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ORIGINAL PAPER

Roles of Religiosity, Obsessive–Compulsive Symptoms, Scrupulosity, and Shame in Self-Perceived Pornography Addiction: A Preregistered Study

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Abstract
This study examined the roles of religiosity, shame, obsessive–compulsive symptoms, and scrupulosity in perceived pornography addiction. We theorized that religiosity causes pornography users to feel shame regarding their use, and in turn, self-identify as addicted to pornography, especially for individuals high on one of several proposed moderators. Participants were 645–646 pornography users who believe in a theistic God. Confirmatory analyses indicated that religious primes did not have indirect or moderated indirect effects on perceived addiction. However, exploratory analyses revealed that religious primes were associated with higher shame, and in turn, perceived addiction among individuals high on both organizational religiosity and Obsessive-Compulsive Disorder compulsivity subscales. Additionally, self-reported religiosity had indirect effects on perceived addiction via shame, especially among individuals high on scrupulosity or moral disapproval of pornography.

Keywords Pornography addiction · Religiosity · Obsessive–compulsive disorder · Scrupulosity

Introduction

Pornography use is common in the U.S. and other developed countries. For example, a nationally representative sample indicates that in the U.S. 45% of men and 16% of women aged 18–39 view pornography in a given week (Regnerus, Gordon, & Price, 2016). Although most pornography users have no problems controlling their use, some individuals report difficulty managing their viewing habits. In fact, among those who have viewed pornography, 11% of men and 3% of women at least "somewhat agree" that they are addicted to pornography (Grubbs, Grant, & Engelman, 2019a; Grubbs, Kraus, & Perry, 2019b; Grubbs, Perry, Wilt, & Reid, 2009c). However, there is no consensus on whether pornography addiction is a valid diagnostic concept (de Alarcón, de la Iglesia, Casado, & Montejo, 2019).

Among some pornography users, perceptions of addiction may arise from awareness that pornography conflicts with deeply held religious values (Grubbs et al., 2019a, b,c). However, evidence for this relies on correlational data, precluding stronger conclusions that moral conflict causes perceptions of addiction. Moreover, although Grubbs et al. (2019a, b, c) have speculated that shame plays a role in how moral incongruence fosters perceived addiction, evidence for this is sparse. In this study, we used religious primes to induce moral conflict among pornography users. Our preregistered hypotheses were that religious primes would be associated with heightened shame regarding pornography use, and in turn, increased self-perceived addiction, and that these associations would be strongest for individuals high on obsessing or scrupulosity (among other possible moderators; see Fig. 1).

Pornography, Well-Being, and Hypersexuality

How pornography impacts well-being is poorly understood. Recent metanalyses find that pornography use is negatively associated with relationship and sexual satisfaction (Perry, 2020; Wright, Tokunaga, Kraus, & Klann, 2017). On the other hand, many pornography users report numerous benefits to their lives and romantic relationships (e.g., Kohut, Fisher, & Campbell, 2017). Several issues might underlie these disparate

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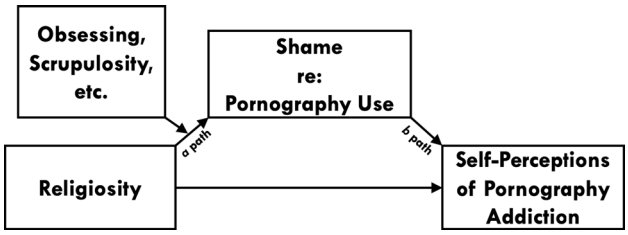

Fig. 1 Theorized model by which religiosity impacts self-perceptions of pornography addiction via shame, moderated by obsessing, scrupulosity, etc.

findings. First, pornography research suffers from overreliance on cross-sectional data (precluding causal conclusions), assumptions of harm, lack of theory, and measurement problems (Campbell & Kohut, 2017; Kohut et al., 2020). Second, overreliance on bivariate correlations obscures possible roles of moderators. As examples, moderators of associations between pornography use and well-being include patterns of pornography use (e.g., solo or with partner; Kohut, Balzarini, Fisher, & Campbell, 2018), open communication about use (Gautreau, 2016), motives for use (Bőthe et al., 2020), pornography literacy (Vandenbosch & van Oosten, 2017), and the gender of the user or the user's partner (Vaillancourt-Morel et al., 2020).

Some researchers believe that harm from pornography is exacerbated by hypersexuality, an umbrella term describing frequent sexual behavior (e.g., pornography use, masturbation, partnered sex) that impairs daily functioning. However, conceptualizations of hypersexuality are controversial and rife with conflicting explanatory frameworks (de Alarcón et al., 2019; Walton, Cantor, Bhullar, & Lykins, 2017). For example, hypersexual disorder had been proposed as an atheoretical diagnosis describing recurrent, intense, and out-of-control sexual urges or behaviors that impair functioning (Kafka, 2010) but was excluded from the DSM-5 due to insufficient evidence (Piquet-Pessôa, Ferreira, Melca, & Fontenelle, 2014). A second framework, the sexual compulsivity model, describes how reduction in anxiety motivates hypersexuality, and despite temporary relief, the behavior fosters further distress (Coleman, 1990; Miner, Coleman, Center, Ross, & Rosser, 2007). A third framework, the impulse control model, emphasizes repeated failure resisting sexual impulses leading to repetitive sexual behavior and impaired functioning (Kraus et al., 2018). The diagnosis of compulsive sexual behavior disorder, included in the forthcoming ICD-11, falls under this framework; distress due to moral disapproval of sexual behaviors precludes this diagnosis (Briken, 2020; World Health Organization, 2019).

The most controversial framework is the addiction model, suggesting that hypersexuality is a behavioral, non-substance addiction, similar to gambling addiction (Rosenberg, O'Connor, & Carnes, 2014). This model describes craving sexual gratification to sooth distress, tolerance, escalation, continued behavior despite consequences, and withdrawal symptoms, and proponents posit that altered neurophysiology and reward circuitry underpin sexual addiction (Black, 2013; Voon et al., 2014). The addiction model has been criticized mainly due to scarcity of supporting evidence (e.g., Kraus, Voon, & Potenza, 2016; Prause, Janssen, Georgiadis, Finn, & Pfaus, 2017). Some neurobiological evidence points to similarities between hypersexuality and addictions, but cross-sectional designs, small samples, and overreliance on Christian and Western samples prevents strong conclusions (Grubbs et al., 2019a, b, c; Kraus et al., 2016). Additionally, there is little evidence that hypersexuality entails tolerance and withdrawal states (e.g., Reid, 2016; but see Bőthe et al., 2020) or is distinguishable from traits such as high sex drive or sensation seeking (Fisher, Montgomery-Graham, & Kohut, 2019; Reid, 2016).

