulse-control disorders, obsessive-compulsive-spectrum disorders, or behavioral addictions (e.g., Griffiths, 2016; Kraus et al., 2016; Potenza et al., 2017). Relationships between transdiagnostic features of impulsivity and compulsivity and problematic sexual behaviors should inform such considerations, although both impulsivity and compulsivity have been implicated in addictions (Fineberg et al., 2014; Leeman & Potenza, 2012). The present study contributes to the ongoing debate by examining and identifying differences in the

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relationships between measures of self-reported impulsivity, compulsivity, hypersexuality, and

problematic pornography consumption.

The findings of the present study showed that impulsivity was moderately and positively

related to hypersexual behavior while compulsivity was only weakly related, suggesting that

impulsivity contributes more strongly to hypersexuality than compulsivity in both males and

females. However, impulsivity and compulsivity related only weakly to problematic pornography

use among both genders. From a statistical perspective, impulsivity and compulsivity both

positively predicted problematic pornography use, but the effect sizes were small in both cases

and the proportion of explained variance of problematic pornography use did not reach 15%,

suggesting that more emphasis should be put on other factors (e.g., social and society-related) in

research and clinical interventions in the case of problematic pornography use. On the other hand,

the finding that impulsivity related moderately to hypersexuality provides support both for the

classification of compulsive sexual behavior disorder (as proposed for ICD-11; World Health

Organization, 2017) as an impulse-control disorder or as a behavioral addiction. In considering

the other disorders currently being proposed as impulse-control disorders (e.g., intermittent

explosive disorder, pyromania, and kleptomania) and the central elements of compulsive sexual

behavior disorder and proposed disorders due to addictive behaviors (e.g., gambling and gaming

disorders), the classification of compulsive sexual behavior disorder in the latter category appears

better supported.

The findings of the present study suggest that problematic pornography use may differ

from hypersexuality more generally. As such, considering specific forms of excessive or

problematic sexual behaviors will be important because different individuals with different

temperamental features may be vulnerable to, and experience problems with, different types of

sexual behavior.

The role of the impulsivity and compulsivity in hypersexuality and problematic pornography

consumption

Impulsivity and compulsivity are among the most frequently examined personality-related factors in the case of problematic behaviors with addictive potential (e.g., Billieux et al., 2008; Davis & Carter, 2009; Deckman & DeWall, 2011; Engel et al., 2005; Leeman & Potenza, 2012; Mottram & Fleming, 2009). However, little research has examined the associations of impulsivity, compulsivity, and problematic sexual behaviors (such as hypersexuality and problematic pornography use). This small body of work reports relatively small effect sizes and inconsistent results. However, no prior study to this one has ever simultaneously investigated the relationships of impulsivity and compulsivity with hypersexuality and problematic pornography use.

Regarding pornography-use motivations (Reid et al., 2011), impulsivity was positively and moderately related to almost all motivational factors, whereas, in the case of the frequency of pornography use, a less consistent pattern was observed from positive associations to no association (e.g., Beyens et al., 2015; Caroll et al., 2008; Peter & Valkenburg, 2011). Only one study (i.e., Wetterneck et al., 2012) has investigated the association between impulsivity, compulsivity, and problematic pornography use simultaneously. Similar to the results of the present study, positive but weak associations between the variables were observed, and after dividing the sample into problematic and non-problematic users, no significant differences were found between the groups regarding levels of impulsivity. Therefore, impulsivity may not be as relevant to problematic pornography use as previously proposed (e.g., Hollander & Wong, 1995; Mick & Hollander, 2006).

In the case of hypersexuality, research has shown that impulsivity is weakly or moderately associated with hypersexual behaviors, fantasies, and urges (Pachankis et al., 2014; Reid et al., 2014; Walton et al., 2017). However, comparisons of hypersexual and non-hypersexual individuals have not shown consistent results (Miner et al., 2016; Mulhauser et al., 2014). The results of the present study corroborate the findings of Pachankis et al. (2014) and Reid et al. (2014) because the associations between impulsivity and hypersexuality are positive and moderate, suggesting that impulsivity may contribute importantly to the development and maintenance of hypersexuality.