The Moral Incongruence Model of Self-Identification as a Pornography Addict

Grubbs et al. (2019c) proposed a model delineating two paths leading to perceived pornography addiction. One path describes how perceived addiction arises from awareness pornography use that is actually dysregulated. The second path, and the focus of Grubbs and colleagues' model, describes how perceived addiction may be due to moral incongruence, which Grubbs et al. define as "the experience of engaging in activities that violate one's deeply held moral values." Although moral incongruence regarding pornography may be due to various factors, religiosity might be a particularly powerful contributor. Most religions teach that sexual behavior and even sexual desire should be limited to specific contexts—usually partnered sex in the context of heterosexual monogamous marriage. Growing evidence supports Grubbs' model. Among pornography users, perceived addiction is strongly associated with moral disapproval of pornography but weakly associated with time spent using pornography (Grubbs, Wilt, Exline, Pargament, & Kraus, 2018). Additionally, religiosity is associated with moral disapproval, and in turn, perceived addiction, even after controlling for actual pornography use (Grubbs et al., 2015a, b), suggesting that for some users, perceived addiction is a function of moral conflict and less a reflection of actual dysregulation. However, to the best of our knowledge, past research supporting Grubbs' model relies solely on non-experimental and survey methods, which preclude strong conclusions that moral incongruence is a cause of perceived addiction (although several longitudinal studies support the model, e.g., Grubbs, Kraus, Perry, Lewczuk, & Gola, 2020). As suggested by Fisher et al. (2019), assessing whether experimental manipulation of moral views of pornography impacts perceived addiction would shed light on the merit of Grubbs' theory, which was the goal of the current study.

Cognitive Dissonance and Shame

In line with classical cognitive dissonance theory (Festinger, 1957; Harmon-Jones & Mills, 2019), we theorized that

awareness that that one's pornography use conflicts with one's own moral beliefs leads to dissonance discomfort. In turn, just as smokers learning their habit is unhealthy might reduce dissonance by adding the consonant cognition that smoking reduces stress (Festinger, 1957), pornography users might reduce dissonance by adding the consonant cognition of identifying as an addict. Identifying as addicted may function to shift blame from perceived moral failings toward a mental health condition, present strategies for treatment, and garner social support (e.g., from support forums).

Shame, regret, and guilt may be particularly powerful motivators of cognitive change (Cooper & Fazio, 1984). For example, shame, a painful emotion accompanied by a sense of worthlessness and the desire to disappear (Frijda, 2007), functions as a barometer of meeting internalized moral standards (Tangney, Stuewig, & Mashek, 2007). Accordingly, we theorized that, among pornography users who feel morally conflicted, shame, regret, and guilt motivate the cognitive change of identifying as addicted. In support of this, Yousaf and Gobet (2013) found that making religious participants advocate for morally incongruent behaviors induced feelings of hypocrisy, and in turn, shame and guilt. Accordingly, we hypothesized that, among pornography users, experimentally induced salience of religiosity would be associated with increased shame, guilt, and regret regarding pornography use, and in turn, identification as a pornography addict (see Fig. 1).

Possible Moderators of the Effect of Religiosity on Shame

Religiosity may increase the effect of religious primes on shame. Many organizations involved in the anti-pornography movement or helping pornography addicts are religious (Thomas, 2013). In contrast, non-religious individuals may have no beliefs susceptible to activation by religious primes. In fact, a metanalysis indicated that religious primes do not have significant effects on non-religious participants (Shariff, Willard, Andersen, & Norenzayan, 2016). Accordingly, we hypothesized that engagement in formal religious activities such as attending church ("organizational religiosity"; Koenig & Büssing, 2010) would strengthen associations between the religious primes and shame, and in turn, perceived addiction.

Obsessive–compulsive symptoms may also increase the impact of religious primes on shame among pornography users. Obsessive–compulsive disorder (OCD) is an anxiety disorder characterized by repetitive intrusive thoughts or impulses (i.e., obsessions) and ritualistic behaviors aimed at neutralizing distress (i.e., compulsions; American Psychiatric Association, 2013). Several theories propose that OCD fosters hypersexuality (Coleman, 1990; Montgomery-Graham, 2017). However, typical manifestations of hypersexuality are inconsistent with DSM-5 criteria that compulsions are rule-based (Walton et al., 2017) and not pleasurable (Montgomery-Graham, 2017). Despite questions over whether compulsivity motivates actual hypersexuality, we theorized that obsessing may foster perceptions of hypersexuality, regardless of how often an individual uses pornography.

Among individuals with OCD, sexual and religious obsessions are common and often co-occur (Grant et al., 2006). Sexual obsessions involve thoughts or impulses that are perceived as immoral or perverse and may entail thoughts of sex with friends, family, or children, or sexual violence (Gordon, 2002). Religious obsessions, also known as scrupulosity, are characterized by fear of sin, Hell, or God's punishment (Olatunji, Abramowitz, Williams, Connolly, & Lohr, 2007) and have been found to be associated with perceived pornography addiction (e.g., Borgogna & McDermott, 2018). However, intrusive sexual thoughts, even with themes of victimization, are common in the general population (e.g., Byers, Purdon, & Clark, 1998). Whereas most people easily dismiss unwanted thoughts, individuals with obsessions believe these thoughts are highly significant and must be controlled. Additionally, because obsessive individuals consider these thoughts immoral, obsessions often trigger shame (Weingarden & Renshaw, 2015). Thus, we theorized that obsessive symptoms may predispose pornography users to identify as addicts, not because their use is actually dysregulated, but because they believe their sexual thoughts (which may be very common) are immoral and necessary to control. Accordingly, pornography users high on obsessing or scrupulosity might be especially likely to respond to religious primes with heightened shame, and in turn, perceived addiction.

We also hypothesized that several other variables might strengthen associations between the religious primes and shame regarding pornography use: intrinsic religiosity (i.e., internalized religiosity; Koenig & Büssing, 2010), duration and frequency of pornography use, or moral disapproval of pornography (Grubbs et al., 2015a, b).

The Current Study

To assess the causal effects of religiosity on perceived pornography addiction, we used explicit religious priming (Bargh, Chen, & Burrows, 1996; Shariff et al., 2016). The "religious" prime condition asked participants to describe the roles religion and God play in their life. The "religious/sex" prime sought to evoke traditional scriptural prohibitions regarding the presumed sex-related societal ills associated with pornography within some religious circles (Thomas, 2013). The neutral prime asked participants to describe their favorite season (Inzlicht & Tullett, 2010). Because we theorized that shame due to moral incongruence motivates the consonant cognition of self-identification as addicted, our preregistered outcome variable was the perceived compulsivity subscale of the Cyber Pornography Use Inventory (CPUI-9; Grubbs et al., 2015a, b) which assesses the cognitive component of perceived addiction ("I believe I am addicted to

Internet pornography") and dysregulated use ("I feel unable to stop my use of online pornography") in a face-valid manner.

Confirmatory hypotheses were that (a) two religious primes, compared to a neutral prime, would be associated with greater shame regarding pornography use, and in turn, increased perceived pornography addiction (i.e., simple mediation); (b) variables such as organizational religiosity, obsessions, and scrupulosity would strengthen associations between prime condition and shame, and in turn, perceived addiction (i.e., moderated mediation). In exploratory analyses (i.e., not preregistered), we tested higher-order interactions between the moderators (i.e., moderated–moderated mediation) and associations with self-reported religiosity.

Method

Confirmatory hypotheses were preregistered prior to hypothesis testing (https://aspredicted.org/fh5dc.pdf). We report how we determined our sample size, all data exclusions, all manipulations, and all measures in the study (Simmons, Nelson, & Simonsohn, 2012). See the Online Supplement for deviations from preregistration and additional information and tables (denoted as Table S1, etc.).

A Monte Carlo simulation using the R package bmem (Zhang, 2014) indicated that 275 participants would achieve 80% power, assuming small–medium associations (Cohen, 1998). In light of recent calls for greater power in psychological research (e.g., LeBel, Campbell, & Loving, 2017), we recruited a larger sample and until our preregistered cutoff date.

Participants

We recruited from online venues such as hanover.edu/psychexperiments, our undergraduate pool, Tumblrs, and Reddit.com. Participants were required to be 18 or older and to have used online pornography in the past 6 months. Hypothesis tests were conducted on 646 participants who identified as theists (i.e., belief that "there is one God that created the universe and observes and intervenes in human affairs"). These 646 participants reported being a man (63.0%), woman (36.5%), or "other" (0.5%); heterosexual/straight (77.7%), bisexual (9.8%), gay/lesbian (6.2%), pansexual (2.6%), asexual (1.2%) or "other" (2.3%); married or common law (17.6%), engaged (2.3%), dating (32.0%), single and not dating (46.9%); White (78.6%), Asian (6.8%), Black or African-American (10.7%), American Indian or Alaskan Native (2.6%), or "other" (8.2%). Participants reported having a BS/BA (18.1%) or graduate degree (26.6%), a high school diploma (29.7%), some college, trade school, or an AA/AS degree (42.3%), or no high school diploma (1.2%). Religious affiliations were Christian (83.6%), Muslim (3.7%), Buddhist (1.4%), Jewish (1.4%), Hindu (0.5%), or none (6.7%). Mean age was 24.9 years ($SD = 9.5$, range, 18–69). Participants reported using online pornography an average of 15.6 times/month ($SD = 19.5$, range, 0–200), and for an average of 28.5 min on a typical day ($SD = 34.4$, range, 0–360).

Procedure

Materials and method were approved by our university's Institutional Review Board. Recruitment ads contained a link to the online survey, described as a "Study of Religiosity and Attitudes Towards Pornography." Participants provided informed consent and demographic information, reported their pornography use, were randomly assigned to one of three priming tasks, and completed measures of emotions regarding pornography use, perceived pornography addiction, moral disapproval of pornography, scrupulosity, OCD symptoms, religiosity, theism, religious affiliation, and a funnel debriefing, in that order. Last, participants were invited to email the researchers to enter into a draw for one of five $20 Amazon.com gift cards, ensuring data anonymity.

Measures and Materials

Unless otherwise noted, continuous measures were computed as means of items; higher scores indicated higher levels of the construct.

Pornography Use

Three items were written for this study. One item, used for inclusion purposes only, asked "When was the last time you intentionally viewed online pornography?" (*In the past day* to *In the past 10 months*, with monthly increments). Two items comprised our continuous measure of pornography use: "How many times per month do you use online pornography, on average?" and "Approximately how much time [in minutes] do you spend using online pornography on the typical day?" Correlation between these items was $r = .40$. Pornography was defined as "erotic or sexually explicit films, video clips, or pictures that intend to sexually arouse the viewer." Participants were asked to report on their use when alone, not with a partner.

Priming Tasks

Participants were randomly assigned to one of three priming conditions. Instructions for the neutral prime read:

> Please describe your favorite season.

Instructions for the religious prime read:

> Please describe the role that religion and God play in your life.

Instructions for the religious/sex prime read:

> Please take a moment to think of the religion that you are MOST familiar with. Please describe that religion's perspectives on sex in terms of lust, pornography and masturbation, or sex outside of marriage (e.g., sex with someone who you are not married to, or adultery). Please also describe whether, according to that religious perspective, any of those things are sinful, and why they're sinful.

For all conditions, instructions began with "One of the goals of this study is to better understand how people think about different topics," and ended with, "When answering, please write at least four sentences."

Emotions Regarding Pornography Use

Participants were presented with six emotions and were asked to respond in terms of "how much you feel these emotions, right now, at this present moment, when you think about your pornography use." The negative emotions, which are the focus of subsequent analyses, were selected from a previous study of emotional reactions to sexual behavior that found them to correlate highly (de Jong, Adams, & Reis, 2018). The items were presented in the following order: satisfaction, shame, enjoyment, regret, happy, guilt (1 = Not at all to 7 = An Extreme Amount). Principal axis factoring indicated that shame had the highest loading on the negative emotion factor onto which all three negative emotions fell. For the negative emotion scale, which we will refer to as shame, Cronbach's $\alpha = 0.96$.

Perceived Pornography Addiction

The Cyber Pornography Use Inventory (CPUI-9; Grubbs et al., 2015a, b) comprises three 3-item subscales. Perceived compulsivity, our preregistered outcome variable, assesses beliefs that one's pornography use reflects an addiction and is out-of-control, for example, "I believe I am addicted to Internet pornography." Access Efforts reflects prioritization of pornography use over other obligations, e.g., "I have put off important priorities to view pornography." Distress assesses feeling ashamed, depressed, and sick after viewing pornography, e.g., "I feel ashamed after viewing pornography online" (1 = Not at all to 7 = Extremely). Cronbach's αs = 0.92, 0.79, and 0.86, respectively.

Moral Disapproval

Moral disapproval was assessed with four items from Grubbs et al. (2015a, b): e.g., "Viewing pornography online troubles my conscience" (1 = Not at all to 7 = Extremely). Cronbach's $\alpha = 0.92$.

Scrupulosity

The Penn Inventory of Scrupulosity (PIOS-R; Olatunji et al., 2007) assesses two domains of religious obsessions, Fear of God (5 items, e.g., "I am afraid my thoughts are unacceptable to God") and Fear of Sin (10 items, e.g., "I am afraid of having immoral thoughts," 0 = Never to 4 = Constantly). Cronbach's αs, respectively, 0.91 and 0.92.