Regarding compulsivity, associations between pornography use and sexual compulsivity have been more widely investigated than those between pornography use and general compulsivity. Not surprisingly, when sexual compulsivity was assessed in relation to pornography viewing (e.g., Grubbs et al., 2015; Twohig et al., 2009; Wetterneck et al., 2012), the association was moderate and positive. Several possible reasons for this relationship have been proposed. First, context-specific compulsivity may be expected to be more strongly related to problematic pornography use than context-free (i.e., general) compulsivity. Second, hypersexuality by definition may include sexual compulsivity (e.g., Kafka, 2010). However, when general compulsivity has been assessed as an antecedent of problematic pornography use, similar to the results of the present study, positive but weak associations were observed (Egan & Parmar, 2013). Previously, general compulsivity or obsessiveness was only weakly related or unrelated to hypersexuality (e.g., Carpenter et al., 2013; Reid & Carpenter, 2009). In the present study, similar relationships were observed because general compulsivity (from a statistical perspective) significantly predicted hypersexuality, but the effect size was low.

In the present study, the five-facet model of impulsivity (Billieux et al., 2012; Lynam, et al., 2006) was examined in relation to problematic pornography use and hypersexuality. The five

facets—namely negative and positive urgency, lack of premeditation, lack of perseverance and

sensation-seeking—were generally positively but weakly related to problematic pornography use

and positively and moderately to hypersexuality, demonstrating a consistent relationship pattern

between the aspects of impulsivity and problematic pornography use and hypersexuality.

Therefore, the total score of impulsivity was used as a statistical predictor of problematic

pornography use and hypersexuality. As expected, impulsivity was positively associated with

problematic pornography use and hypersexuality. However, the extent of the association between

impulsivity and problematic pornography use was rather small.

Possible explanations for the weak associations between impulsivity, compulsivity and

problematic pornography use

Several factors may explain why impulsivity and compulsivity only weakly statistically

predicted the level of problematic pornography use while hypersexuality was moderately

statistically predicted by impulsivity. It is possible that impulsivity and compulsivity do not have

a strong direct impact on problematic pornography use, but have stronger effects via mediating

variables. In the case of impulsivity, Reid et al. (2011) found that impulsivity had positive

moderate associations with all four motivations of pornography use. From their four motivational

factors, emotional avoidance had the strongest relationship with impulsivity, with excitement-

seeking being the second strongest and sexual pleasure being the third strongest, whereas sexual

curiosity had the weakest relationship with impulsivity. Based on these results, emotional

avoidance motivation may represent a mediator between impulsivity and problematic

pornography use, although direct investigation of this possibility is needed to confirm the

hypothesis.

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Moreover, the frequency of pornography use may also serve as a potential mediator between impulsivity and problematic pornography use. For males, impulsivity has been found to be positively related to the frequency of pornography viewing, while for females, it was not related (Caroll et al., 2008). As males tend to have higher levels of impulsivity (e.g., Chapple & Johnson, 2007; Cross, Copping, & Campbell, 2011; Waldeck & Miller, 1997), it could be hypothesized that this elevated level of impulsivity may lead to an increased frequency of pornography use which in turn may lead to problematic pornography use (e.g., Brand et al., 2011; Grubbs et al., 2015; Twohig et al., 2009). For females, impulsivity was not related to the frequency of pornography use (Caroll et al., 2008); therefore, it could be assumed that their impulsivity may not reflect in the frequency of pornography leading to problematic pornography use, but problematic pornography use could develop via different pathways (e.g., Lewczuk, Szmyd, Skorko, & Gola, 2017). In Egan and Parmar's (2013) study, the association between compulsivity and problematic pornography use was mediated by sexual addiction, Internet addiction, and addiction more generally. Therefore, a similar mediational pattern could be hypothesized regarding the association between compulsivity and hypersexuality.