Obsessive–Compulsive Symptoms

The Obsessive–Compulsive Inventory (OCI-R; Foa et al., 2002) comprises six 3-item subscales: Obsessing (e.g., "I find it difficult to control my own thoughts," $\alpha = 0.81$), Washing (e.g., "I wash my hands more often and longer than necessary," Cronbach's $\alpha = 0.75$), Hoarding (e.g., "I collect things I don't need," $\alpha = 0.71$), Ordering (e.g., "I get upset if objects are not arranged properly," $\alpha = 0.83$), Checking (e.g., "I check things more often than necessary," $\alpha = 0.68$), and Neutralizing (e.g., "I feel compelled to count while I am doing things," 0 = Not at All to 4 = Extremely, $\alpha = 0.74$).

Religiosity

The Duke University Religion Index (DUREL; Koenig & Büssing, 2010) comprises three subscales. The single item assessing organizational religiosity asks, "How often do you attend church or other religious meetings?" (1 = Never to 6 = More than Once/Week). The single item assessing non-organizational religiosity asks, "How often do you spend time in private religious activity, such as prayer, meditation, or Bible study?" (1 = Rarely or Never to 6 = More than Once a Day). Three items assess intrinsic religiosity, e.g., "In my life, I experience the presence of the Divine (e.g., God)," 1 = Definitely Not True to 5 = Definitely True, Cronbach's $\alpha = 0.86$.

Theism

To assess the inclusion criterion of being a theist (indicated by the first response option below), participants were asked, "What type of God you believe in, if any?" Response options were, modified from Inzlicht and Tullett (2010):

> There is one God that created the universe and observes and intervenes in human affairs.
> There is a God or Gods, but that God(s) does not observe and intervene in human affairs.
> A pantheistic God, where God is synonymous with nature or the unknown.

I don't believe in any kind of God.

Analytic Strategy

Hypotheses tested with PROCESS v3.0 (Hayes, 2017) and SPSS 20.0.0. As per Hayes, indirect effects are significant if the bootstrap confidence interval excludes zero; moderated mediation (or moderated-moderated mediation) is significant if the bootstrap confidence interval for the respective index excludes zero (Hayes, 2017); we report partially standardized effect sizes (β_{ps}) for indirect effects of categorical antecedents, and fully standardized betas (β_{fs}) for other results. Continuous variables were Winsorized to not exceed 3 *SD* from the mean, which had no effect on whether any confidence intervals included zero.

Results

Preliminary Analyses

We tested whether prime condition was associated with shame, the pornography addiction subscales, or any of the continuous measures that followed the primes, without considering any indirect effects or interactions. One-way ANOVAs indicated that none of these associations were significant, *p*s = .14–0.88 (see Table S1).

Tables S2 and S3 present means, standard deviations, and bivariate Pearson correlations for key variables. Although we had no a priori hypotheses about gender differences, men were significantly higher on pornography use, shame, the three CPUI-9 subscales, moral disapproval, fear of sin, and organizational and non-organizational religiosity, and lower on ordering and neutralizing.

Perceived compulsivity was positively and significantly correlated with shame, moral disapproval, fear of sin, fear of God, obsessing, hoarding, checking, and the three religiosity subscales. The three CPUI-9 subscales were positively and significantly correlated.

Confirmatory Analyses

A simple mediation analysis (condition → shame → perceived compulsivity) indicated that neither the religious prime nor the religious/sex prime, relative to the neutral prime, had significant indirect effects on perceived compulsivity via shame. For the indirect effect of the religious prime vs. neutral, $B = 0.086$, $SE = 0.066$, 95% CI [-0.043, 0.216], $\beta_{ps} = 0.053$; for the religious/sex prime vs. neutral, $B = 0.060$, $SE = 0.069$, 95% CI [-0.076, 0.195], $\beta_{ps} = 0.037$ (*N*s = 646).

We tested whether the *a* path (condition → shame) of the mediation model (condition → shame → perceived compulsivity) was strengthened by any of the preregistered moderators: obsessing, organizational or intrinsic religiosity, moral disapproval, fear of sin, fear of God, or pornography use. None of these moderated-mediation results were significant (see Table 1). In sum, none of our preregistered hypotheses were supported.

Exploratory Tests of Indirect Effects of Religious Primes on Perceived Addiction

In exploring the lack of support for our confirmatory hypotheses, we found that prime condition did not have significant indirect effects on any of the CPUI-9 subscales, even when indirect effects were conditional on the proposed moderators described in our preregistration, the other OCD subscales, or gender. None of these simple indirect effects or moderated indirect effects were significant when the sample included Christians only, nor when controlling for pornography use.

Although we had preregistered hypotheses that the proposed moderators would strengthen the indirect effects of the religious primes on perceived compulsivity, we did not preregister the possibility of higher-order interactions. Accordingly, we assessed all possible three-way interactions (i.e., moderated-moderated mediation) between condition, the moderators specified in our preregistration, the other OCD subscales, and gender (13 moderators paired together = 78 models).[1] Among these tests, there were five cases of significant moderated–moderated mediation. In all five cases, either the religious or the religious/sex prime, relative to the neutral prime, was associated with increased shame, and in turn, perceived compulsivity, but only for individuals who were high on both organizational religiosity and OCD compulsivity symptoms. Next, we describe these five cases of significant moderated–moderated mediation. See Tables S4–S8 for conditional indirect effects at low and high levels of the moderators, noting that the conditional indirect effects were significant only at high levels of both moderators. Table 2 summarizes the conditional indirect effects at high levels of both moderators.

Effect of the Primes, Moderated by Organizational Religiosity and Washing

The religious prime, relative to the neutral prime, was associated with increased shame regarding one's pornography use, but only among individuals who were high on both organizational religiosity and washing; in turn, increased shame was associated with greater perceived compulsivity (see Tables 2

[1] Only one OCD subscale was entered per model due to collinearity and construct overlap. None of the three-way interactions with gender or pornography use were significant. Controlling for pornography use did not change the significance of these tests.

Table 1 Tests of moderation of the indirect effects of the two religious primes vs. the neutral prime on perceived compulsivity

Moderator	Index of moderated mediation	*SE*	95% CI	
			Lower	Upper
Religious vs. neutral prime				
Obsessing	−0.041	0.066	−0.017	0.090
Organizational religiosity	0.050	0.040	−0.028	0.129
Intrinsic religiosity	0.066	0.052	−0.035	0.172
Moral disapproval	−0.003	0.017	−0.036	0.031
Fear of Sin	−0.009	0.052	−0.114	0.094
Fear of God	0.083	0.049	−0.013	0.177
Pornography use	0.007	0.113	−0.220	0.233
Religious/sex vs. neutral prime				
Obsessing	−0.005	0.075	−0.148	0.152
Organizational religiosity	0.054	0.041	−0.026	0.134
Intrinsic religiosity	0.034	0.055	−0.070	0.143
Moral disapproval	0.016	0.017	−0.019	0.050
Fear of Sin	−0.013	0.050	−0.111	0.082
Fear of God	0.035	0.052	−0.069	0.137
Pornography use	0.057	0.109	−0.279	0.159

SE = bootstrap standard error. CI = bootstrap confidence interval for the index of moderated mediation. *N* = 645–646

and S4). This interaction was also significant when predicting access efforts and distress.

Effect of the Primes, Moderated by Organizational Religiosity and Hoarding

The religious prime, relative to neutral, was associated with increased shame, but only among individuals who were high on both organizational religiosity and hoarding; in turn, increased shame was associated with greater perceived compulsivity (see Tables 2 and S5). This interaction was also significant when predicting access efforts and distress.

Effect of the Primes, Moderated by Organizational Religiosity and Ordering

The religious/sex prime, relative to neutral, was associated with increased shame, but only among individuals who were high on both organizational religiosity and ordering. In turn, increased shame was associated with greater perceived compulsivity (see Tables 2 and S6). This interaction was also significant when predicting access efforts and distress.

Table 2 Conditional indirect effects of the religious or religious/sex prime on the three CPUI-9 subscales at high levels of the moderators

Interaction	Cyber pornography use inventory subscale	*B*	*SE*	95% CI		β_{ps}
				Lower	Upper	
Religious Prime vs. Neutral × Organizational Religiosity × Washing	Perceived compulsivity	0.335	0.139	0.085	0.630	0.208
	Access efforts	0.107	0.050	0.024	0.219	0.103
	Distress	0.668	0.267	0.176	1.226	0.404
Religious Prime vs. Neutral × Organizational Religiosity × Hoarding	Perceived compulsivity	0.250	0.107	0.037	0.462	0.155
	Access efforts	0.080	0.037	0.011	0.157	0.077
	Distress	0.500	0.213	0.072	0.909	0.302
Religious/Sex Prime vs. Neutral × Organizational Religiosity × Ordering	Perceived compulsivity	0.244	0.112	0.014	0.459	0.151
	Access efforts	0.078	0.039	0.005	0.158	0.075
	Distress	0.488	0.222	0.029	0.905	0.295
Religious Prime vs. Neutral × Organizational Religiosity × Checking	Perceived Compulsivity	0.318	0.120	0.082	0.561	0.197
	Access efforts	0.101	0.101	0.024	0.196	0.098
	Distress	0.634	0.230	0.167	1.085	0.384
Religious/Sex Prime vs. Neutral × Organizational Religiosity × Checking	Perceived compulsivity	0.317	0.139	0.061	0.610	0.197
	Access efforts	0.102	0.048	0.018	0.208	0.098
	Distress	0.632	0.267	0.119	1.173	0.382

Religious or religious/sex prime was coded 1, neutral prime coded 0, therefore *B* for an indirect effect of prime condition indicates difference in the outcome associated with the religious or religious/sex prime, relative to neutral, via the mediator shame. Displayed are conditional indirect effects at high levels of both moderators (e.g., 84th percentile on both organizational religiosity and washing), only for instances of significant moderated–moderated mediation. *SE* = bootstrap standard error. CI = bootstrap confidence interval for *B*. β_{ps} = partially standardized effect. *N* = 645–646

Table 3 Indirect effects of religiosity (measured continuously) on the three Cyber Pornography Use Inventory subscales via shame

Outcome	Religiosity subscale	*B*	*SE*	95% CI for *B*		β_{fs}
				Lower	Upper	
Perceived compulsivity	Organizational	0.176*	0.024	0.130	0.224	0.164
	Non-organizational	0.151*	0.020	0.113	0.192	0.171
	Intrinsic	0.299*	0.033	0.235	0.366	0.205
Access efforts	Organizational	0.052*	0.013	0.028	0.078	0.087
	Non-organizational	0.045*	0.010	0.027	0.067	0.092
	Intrinsic	0.089*	0.018	0.054	0.125	0.109
Distress	Organizational	0.374*	0.033	0.312	0.439	0.340
	Non-organizational	0.292*	0.037	0.239	0.348	0.324
	Intrinsic	0.557*	0.044	0.472	0.643	0.373

SE = bootstrap standard error. CI = bootstrap confidence interval. β_{fs} = fully standardized regression coefficient

*Significant indirect effect (bootstrap CI does not include zero). *N* = 646

Effect of the Primes, Moderated by Organizational Religiosity and Checking

The religious prime, relative to neutral, was associated with increased shame, but only among individuals who were high on both organizational religiosity and checking; in turn, increased shame was associated with greater perceived compulsivity (see Tables 2 and S7). Additionally, among individuals high on organizational religiosity and checking, the religion/sex prime also caused increased shame, and in turn, greater perceived compulsivity (see Tables 2 and S8). These interactions were also significant when predicting access efforts and distress.

Exploratory Tests of Associations Between Self-Reported Religiosity (Measured Continuously) and Perceived Addiction

In light of our theorizing that religiosity leads pornography users to feel shame about their pornography use, and in turn, perceive themselves as addicted, we investigated whether the three self-report religiosity subscales (organizational, non-organizational, and intrinsic) had indirect or moderated indirect effects on perceived compulsivity. Note that these measures of religiosity are continuous rather than experimentally manipulated and were administered after the priming task. Although one-way ANOVAs indicated that prime condition was not significantly associated with the continuous variables administered after the primes, the following analyses controlled for prime condition.

Does Self-Reported Religiosity (Measured Continuously) Have Indirect Effects on Perceived Addiction via Shame?

We tested whether the three religiosity subscales had indirect effects via shame on perceived compulsivity, the outcome specified in our preregistration, in three separate simple mediation models. Each model was run twice, with and without controlling for pornography use. All three religiosity subscales had significant indirect effects on perceived compulsivity via shame. In other words, higher levels of organizational, non-organizational, and intrinsic religiosity were associated with more shame regarding one's pornography use, and in turn, stronger perceptions of addiction. The same pattern of results was found when the outcomes were access efforts and distress (see Table 3). Controlling for pornography use did not change the significance of these tests.

Are the Indirect Effects of Self-Reported Religiosity (Measured Continuously) on Perceived Addiction Conditional on the Proposed Moderators?