Likewise, self-efficacy may also mediate possible relationships between impulsivity, compulsivity, and problematic pornography use. In previous studies (e.g., Kraus, Rosenberg, & Tompsett; 2015; Kraus, Rosenberg, Martino, Nich, & Potenza; 2017), self-efficacy in reducing pornography use and self-efficacy in avoiding possibly tempting situations were identified as important factors in reducing problematic pornography use. Therefore, one might hypothesize that people with high levels of impulsivity or compulsivity may control their urges because of their high level of self-efficacy to avoid tempting situations which in turn may result in lower levels of problematic pornography use.

Nevertheless, it is possible that levels of impulsivity and compulsivity in relationships with problematic sexual behaviors (such as problematic pornography use and hypersexuality) have been overestimated. According to a number of scholars (e.g., Conway, Kane, Ball, Poling, & Rounsaville, 2003; Griffiths, 2017; Kerr, 1996; Szalavitz, 2016), no single personality trait or set of traits may lead to problematic behaviors or addictions. The three 'cornerstones' of online pornography use (anonymity, affordability, and accessibility) may create situations that facilitate the increased use of pornography, and these may also contribute to the development of problematic pornography use. The careful, experimental examination of these 'cornerstones' may significantly contribute to the understanding of problematic pornography use. Furthermore, situation-related factors that may affect individuals in a given life stage, such as loneliness (e.g., Bozoglan, Demirer, & Sahin, 2013; Ceyhan & Ceyhan, 2008) or perceived stress (e.g., Grubbs et al., 2015; Levin et al., 2012; Paul & Shim, 2008; Reid et al., 2011) may also influence the level of addictive online behaviors such as problematic pornography use. Finally, it should also be noted that societal factors such as regulations and policies that may influence the accessibility, affordability, and anonymity of pornography may in turn promote or hinder the emergence of those specific situations in which (problematic or non-problematic) pornography use may have significant psychosocial impacts.

Future studies and limitations

Further measures are needed in future studies that may directly assess respondents' behaviors while respecting individuals' privacy. The extent of problematic pornography consumption and the level of hypersexuality may be temporally stable or it may change over time. It is possible that an individual may temporarily use pornography more intensively or in a more problematic manner, but later this behavior may again change. Therefore, longitudinal

studies are needed to answer the question of stability. Future experimental studies with well-

established designs are needed in order to determine a potentially causal role of individual

differences and situational factors in the development and maintenance of hypersexuality and

problematic pornography use, such as sex mindset beliefs (Bőthe, Tóth-Király, Demetrovics, &

Orosz, 2017), reward deficiency syndrome (Comings & Blum, 2000, Lochner et al., 2005),

perceived stress (Grubbs, Volk, Exline, & Pargament, 2015), or basic psychological needs (Tóth-

Király, Morin, Bőthe, Orosz, & Rigó, 2017). Finally, it should be kept in mind that the outcomes

studied in the present study only pertain to specific problematic aspects of sexuality (i.e.,

problematic online pornography use and hypersexuality). Developing measures that can assess

non-problematic aspects of pornography use may be useful in further research. Stronger

cooperation between pornography websites—which may provide behavioral data—and the

scientific community may be beneficial in providing predictive validity of related measures.

Future studies should focus on preventions and interventions that emphasize not only self-

reported individual differences, but also social and situational factors related to the development

and maintenance of problematic sexual behaviors.

Some limitations of the present study should also be noted. The use of self-report cross-

sectional methods have possible biases that need be considered when interpreting the findings.

Moreover, causality cannot be inferred from the present cross-sectional findings. The internal

consistency of the compulsivity subscale of the SCID-II was not adequate, therefore, it is possible

that the low level of internal consistency may have distorted the findings. Additionally, self-

reported compulsivity was assessed via SCID-II methods. Other assessments of compulsivity

(e.g., via the Padua Inventory or other assessments – Andrews et al., 2011; Schrerrer et al., 2015)

may have yielded different results. Similar concerns exist regarding the UPPS and other self-

report measures of impulsivity. Additionally, because self-report measures differ with behavioral

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measures of constructs (e.g., Krishnan-Sarin et al., 2007), it is important for future studies to

investigate both behavioral and self-report measures related to hypothesized predictors of the

given behavior (e.g., using the Cued Go/No-Go Task [Fillmore, 2003] or the Stop Signal Task

[Logan, 1994] with a self-reported measure in the case of impulsivity – Ding et al., 2014). It will

also be important to concurrently assess the behavior itself (e.g., actual amount of pornography

use employing tracking-data approaches in collaboration with pornography-site operators as has

been done in other fields such as gambling – Griffiths [2014]).