We tested whether the variables proposed as moderators in our preregistration strengthened the indirect effects of the religiosity subscales on perceived compulsivity via shame. Accordingly, we ran a series of moderated mediation analyses in which the *a* paths (religiosity → shame) of the mediation model (religiosity → shame → perceived compulsivity) were moderated by obsessing, organizational or intrinsic religiosity, moral disapproval, fear of sin, fear of God, or pornography use (three religiosity subscales × five moderators = 15 models). Each of these 15 models was run twice, with and without controlling for pornography use (except for the model with pornography use as a moderator). Controlling for pornography use did not change the significance of these tests. Next, we describe the results for the three instances of significant moderated mediation.

Effect of Non-Organizational Religiosity, Moderated by Moral Disapproval

Non-organizational religiosity was associated with higher shame and in turn, higher perceived compulsivity, but only

Table 4 Conditional indirect effects of non-organizational religiosity (measured continuously) on the three Cyber Pornography Use Inventory subscales, moderated by moral disapproval

Outcome	Moderator	*B*	*SE*	95% CI		β_{fs}
				Lower	Upper	
Perceived compulsivity	Low moral disapproval	−0.021	0.013	−0.048	0.002	−0.024
	High moral disapproval	0.034*	0.018	0.002	0.070	0.039
Access efforts	Low moral disapproval	−0.007	0.005	−0.017	0.001	−0.012
	High moral disapproval	0.011*	0.006	0.000	0.025	0.020
Distress	Low moral disapproval	−0.041	0.025	−0.091	0.007	−0.045
	High moral disapproval	0.067*	0.034	0.001	0.134	0.074

SE = bootstrap standard error. CI = bootstrap confidence interval. β_{fs} = fully standardized coefficient. Indices of moderated mediation: perceived compulsivity: *B* = 0.011, *SE* = 0.005, 95% CI [0.002, 0.020]; access efforts: *B* = 0.004, *SE* = 0.002, 95% CI [0.001, 0.007]; distress: *B* = 0.021, *SE* = 0.009, 95% CI [0.005, 0.039]

*Significant conditional indirect effect (bootstrap CI does not include zero). *N* = 646

Table 5 Conditional indirect effects of intrinsic religiosity (measured continuously) on the three Cyber Pornography Use Inventory subscales, moderated by fear of sin

Outcome	Moderator	*B*	*SE*	95% CI		β_{fs}
				Lower	Upper	
Perceived compulsivity	Low fear of sin	0.094*	0.022	0.053	0.142	0.064
	High fear of sin	0.255*	0.042	0.179	0.343	0.175
Access efforts	Low fear of sin	0.030*	0.009	0.014	0.051	0.032
	High fear of sin	0.081*	0.020	0.046	0.124	0.087
Distress	Low fear of sin	0.175*	0.040	0.100	0.256	0.117
	High fear of sin	0.485*	0.073	0.337	0.625	0.327

SE = bootstrap standard error. CI = bootstrap confidence interval. β_{fs} = fully standardized coefficient. Indices of moderated mediation: perceived compulsivity: *B* = 0.083, *SE* = 0.024, 95% CI [0.038, 0.133]; access efforts: *B* = 0.026, *SE* = 0.009, 95% CI [0.011, 0.046]; distress: *B* = 0.154, *SE* = 0.044, 95% CI [0.072, 0.242]

*Significant conditional indirect effect (bootstrap CI does not include zero). *N* = 646

for individuals high on moral disapproval. For individuals low on moral disapproval, the indirect effect was not significant. The same pattern of results was found when predicting access efforts and distress (see Table 4).

Effect of Intrinsic Religiosity, Moderated by Fear of Sin

Intrinsic religiosity was associated with higher shame and in turn, higher perceived compulsivity, but the indirect effect was significantly stronger for individuals high on fear of sin. The same pattern of results was found when predicting access efforts and distress (see Table 5).

Effect of Intrinsic Religiosity, Moderated by Fear of God

Intrinsic religiosity was associated with higher shame and in turn, higher perceived compulsivity, but the indirect effect was significantly stronger for individuals high on fear of God. The same pattern of results was found when predicting access efforts and distress (see Table 6).

Are Associations Between Self-Reported Religiosity (Measured Continuously) and Perceived Addiction Conditional on the Proposed Moderators?

We wanted to know whether positive associations between religiosity and perceived compulsivity were conditional on the variables proposed as moderators in our preregistration: obsessing, moral disapproval, fear of God, fear of sin, or pornography use. We ran a series of moderated regressions predicting perceived compulsivity from all two-way combinations of each of the religiosity subscales with the proposed moderators (three religiosity subscales × five moderators = 15 models). The religiosity subscale and the proposed moderator were entered into the first step, and the interaction was entered into the second step. Each model was run twice, with and without controlling for pornography use (except for the model with

Table 6 Conditional indirect effects of intrinsic religiosity (measured continuously) on the three Cyber Pornography Use Inventory subscales, moderated by fear of God

Outcome	Moderator	*B*	*SE*	95% CI		β_{fs}
				Lower	Upper	
Perceived compulsivity	Low fear of God	0.145*	0.029	0.092	0.206	0.100
	High fear of God	0.296*	0.047	0.209	0.394	0.203
Access efforts	Low fear of God	0.046*	0.012	0.025	0.074	0.050
	High fear of God	0.095*	0.023	0.054	0.144	0.101
Distress	Low fear of God	0.270*	0.048	0.180	0.370	0.181
	High fear of God	0.552*	0.083	0.391	0.720	0.370

SE = bootstrap standard error. CI = bootstrap confidence interval. β_{fs} = fully standardized coefficient. Indices of moderated mediation: perceived compulsivity: *B* = 0.063, *SE* = 0.021, 95% CI [0.023, 0.105]; access efforts: *B* = 0.020, *SE* = 0.008, 95% CI [0.007, 0.037]; distress: *B* = 0.117, *SE* = 0.040, 95% CI [0.042, 0.200]

*Significant conditional indirect effect (bootstrap CI does not include zero). *N* = 646

pornography use as a moderator). Two of these models had significant interactions: organizational religiosity × obsessing, and organizational religiosity × fear of sin. Next, we lay out the results of these tests that were significant. The patterns of associations described below did not change when controlling for pornography use.

Organizational Religiosity × Obsessing

In the first step of the model, both organizational religiosity and obsessing were significantly and positively associated with perceived compulsivity (see Table S9). The interaction entered into the second step was also significant. Simple slopes indicated that organizational religiosity was significantly associated with greater perceived compulsivity among individuals high on obsessing, but not among individuals low on obsessing (see Fig. 2). The same pattern of results emerged when predicting access efforts (see Table S10) and distress (see Table S11).

Organizational Religiosity × Fear of Sin

In the first step of the model, both organizational religiosity and fear of sin were positively and significantly associated with perceived compulsivity (see Table S12). The interaction was also significant. Simple slopes indicated that organizational religiosity was significantly associated with greater perceived compulsivity among individuals high on fear of sin, but not among individuals low on fear of sin (see Fig. 3). The same pattern of results emerged when predicting distress (see Table S13), but not when predicting access (see Table S14).

Discussion

This study was based on research, suggesting that perceptions of pornography addiction may arise from conflict between individuals' pornography use and religious beliefs (Grubbs et al. 2019a, b, c). Although our preregistered hypotheses were not supported, exploratory analyses offer support for our theorizing that religiosity fosters perceived pornography addiction via the mediation process of shame, especially among individuals high on OCD symptoms and religious obsessions.

Confirmatory Analyses

The religious primes did not have significant indirect effects on perceived pornography addiction via shame. Adding each of the proposed moderators to the model did not lead to any significant conditional indirect effects. Thus, none of our preregistered hypotheses were supported. Why were these hypotheses not supported? Perhaps the religious primes were unsuccessful in increasing salience of religiosity. The robustness of behavioral priming effects has come under scrutiny (e.g., Schimmack, Heene, & Kesavan, 2017, with notable comment by

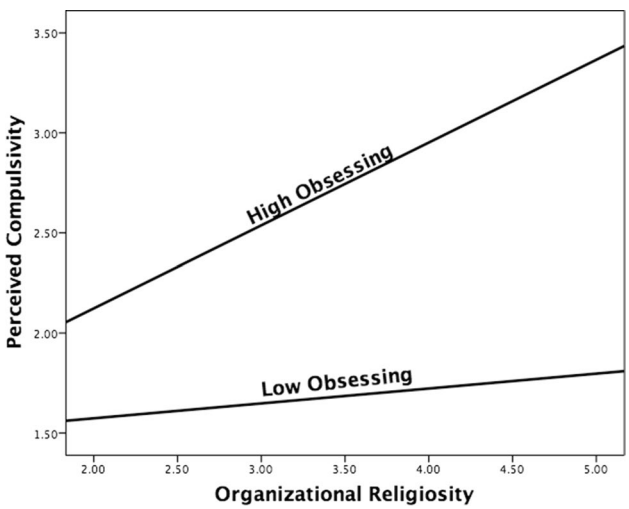

Fig. 2 Simple slopes for the interaction between organizational religiosity and obsessing predicting perceived compulsivity

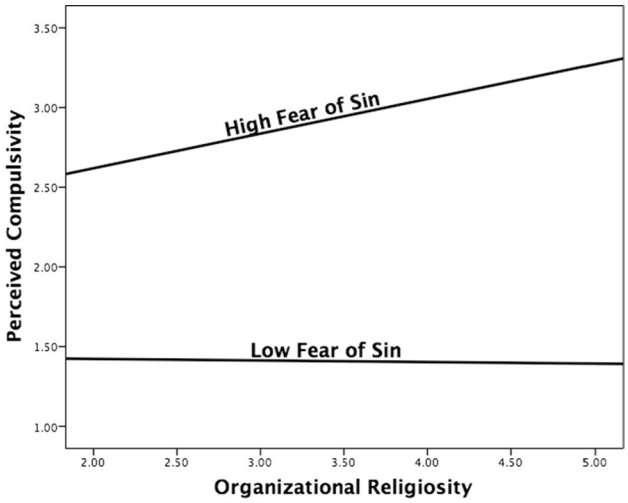

Fig. 3 Simple slopes for the interaction between organizational religiosity and fear of sin predicting perceived compulsivity

Kahneman) due to numerous replication failures (e.g., Doyen, Klein, Pichon, & Cleeremans, 2012) and suboptimal methods (e.g., lack of power; Rivers & Sherman, 2018). The robustness of religious priming in particular has also been questioned. For example, although Shariff et al.'s (2016) metanalysis indicated that religious priming has positive effects on prosocial behavior, Van Elk et al.'s (2015) reanalysis of those data suggested that Shariff et al.'s (2016) findings might reflect publication bias. Thus, lack of support for our preregistered hypotheses might be further evidence that religious priming is not as effective as once thought. It is also possible that religiosity does cause pornography users to feel shame and addicted, but our religious primes were too subtle to elicit the expected effects. Researchers pursuing this might consider more forceful methods such as realistic websites featuring religious leaders warning of the purported harms of pornography or promoting the self-diagnosis and treatment of pornography addiction.

Exploratory Analyses

In exploratory analyses, it is not possible to meaningfully adjust alpha to compensate for inflated familywise error rate due to an indeterminate number of potential tests (Nosek, Ebersole, DeHaven, & Mellor, 2018; Rubin, 2017). Additionally, such adjustments inevitably increase Type II errors, and in the context of exploration, risk obscuring discovery of important phenomena (Fiedler, Kutzner, & Krueger, 2012). Accordingly, while these results should be viewed with caution and in need of replication, they raise potentially valuable explanations for perceived pornography addiction.

Another possible reason for the lack of support for our preregistered hypotheses, in addition to the explanations offered above, is that the religious primes had significant indirect effects on perceived addiction via shame, but only for individuals high on two of the proposed moderators (i.e., moderated–moderated mediation), a possibility that we did not preregister. In exploratory analyses, we found support for this: The religious prime had indirect effects on all three CPUI-9 subscales via shame among individuals who were high on both organizational religiosity and either washing, hoarding, ordering, or checking. Additionally, the religious/sex prime had indirect effects on the three CPUI-9 subscales for individuals high on both organizational religiosity and either ordering or checking.

Washing, hoarding, ordering, and checking strengthened the effects of the religious primes on perceived addiction. This suggests that pornography users with these compulsions might also consume pornography compulsively, that is, frequently, ritualistically, and to counteract anxiety, and the religious primes induced shame regarding their compulsive pornography use, and in turn, heightened perceived addiction. If this speculation is correct, it would point to an explanation for perceived addiction different from our original theory. Our initial theory was that obsessing would interact with religiosity to heighten shame and perceived addiction, not because one's use is actually dysregulated, but because of obsessions that one's sexual thoughts and impulses are immoral and must be controlled. Instead, if trait-level compulsivity heightens the effect of religiosity on perceived addiction, perhaps the religious primes heighten awareness of pornography use that is, in fact, dysregulated, which in turn leads to shame and perceptions of addiction. This notion is supported by previous findings that pornography use is associated with compulsive tendencies more broadly (Egan & Parmar, 2013). Future investigations should assess whether participants' pornography use reflects DSM-5 criteria for compulsivity (e.g., behaviors that rule-based and not pleasurable), which the current study did not.