CONCLUSION AND IMPLICATIONS

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. Furthermore, these results have several conceptual and

research implications. First, several issues arise regarding the categorization of problematic

pornography use. One issue is whether problematic pornography use may be considered as a

subcategory of hypersexuality if relationships with impulsivity and compulsivity are not as strong

as previously hypothesized. A second issue—which may be related to the categorization of

problematic pornography use under the umbrella of hypersexuality—is how best problematic

pornography use (and especially problematic online pornography use) may best be categorized

(Griffiths, 2016; Kraus et al., 2016; Potenza et al., 2017).

From a research perspective, self-reported tendencies may have a stronger impact on

problematic sexual behaviors via mediating variables such as motivations, the frequency and time

spent with the activity, frustration relating to psychological needs, beliefs about the malleability

of the given activities or topic-relevant self-efficacy beliefs and/or other factors. All of these

possibilities warrant direct examination. Moreover, it is important to consider the complex

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etiologies of addictions. More specifically, it is likely that a complex set of personality, other

individual difference factors, and social and situational factors lead to the development and

maintenance of problematic sexual behaviors, and that these may vary according to the type of

problematic sexual behavior. Additional research is needed to understand factors related to

specific problematic sexual behaviors and translate the factors into improved prevention,

treatment, and policy initiatives.

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Table 1

Descriptive statistics, reliability indices and correlations between the aspects of impulsivity, compulsivity, hypersexuality and problematic

pornography use

Scales	Skewness (SD)	Kurtosis (SD)	Range	M (SD)	α	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[a]	.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; α = Cronbach's alpha; M = mean; SD = standard deviation; [a] = Internal

consistency was examined by assessment of the Kuder-Richardson Formula 20 (KR-20) for this dichotomous scale.

*p < .001

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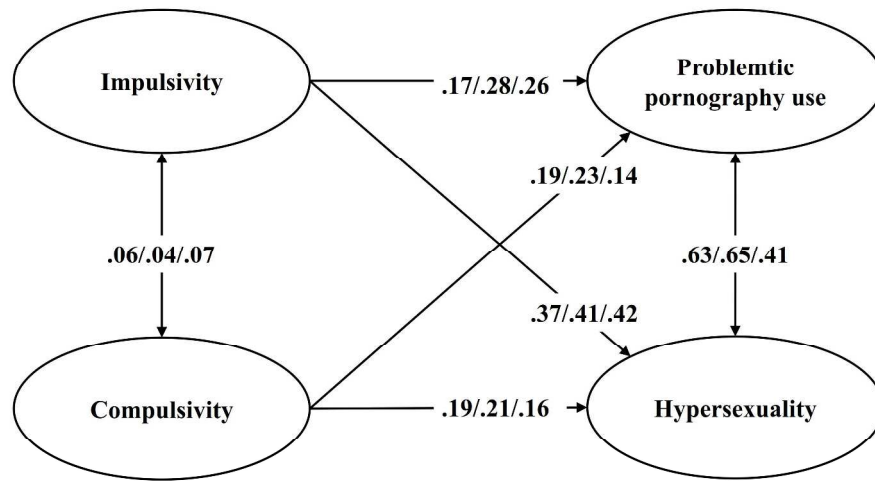12
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Figure 1
The impulsivity and compulsivity background of hypersexuality and problematic pornography use (Ntotal = 13,778; Nmales = 9,555; Nfemales = 4,151)
Note. All variables presented in ellipses are latent variables. For the sake of clarity, indicator 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 $p < .01$.

304x171mm (300 x 300 DPI)