Next, we examined religiosity as a non-manipulated, self-reported, continuous predictor of perceived compulsivity. We found that all three religiosity subscales had indirect effects on the three CPUI-9 subscales via shame. Moreover, these indirect effects were significant over and above the predictive ability of pornography use. These findings provide additional support for Grubbs and colleagues' theorizing that perceived addiction might be motivated by religiosity (Grubbs et al., 2019a, b, c); however, our results also suggest that shame might be a mechanism by which religiosity impacts perceived addiction. The possibility that shame plays some role in the association between religiosity and perceived pornography addiction has been speculated (Grubbs et al., 2019a, b, c), and several studies have supported alternative mediation models in which moral disapproval and religiosity are associated with perceived pornography addiction, and in turn, sexual shame (Volk et al., 2019; Volk, Thomas, Sosin, Jacob, & Moen, 2016). However, to the best of our knowledge, the current study offers the first empirical evidence that religiosity motivates self-identification as an addict due to heightened feelings of shame.

Further support for our theorizing that religiosity causes shame, which in turn causes perceived addiction, might be found in a recurring pattern of associations which emerged in our exploratory analyses. In predicting the CPUI-9 subscales, effect sizes for the predictors that plausibly contribute to feeling morally conflicted about pornography use (i.e., prime condition, three continuous measures of religiosity, moral disapproval, scrupulosity, shame) were largest for distress, smaller for perceived compulsivity, and smallest for access efforts. This pattern was found for all predictive models and also in bivariate correlations with CPUI-9 subscales, and accords with previous findings (Wilt, Cooper, Grubbs, Exline, & Pargament, 2016). In terms of Grubbs' model, this pattern might suggest that morally incongruent pornography use (e.g., due to religiosity, scrupulosity) impacts emotional distress most directly and strongly, and in turn, distress fosters self-identification as addicted. (In contrast, reports of access efforts may entail recall of real-world obligations neglected to access pornography and in turn, might be less malleable.) This speculation that moral incongruence leads to distress which in turn fosters self-identification as addicted accords with our theorizing and current findings that religiosity is associated with perceived compulsivity via the mediating process of shame, a distressing emotion.

Scrupulosity (i.e., obsessions regarding sin, Hell, and God's punishment) and obsessing (as measured by the OCI-R; Foa et al., 2002) emerged as predictors that strengthened associations between religiosity and perceived addiction. Noteworthy is that although these analyses were not preregistered, the findings were consistent with our theorizing that obsessing, including obsessions regarding sin and punishment by God, predispose pornography users to feel shame about their use and perceive they are addicted. Scrupulosity and obsessing, which were positively correlated in our study (and see Olatunji et al., 2007), are characterized by distressing, repetitive, and intrusive thoughts or impulses the individual believes are highly significant and must be controlled. Both scrupulosity and obsessing often entail sexual thoughts or impulses believed to be immoral or taboo, and scrupulosity in particular may reflect an overly strict moral code (Olatunji et al., 2007). However, frequency of sexual thoughts and impulses may simply reflect individual differences in the propensity for sexual excitation and inhibition (often referred to as sex drive or libido), which in turn is governed by complex neurophysiological processes that operate automatically (Janssen & Bancroft, 2007) and thus independently from moral beliefs.

Moreover, intrusive sexual thoughts or fantasies, even those featuring themes of aggression or victimization, are common in the general population (e.g., Byers et al., 1998), and suppression of sexual and non-sexual thoughts results in increased frequency of those thoughts (Abramowitz, Tolin, & Street, 2001). The sexual behaviors (e.g., masturbation, pornography use, fantasizing, partnered sex) motivated by those sexual thoughts or impulses may simply be a function of a high sex drive over which the individual has little control. Thus, we speculate that beliefs of addiction among some pornography users may reflect an obsessive religious preoccupation with ridding oneself of sexual impulses and behaviors perceived to be immoral but are, in fact, common and motivated by a normally operating sexual response system. Future investigations should consider whether high sex drive, lack of knowledge about human sexual response and normative sexual behaviors, or sexual or religious obsessions in particular contribute to perceptions of pornography addiction.

Our findings have another implication for Grubbs et al.'s (2019) theory. Across our analyses, organizational religiosity emerged as the measure of religiosity that was the most consistent predictor of perceived pornography addiction, perhaps because of the roles of some religious organizations in the anti-pornography movement and the popularization of the notion of pornography addiction (Thomas, 2013). However, we also found scattered associations between intrinsic and non-organizational religiosity and perceived addiction. Accordingly, we encourage future investigations into how specific manifestations of religiosity (e.g., organizational, intrinsic, spiritual) might be differentially related to perceived pornography addiction.

Limitations

This study had a number of limitations. Our experimental findings suggest that the religious primes cause heightened shame and perceived addiction. However, whether shame causes perceived addiction could not be tested because we did not manipulate shame. For example, it is possible that the religious primes caused perceived addiction, which in turn elicited shame (Volk et al., 2016). And although our findings of associations between self-reported religiosity, shame, and in turn, perceived addiction support our theorized causal model, due to reliance on cross-sectional data other causal directions must be considered. For example, perceived addiction and shame may cause heightened religiosity—that is, struggling with pornography may lead individuals to turn to God, prayer, and the church for support.

Our exploratory analyses suggest that OCD symptoms, scrupulosity, obsessing, and religiosity play a role in self-perceptions of perceived addiction. However, many of our analyses were post hoc and not preregistered nor adjusted for inflated risk of Type I errors (Nosek et al., 2018; Rubin, 2017). Thus, these findings should be in interpreted as tentative and in need of replication. Even though our analyses were well-powered ($N = 644–645$, more than twice the minimum sample size indicated by a priori power analysis), non-religious participants had to be excluded from analyses due to differential completion of the religious primes (see Online Supplement), causing a reduction in anticipated power and inability to test some preregistered hypotheses. In future investigations using priming, we recommend testing for and remedying such threats to validity (see Sakaluk, 2014 for more on this risk).

Like most previous investigations of perceived pornography addiction, our sample was relatively homogenous, comprising mostly Christians who were White, male, and recruited from online venues (e.g., Tumblrs, Reddit) likely to attract North Americans. Further research into the predictors of perceived pornography addiction should endeavor to recruit more diverse samples.

Conclusion

Our findings suggest that among some pornography users, beliefs of addiction may result from being religious while also suffering from OCD-related symptoms. Researchers and clinicians should consider how religiosity and existing mental health problems, even if sub-clinical, may contribute beliefs of being addicted to pornography.

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Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical Approval This study was approved by the Western Carolina University Institutional ReviewBoard. This study was performed in accordance with the ethical standards as laiddown in the 1964 Declaration of Helsinki and its later amendments or comparableethical standards.

Consent to Participate Informed consent was obtained from all individual participants included in the study.

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